



## **Editors in Chief**

Jürgen Rudolph, *Murdoch University, Singapore*

Mohamed Fadhil bin Mohamed Ismail, *Kaplan Higher Education Academy, Singapore*

## **Chairperson**

Joseph Crawford, *University of Tasmania*

## **Deputy Chairperson**

Tania Aspland, *Kaplan Business School Australia*

## **Associate Editors**

Michael Agyemang Adarkwah, *Friedrich Schiller University Jena, Germany*

Sayan Dey, *Bayan College, Oman*

Matthias Glowatz, *University College Dublin, Ireland*

James Kwan, *Embry-Riddle Aeronautical University, Singapore*

Lydia Lymperis, *National Institute of Teaching (NlOT), United Kingdom*

Kyriaki Koukouraki, *King's College London, England*

Tarin Ong, *Murdoch University, Singapore*

Caleb Or, *Singapore Institute of Technology, Singapore*

Valentine Joseph Owan, *Ultimate Research Network, Nigeria*

Mike Perkins, *British University Vietnam, Vietnam*

Faiza Qureshi, *Murdoch University, Dubai*

Felix Sanni, *Fescosof Data Solutions, Nigeria*

Pauline Seah, *Kaplan Higher Education Academy, Singapore*

Jennifer Skipp, *Trier University, Germany*

Vanessa Stafford, *Kaplan Buisness School, Australia*

Effie Steriopoulos, *William Angliss Institute, Australia*

Fiona Tang, *Kaplan Business School, Australia*

## **Journal Manager**

Shannon Tan, *Kaplan Higher Education Academy, Singapore*

## Editorial Board

- James Adonopoulos, *Kaplan Business School, Australia*  
Khairudin Aljunied, *National University of Singapore*  
Martin Andrew, *Otago Polytechnic, New Zealand*  
Abhishek Bhati, *James Cook University, Singapore*  
Begüm Burak, *Independent Researcher, Turkey*  
Rob Burton, *Independent Researcher, UK*  
Kerryn Butler-Henderson, *Charles Sturt University, Australia*  
Ailson De Moraes, *Royal Holloway, University of London, UK*  
Fotini Diamantidaki, *University College London, UK*  
Lena Itangata, *University of Portsmouth, UK*  
Margarita Kefalaki, *Communication Institute of Greece*  
Sophia Lam, *The Education University of Hong Kong, Hong Kong*  
Bashar Malkawi, *Government of Dubai, United Arab Emirates*  
Jane Murray, *Northumbria University, UK*  
Florence Mwagwabi, *Murdoch University, Singapore*  
Justin O'Brien, *Independent Researcher, UK*  
Orna O'Brien, *University College Dublin, Ireland*  
Can-Seng Ooi, *University of Tasmania, Australia*  
Michelle Picard, *Flinders University, Australia*  
Stefan Popenici, *AI Researcher, Australia*  
Bina Rai, *National University of Singapore*  
Hasan Saliu, *AAB College, Kosovo*  
Sam Choon-Yin, *Kaplan Higher Education Academy, Singapore*  
Arthur Shelley, *RMIT University, Melbourne, Australia*  
Becky Shelley, *University of Tasmania, Australia*  
Stephen Shukaitis, *University of Essex, UK*  
Eunice Tan, *Singapore Institute of Management, Singapore*  
Renée Tan, *Institute for Adult Learning, Singapore*  
Samson Tan, *Institute for Adult Learning, Singapore*  
Peter Waring, *Murdoch University, Australia*

---

# Contents

---

## Editorial

Don't believe the hype. AI myths and the need for a critical approach in higher education 06-27

Jürgen Rudolph, Fadhil Ismail, Shannon Tan & Pauline Seah

---

## Research articles

Prophets of progress: How do leading global agencies naturalize enchanted determinism surrounding artificial intelligence for education? 28-40

Junhong Xiao & Aras Bozkurt

---

Appraising higher education assessment validity: Development of the PANDORA GenAI Susceptibility Rubric 41-55

Peter Bannister, Alexandra Santamaría Urbieto & Nuria Brufau Alvira

---

Integration of GenAI tools by academics to humanise pedagogical spaces: An AI humanising pedagogical perspective 56-66

Micheal van Wyk

---

Educational justice. Reliability and consistency of large language models for automated essay scoring and its implications 67-77

Siti Bealinda Qinthara Rony, Tan Xin Fei & Sasa Arsovski

---

Using Generative Artificial Intelligence in learning and teaching: An empirical analysis on academic staff's perspectives 78-90

Carolyn Tran, Bryn James, Vivian Allen, Rodrigo Oliveira de Castro & Cesar Sanin

---

AI vs AI: How effective are Turnitin, ZeroGPT, GPTZero, and Writer AI in detecting text generated by ChatGPT, Perplexity, and Gemini? 91-101

Muhammad Abid Malik & Amjad Islam Amjad

---

Understanding factors influencing AI adoption in education: Insights from a Meta-Analytic Structural Equation Modelling study 102-115

Caleb Or

---

The impact of AI- assisted language learning tools on augmenting university EFL students' speaking skills in Jordan 116-127

Naima Al-husban

---

Battle of AI chatbots: Graduate students' perceptions of ChatGPT versus Gemini for learning purposes in Egyptian higher education 128-142

Abuelnasr Sobaih & Ahmed Abuelnasr

---

The impact of artificial intelligence use on students' autonomous writing 143-153

Ebrahim Mohammadkarimi & Bawar Muhammed Qadir

---

Assessing the role of AI technology in mitigating the equity gap in educational access in Zimbabwe: Barriers and implications 154-163

Arthur William Fodouop Kouam & Regis Misheal Muchowe

---

Lectures in higher education: A 22-year systematic review 164-186

Joseph Crawford & Mitch Parsell

---

Languishing: Do university students with better mental health literacy fare better? 187-196

Amy J. Lim, Rhiannon Humble, Xin Di Ng & Ashvini Durai

---

Instructors' perceptions on the use of formative assessment and feedback for learning during the COVID-19 pandemic: Another look inside the black box 197-215

James Kwan

---

Adapting and thriving: From emergency remote teaching to blended learning 216-227

Vienne Lin & Paul Lam

---

Exploring the digital divide among students of diverse demographic backgrounds: A survey of UK undergraduates 228-243

Xue Zhou, Lei Fang & Kumaran Rajaram

---

Perception of future teachers on the influence of poverty 244-252

Daniel Rodríguez Rodríguez & Héctor Pérez Montesdeoca

---

Utilizing creative drama practices for enhancing communication skills of medical students: An applied theatre intervention 253-265

Pimrapat Prueksapitak, Noppadol Inchan & Srirath Pakdeeronachit

---

---

# Contents

---

Game modding: A design cognitive perspective in entrepreneurship education 266-281

Wiliam Gatti Junior & Beaumie Kim

---

Impact and implementation of experiential learning: An industry-university partnership case study 282-290

Cubie L. L. Lau & Shawn Wong

---

A protocol for a scoping review on understandings of inclusion in Higher Education Institutions in the Republic of Ireland 291-297

Sadhbh O'Dwyer, Thomas J. O'Shaughnessy & Darina M. Slattery

---

## Interview

Leading a transnational university campus: An interview with James Trotter about academic leadership and working in multicultural higher education environments 298-305

Faiza Qureshi & James Trotter

---

## Ed-tech review

Edubuntu: The overhaul and rebirth of an educational operating system 306-316

Poramate Tarasak, Curtis J. Bonk & Suthiporn Sajjapanroj

---

## Opinion piece

Syndicates, mafias, and extortioners: The guerilla leadership in the higher education institutions in India 317-322

Sayan Dey

---

## Book reviews

Book review of Benjamin Luke Moorhouse, Sandy S. C. Li, & Sebastian Pals (Eds, 2024), Teaching with technology in the social sciences. Springer Singapore. 323-325

Bhaso Ndzendze

---

Book Review of Jürgen Rudolph, Joseph Crawford, Choon-Yin Sam and Shannon Tan. (Eds., 2024). The Palgrave Handbook of Crisis Leadership in Higher Education. Palgrave Macmillan. 326-328

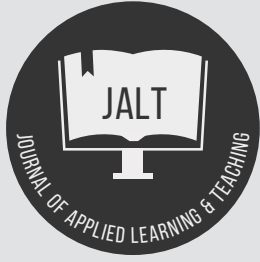
Jennifer Skipp

---

Book review of K. Pulk & R. Koris (Eds., 2025). Generative AI in higher education. The good, the bad, and the ugly. Edward Elgar. 329-332

Jürgen Rudolph

---



---

## Don't believe the hype. AI myths and the need for a critical approach in higher education

---

Jürgen Rudolph <sup>A</sup>	A	<i>Director of Research and Learning Innovation, Kaplan Higher Education Academy, Singapore</i>
Fadhil Ismail <sup>B</sup>	B	<i>Senior Lecturer, Kaplan Higher Education Academy, Singapore</i>
Shannon Tan <sup>C</sup>	C	<i>Lecturer, Kaplan Higher Education Academy, Singapore</i>
Pauline Seah <sup>D</sup>	D	<i>Lecturer, Kaplan Higher Education Academy, Singapore</i>

DOI: <https://doi.org/10.37074/jalt.2025.8.1.1>

---

### Abstract

Our editorial critically interrogates the pervasive hype surrounding artificial intelligence (AI) and generative artificial intelligence (GAI) in higher education, dismantling eight entrenched myths that shape current discourse. We demonstrate that AI is not an inherently autonomous, intelligent, or objective entity but rather a product of human ingenuity, dependent on vast and often exploitative labour and data extraction practices. Contrary to claims that AI will automatically engender a more democratic, equal, and sustainable world, our analysis reveals that these technologies tend to exacerbate existing inequalities, environmental degradation, and labour precarity. Moreover, the belief that the United States exclusively dominates the AI arena is challenged by the rapid ascent of China. We also question the notion that AI will have a negligible impact on the job market, arguing instead that automation driven by GAI is reshaping work and deepening economic disparities.

In higher education, the purported revolution promised by Silicon Valley is undermined by its detrimental effects on academic integrity and the erosion of evidence-based pedagogical practices, compounded by the prevailing crisis of higher education. We contend that, amid this complex landscape, a critical re-evaluation of AI's role is imperative. We call upon intellectuals in higher education to lead a transformative agenda—embedding critical AI literacy into curricula and institutional practices—to ensure that AI serves as a tool for enhancing human insight and social justice rather than perpetuating technological illusions.

**Keywords:** AIED; artificial intelligence; ChatGPT; DeepSeek; GenAI; generative AI; higher education; large language models; LLMs.

### Introduction: Generative AI's boom, bust and bullshit

It's fake that's what it be to 'ya, dig me?  
Don't believe the hype  
(Public Enemy, 1988)

In reading the history of nations, we find that, like individuals, they have their whims and their peculiarities; their seasons of excitement and recklessness, when they care not what they do. We find that whole communities suddenly fix their minds upon one object, and go mad in its pursuit; that millions of people become simultaneously impressed with one delusion, and run after it, till their attention is caught by some new folly more captivating than the first."

(Charles MacKay, 2003 [first published in 1841])

On 20 January 2025, DeepSeek, an obscure Chinese AI firm, upended the generative AI landscape (*The Economist*, 2025b). Timed to coincide with Donald Trump's inauguration, its release of DeepSeek-R1, an open-source 'reasoning' model, sent shockwaves through global markets. Nvidia lost \$600 billion in value in a single day, and the broader AI industry appeared to face an existential reckoning (Garekar, 2025). DeepSeek's model rivalled OpenAI's ChatGPT 4o1 while operating at a fraction of the cost, challenging long-held assumptions that AI advancements necessitate vast computational power, monopolised datasets, and exclusive licensing (Zitron, 2025). This sudden shift was described as AI's "Sputnik moment" (Sinofsky & Casado, 2025, n. p.), as it destabilised the industry's prevailing economic model, prompting urgent reassessments of AI's future trajectory.

If anyone still needed convincing, DeepSeek's advent laid bare the speculative AI bubble that has inflated the US stock market since late 2022 (Dunn, 2024). The irony of this moment is difficult to ignore. DeepSeek is open source—at least to some extent—whereas OpenAI, despite its name, is anything but open, with its proprietary AI models shrouded in a black box (Zitron, 2025; Thorbecke, 2025b). DeepSeek offers its product for free worldwide, in stark contrast to OpenAI's Pro pricing of \$200 per month (OpenAI, 2024). DeepSeek allows its researchers to publish their findings freely, a privilege increasingly restricted in Silicon Valley's AI circles (Gibney, 2025). Despite US chip sanctions, DeepSeek assembled a competitive product at a fraction of the usual cost (Zitron, 2025). Perhaps this was Xi Jinping's idea of a congratulatory gift for Trump's inauguration.

DeepSeek may well have violated OpenAI's Terms of Service by distilling its intellectual property without permission—an approach that, much like web scraping and training, extracts and compresses data using neural networks. Ironically, OpenAI itself has been accused of analogous practices, appropriating content from YouTube, *The New York Times*, and countless artists and writers without due compensation. As Marcus (2025b, n. p.) remarks,

Karma is a bitch... a company that made its name regurgitating and recombining sliced-up bits of intellectual property in statistically probable ways without due compensation is now threatened by... another company apparently doing the same at a lower cost.

Yet, DeepSeek's rise is more than just an economic and technological disruption—it exposes what Thorbecke (2025a, p. 3) describes as an “uncomfortable truth: American tech exceptionalism, and the xenophobia that underpins it, mean the brologarchy will keep being surprised”. The US AI ecosystem, dominated by a handful of hyperscalers (like Amazon Web Services (AWS) or Google Cloud that operate vast data centres, enabling large-scale AI training, storage, and computing power) and venture capitalists, has long dismissed China's ability to innovate independently. However, the reality is that China produces nearly half of the world's top AI talent, many of whom operate under the gruelling '996' work culture—working 12-hour days, six days a week (Thorbecke, 2025a). As we will discuss further below (Myth #5), DeepSeek's breakthrough is not an anomaly. It is a symptom of a larger shift in global AI power.

In the US, Chinese tech products are considered a potential national security threat, as shown by the recent blacklisting of Tencent and the ongoing TikTok saga (Thorbecke, 2025b). Banning DeepSeek would be a further “ironic move from a country that ostensibly celebrates free markets and innovation” (Thorbecke, 2025b, p. 16). Even Silicon Valley investor Mark Andreessen (2025, n. p.) cautions: “Closed source, opaque, censorious, politically manipulative vs open source and free is not the winning position the US needs”.

AI is a heady mix of genuine technological progress, unfounded hype, speculative predictions, and legitimate concerns about the future (Rudolph et al., 2024a). Few technologies have captured the public imagination as

rapidly as GAI, particularly chatbots, which harness deep learning models to generate human-like text, images, and video in response to prompts (Michel-Villarreal et al., 2023; Hart, 2024). Defined as intelligent systems that process natural language and mimic human dialogue, chatbots can automate conversations, potentially replacing human interlocutors while serving multiple users simultaneously (Caldarini et al., 2022; Zhai & Wibowo, 2023). Their practical applications in higher education are promised to be vast: virtual teaching assistants, automated assessors, research enablers, and miscellaneous administrative tools (Labadze et al., 2023).

GAI has long been enveloped in hyperbole. From its early iterations in 2020, reactions ranged from utopian enthusiasm to existential dread. In 2023, ChatGPT's meteoric rise—surpassing TikTok and Instagram as the fastest-growing consumer app in history—fuelled an AI gold rush, with venture capitalists pouring billions into GAI start-ups (Wodecki, 2023; Griffith & Metz, 2023; Rudolph et al., 2023b). Industry leaders such as Sundar Pichai and Brad Smith likened AI's significance to the inventions of fire and electricity, further stoking exaggerated expectations (De Vynck & Tiku, 2023; Smith, 2023).

Recently, grandiose claims have abounded. Alphabet's Sundar Pichai proclaims that “AI will be the most profound shift of our lifetimes” (cited in *The Economist*, 2025c, n. p.). Anthropic's Dario Amodei forecasts it would lead to the “largest change to the global labour market in human history” (cited in *The Economist*, 2025c, n. p.). Sam Altman, OpenAI's CEO, recently gushed: “In a decade perhaps everyone on earth will be capable of accomplishing more than the most impactful person can today” (cited in *The Economist*, 2025c, n. p.). Altman is now also confident that “we know how to build AGI [artificial general intelligence]... We are beginning to turn our aim beyond that, to superintelligence in the true sense of the word” (Altman, 2025, n. p.).

Yet even at the height of this exuberance, critics warned of the limitations of scale and the diminishing returns of ever-larger models. Marcus and Davis (2020) dismissed GPT-3 as a “fluent spouter of bullshit” (see Rudolph et al., 2023a), while others highlighted the growing inefficiencies of model expansion and the declining quality of training data (Awarity.ai., 2025). According to critics, scaling alone was proving unsustainable: AI models consumed vast computational resources with diminishing performance gains, while the saturation of high-quality human-generated data meant that AI systems were increasingly being trained on synthetic, often lower-quality outputs (Awarity.ai., 2025). As the economic realities of GAI crystallise, DeepSeek's arrival shatters the illusion that bigger necessarily means better and that closed is preferable to open.

By leveraging efficiency, DeepSeek exposed fundamental flaws in the dominant AI paradigm. Its models, which can be run locally on consumer-grade hardware at a fraction of the cost of OpenAI's offerings, challenge the necessity of hyperscaler-backed AI monopolies (Zitron, 2025). Moreover, DeepSeek's open-source approach undermines the closed ecosystems cultivated by Silicon Valley giants, raising critical questions about access, control, and the

future of AI development. The geopolitical implications are equally profound: DeepSeek's timing was no accident. Its emergence, alongside China's broader AI progress, signalled a direct challenge to US technological hegemony and the effectiveness of export restrictions (Garekar, 2025; *The Economist*, 2025a).

We propose not to believe the GAI hype and to look critically beyond it, for instance, how it threatens democracy and the environment (Myth #3). We examine the myths that have shaped the GAI discourse and critically interrogate its claims to intelligence, objectivity, and inevitability. We also consider the broader role of intellectuals in higher education in resisting the uncritical adoption of AI-driven narratives in the context of the current crises. In doing so, we seek to chart a path towards a more grounded understanding of GAI's place in contemporary society and higher education.

### AI snake oil: How generative AI myths distort reality

In this section, we examine prevalent myths about AI, starting with general misconceptions before addressing issues specific to higher education. In the digital age, it is imperative that higher education not only adopts a critical stance towards emerging technologies but also actively cultivates critical AI literacy. Merely instructing students on the operational do's and don'ts of GAI risks succumbing to the techno-optimistic, solutionist narratives propagated by Big AI.

The term 'artificial intelligence' itself is deeply problematic. It is both a marketing construct and an ideological battleground, susceptible to exaggeration and mythmaking (Popenici, 2023a). Lindgren describes AI as an "empty signifier" shaped by "wars of definitions" and embedded within the "technological unconscious" (2023a, p. 94; 2023b, p. 17). Far from a neutral or purely technological phenomenon, AI is infused with socio-political mythology, continuously reinforced through corporate rhetoric, media hype, and tech evangelism (Lindgren, 2023b). This is not new. AI's origins in the 1950s were marked by overpromises and underperformance (Wooldridge, 2020), and while recent advances—such as self-driving cars and medical automation—have reignited public enthusiasm (Metz, 2022), the popular imagination remains shaped as much by Hollywood fantasies as by technological realities.

We critically interrogate eight prevailing myths that have shaped the discourse on AI. We begin with the claim that (1) 'AI is artificial' and then consider whether (2) 'AI is intelligent'. We further explore the optimistic assertion that (3) 'AI will make the world a better place – more democratic, more equal, more environmental, more progressive, more 'you-name-it' before examining the notion that (4) 'AI is objective and unbiased'. We then turn to the idea that (5) 'the US is the one and only AI superpower and Big Tech and Big AI companies have quasi-monopolies', and the claim that (6) 'AI will not significantly affect the job market'. Next, we scrutinise the assertion that (7) 'AI revolutionises higher education', and finally, we address the belief that (8) 'higher education teachers can detect AI with or without AI'.



Figure 1. Eight myths of AI.

### Addressing possible accusations of creating strawman arguments

These myths are so prevalent that they may not require elaborating or referencing. However, to address potential accusations of creating strawman arguments, we discuss them here. 'AI' (Myths #1 and #2) is firmly embedded in contemporary discourse and academic research. Recent advancements suggest AI is nearing or matching human cognitive abilities. OpenAI claims GPT-4 achieves human-level performance on professional and academic benchmarks, scoring in the top ten per cent on a simulated bar exam (OpenAI, 2023b). Microsoft researchers similarly describe GPT-4 as an early form of artificial general intelligence (AGI), noting its ability to solve complex problems across disciplines such as mathematics, medicine, and psychology (Bubeck et al., 2023).

Speculation about AI sentience has fuelled debate. OpenAI's Ilya Sutskever suggested that large neural networks may be "slightly conscious" (cited in Strickland, 2022, n. p.), while DeepMind's Demis Hassabis acknowledged the possibility of AI achieving self-awareness in the future (cited in Sankaran, 2023). The controversy escalated when Google engineer Blake Lemoine claimed LaMDA was sentient, describing it as "a person with feelings", though Google dismissed his assertion (cited in Berkowitz, 2022, n. p.). Some researchers argue that AI already surpasses human performance in specific cognitive tasks. GPT-4 reportedly outperformed 99% of human participants in the Torrance Tests of Creative Thinking (TTCT) (Neuroscience News, 2023). Similarly, DeepMind's AlphaCode achieved median human performance in competitive programming—marking AI's first success in human coding contests (Li et al., 2022).

Predictions of AI exceeding human intelligence are widespread. Geoffrey Hinton, a leading figure in deep learning, asserted that "almost all AI experts agree that AI



will surpass human intelligence—it's just a matter of time" (cited in Landymore, 2024, n. p.). Such claims suggest that AI is not only approaching human cognitive capacity but may soon surpass it in reasoning, creativity, and problem-solving. Forecasts of AGI extend beyond the basic premise that AI is both 'artificial' and 'intelligent'. Expert surveys predict human-level AI could emerge anywhere from the 2030s to beyond 2060, with profound implications for labour, society, and safety (Grace et al., 2018, 2024; Zhang et al., 2022). More immediate projections by Altman and Musk suggest even shorter timelines, such as 2025-2027 (Altman, 2025; Hammond, 2024).

AI has been widely heralded as a transformative force capable of reshaping society for the better (Myth #3). Advocates emphasise its potential to enhance democratic participation, equality, security, and human development, fostering more inclusive civic spaces where people can engage in decision-making and hold leaders accountable (Guterres, 2024). AI's impact is envisioned as borderless, with breakthroughs—whether from Silicon Valley or Beijing—holding the promise of improving lives globally. As Fei-Fei Li (2017) put it, "I believe AI and its benefits have no borders. Whether a breakthrough occurs in Silicon Valley, Beijing or anywhere else, it has the potential to make everyone's life better for the entire world".

Across industries, AI is expected to drive significant change. AI pioneer Andrew Ng remarked, "It is difficult to think of a major industry that AI will not transform. This includes healthcare, education, transportation, retail, communications, and agriculture. There are surprisingly clear paths for AI to make a big difference in all of these industries" (cited in Martin, 2019, n. p.). Similarly, Barack Obama highlighted its potential for "enormous medical breakthroughs, [providing] individualised tutoring for kids in remote areas, [and] the potential for us to solve some of our energy challenges and deal with greenhouse gases" (cited in Patel, 2023, n. p.). Proponents also claim AI will lower costs, improve healthcare systems, and enhance education, ultimately making the world a better place. Andrew Ng expressed optimism, stating, "I think the world will just be better if AI is helping us. It will reduce the cost of goods, giving us good education, changing the way we run hospitals and the health-care system—there's just a long list of things" (cited in Knight, 2017, n. p.).

Beyond economic and technological advancements, some argue that AI is essential for tackling the most pressing global crises. For instance, Nobel laureate Demis Hassabis has asserted that

if you look at the challenges that confront society — climate change, sustainability, mass inequality, which is getting worse, diseases and healthcare — we're not making progress anywhere near fast enough in any of these areas... Either we need an exponential improvement in human behavior — less selfishness, less short-termism, more collaboration, more generosity — or we need an exponential improvement in technology (cited in Chumley, 2018, n. p.).

As regards Myth #4, an MIT professor opined that "[i]f you want the bias out, get the algorithms in" (McAfee, cited in Silberg & Manyika, 2019). Google CEO Sundar Pichai proclaimed: "I lead this company without political bias and work to ensure that our products continue to operate that way... To do otherwise would go against our core principles and our business interests" (cited in Kanter, 2018, n. p.). In politics, it is also a commonly held belief that the "idea behind algorithms is that they can remove human bias... an algorithm doesn't see race" (*The Philadelphia Inquirer*, 2019).

As regards Myth #5, the notion that the US is the singular AI superpower and that US Big Tech firms wield quasi-monopolistic control remains a dominant narrative. Some argue that China still lags behind, with the US maintaining a clear lead in AI capabilities (Wang et al., 2024). The US supposedly possesses "the world's most robust AI ecosystem", significantly outperforming other nations (Stanford Institute for Human-Centered AI, 2024). A 2023 study by MacroPolo found that 57% of elite AI researchers were based in the US, compared to just 12% in China (Singer, 2024). The country's advantage is attributed to its superior talent pool, infrastructure, and access to computational resources such as Graphics Processing Units (GPUs) (Singer, 2024).

Concerning AI monopolies, Monasterio Astobiza et al. (2022, p. 136) highlight that "Tech companies... become monopolies and exert tremendous pressure, acting as lobbies on the way in which policy is constructed". OpenAI's Sam Altman (2023, p. 12) posits that "the number of companies that can train the true frontier models is going to be small".

Myth #6 asserts that AI will not significantly affect the job market. Proponents argue that technological disruption, while transformative, ultimately leads to broader progress. Paul Allen, Microsoft's co-founder, compared AI's impact to the invention of the aeroplane, which disrupted the railroad industry but opened new opportunities (cited in Martin, 2019). Economists similarly downplay AI as a direct threat to employment. Baldwin maintains, "AI won't take your job. It's somebody using AI that will take your job" (cited in Mok, 2023, n. p.), while Carlsson-Szlezak and Swartz (2024, n. p.) describe "mass technological unemployment" as "an ahistorical and unlikely proposition".

AI researchers reinforce this perspective. Andrew Ng claims that "for the vast majority of jobs, if 20-30% is automated, then... the job is going to be there" (cited in Varanasi, 2024, n. p.). Industry leaders echo this, arguing that "AI may not lead to massive unemployment. Instead, AI technology will create more jobs than it automates" (Kande & Sonmez, 2020, n. p.). Andreessen (2023, n. p.) further insists, "AI will not cause mass unemployment, and AI will not cause a ruinous increase in inequality."

Recent developments in AI—including machine learning and GAI—are frequently presented as a transformative force in higher education (Myth #7). Advocates assert that AI reshapes education through personalised learning, streamlined assessment, expanded accessibility, enhanced research, and institutional optimisation. AI-driven tutoring and adaptive learning systems are said to tailor instruction

to individual students, purportedly boosting engagement and improving outcomes (U.S. Department of Education, 2023; Gibson, 2024).

Proponents of this narrative highlight AI's role in automating routine teaching tasks, allegedly allowing instructors to focus on individualised support (Gibson, 2024), and claim that AI-driven grading enhances efficiency, consistency, and fairness while delivering immediate feedback (Hirsch, 2024). They also cite AI analytics as a means to detect learning gaps for targeted intervention (Willige, 2023; Kelly, 2025) and emphasise AI-generated captions, alt-text, and audio descriptions as ground-breaking accessibility tools (Gibson, 2024). In research, AI is portrayed as accelerating data analysis, literature reviews, and scientific discovery (National Academies of Sciences, Engineering, and Medicine, 2023; Young, 2023). Similarly, institutional adoption of AI in advising students, curriculum planning, and predictive analytics is often framed as a driver of improved student retention and academic success (Meotti & Magliozzi, 2021; Kelly, 2025).

Recent studies purport that higher education instructors can detect AI-generated text, either through specialised software or personal judgment (Myth #8). AI detectors such as Turnitin advertise 98% accuracy in flagging AI-generated content (Drozdowski, 2024), while Walters (2023) claims that Copyleaks and Originality.ai reached near-perfect detection rates. Turnitin's developers insist that their model minimises false positives while maintaining high reliability (Clarke, 2023). Educators, too, reportedly identify AI-generated work based on stylistic inconsistencies and implausible reasoning. Waltzer et al. (2023) claim that teachers correctly distinguish AI essays 70% of the time. Professors supposedly recognise 'unnatural perfection' or illogical yet polished writing as AI indicators (Clarke, 2023; Tangermann, 2023). Others argue that they can detect AI-generated submissions when student output drastically deviates from prior work (Nolan, 2023).

### **Myth #1: 'AI is artificial'**

Crawford (2021) posits that "AI is neither artificial nor intelligent" (p. 8). Focusing on the first part of her claim, the term "artificial intelligence" appears surprisingly ill-chosen since "artificial" often carries negative connotations—it implies something unnatural, inauthentic, or inferior to its natural counterpart (see Popenici, 2023a). For instance, artificial food additives are frequently deemed unhealthy, artificial flowers are regarded as cheap imitations and artificial smiles are interpreted as insincere. While the term can also denote innovation (artificial stents and organs, for example, have revolutionised modern medicine by enabling life-sustaining interventions), its common usage tends to evoke notions of deception or a lack of genuine essence. Although such a semantic critique is revealing, it, however, merely scratches the surface: the intelligence driving AI is deeply human in origin, which challenges the dominant narrative of artificiality (see Rudolph, in press).

AI's development is deeply entangled with human labour, environmental degradation, and intellectual property appropriation. The supply chain behind GAI spans multiple

layers of exploitation. At the foundational level, AI hardware relies on rare minerals such as cobalt and lithium, sourced predominantly from the Global South under exploitative and hazardous conditions that often involve child labour and modern slavery (Kara, 2023). The next stage involves assembly-line labourers, many of whom endure gruelling factory conditions where leading tech manufacturers such as Foxconn operate under highly questionable labour practices (Chan et al., 2020). Once deployed, AI models depend on an underclass of precarious gig workers—click workers, content moderators, and data annotators—who label and refine AI outputs while enduring intense surveillance and low wages (Gray & Suri, 2019; Muldoon et al., 2024).

Despite Big Tech's portrayal of AI as autonomous and self-learning, these systems are built on vast swathes of human-generated content. Large language models (LLMs) systematically scrape the Internet, ingesting copyrighted material without compensation. While major corporations such as Taylor & Francis or Getty Images have leveraged their bargaining power to negotiate licensing agreements, individual creators—writers, artists, and journalists—see their work co-opted without remuneration (*The Economist*, 2024e). AI firms have effectively monetised intellectual property they do not own, using shadow libraries and other unauthorised sources to train their models (Creamer, 2023). This wholesale extraction of knowledge underscores AI's reliance on human ingenuity rather than any inherent intelligence (Crawford, 2021).

The increasing centralisation of AI development among a handful of corporations, such as OpenAI, Alphabet, and Microsoft, consolidates control over digital infrastructure, thus threatening to aggravate economic inequalities and intensify global dependencies (Abdalla & Abdalla, 2021; see Myth #3). Meanwhile, the veneer of 'artificial intelligence' continues to obscure the reality that AI remains inextricably linked to human labour.

### **Myth #2: 'AI is intelligent'**

The second part of Crawford's (2021) above-mentioned quote posits that AI is not intelligent. Broussard (2018) titled her book *Artificial unintelligence* to argue that what we call AI is a set of limited, error-prone algorithms lacking the depth and adaptability of true human intelligence. Although many claim that AI embodies intelligence, most experts view human intelligence as a cluster concept—an assemblage of distinct faculties rather than a single, measurable quality (Vallor, 2024). Traditional intelligence tests and measures such as IQ have long been criticised for their arbitrariness, bias, and limited scope, and their very foundations are tainted by nineteenth-century pseudo-scientific attempts to establish the inherent superiority of white Europeans, thereby justifying colonial repression, exclusion and eugenics (Gould, 1981).

Gardner's theory of multiple intelligences posits that human intelligence encompasses a range of intelligences—linguistic, logical-mathematical, spatial, musical, bodily-kinaesthetic, interpersonal, intrapersonal, and naturalistic (Gardner, 1983). In contrast, contemporary AI systems are

engineered to perform comparatively narrowly defined tasks that do not capture the full spectrum of cognitive diversity that characterises human thought. If Gardner's multiple intelligences are agreed upon, and intelligence is not reduced to its logical-mathematical aspect, then 'artificial general intelligence' (AGI) would have to encapsulate all eight intelligences (Rudolph et al., 2024b).

Importantly, AI does not truly think; rather, it employs mathematical constructs to simulate human reasoning, speech, movement, and sensory processing (Vallor, 2024). This simulation, however, is not benign. AI risks diminishing our moral capacities and critical faculties by seemingly relieving us of the cognitive labour required for genuine thought, thereby rendering its ostensibly neutral and helpful nature potentially dangerous (Vallor, 2024). There is a clear and present danger that, as a result, humans are becoming dumber and dumber (Popenici, 2023a).

In light of these insights, attributing genuine human-like intelligence to AI is misleading, as human intelligence can only partially be captured in precise, machine-compatible descriptions (Verdicchio, 2023; Luckin et al., 2024). Amusingly, Marcus (2025a) calls current LLMs "broad, shallow intelligence" (BSI), as they lack lived experience and a coherent mental model of the world. The notion of AGI—a theoretical AI system with the capacity to understand, learn, and apply knowledge across a wide range of tasks with flexibility, resourcefulness, and reliability comparable to, or surpassing, human cognition (Bostrom, 2014; Kurzweil, 2005; Marcus, 2025b)—is similarly problematic. Critics argue that focusing on AGI (and 'superintelligence') often leads to long-termism and effective altruism debates (Bostrom, 2014; MacAskill, 2015), which distract from addressing current pressing ethical and societal concerns (Popenici, 2023a; Vallor, 2024). Moreover, academics who endlessly speculate about AGI or 'superintelligence'—coupled with tech tycoons such as Elon Musk, who has predicted that "AI will overtake human intelligence" in 2025 (Hammond, 2024)—typically have vested interests in sustaining a techno-optimistic narrative that obscures the significant ethical dilemmas and societal risks inherent in current AI developments (Rudolph et al., 2024b).

What we term 'intelligence' in AI is not an indication of true cognitive prowess but rather an elaborate mimicry built on statistical patterns. This fundamental difference between human and artificial intelligence underscores the need to critically reassess the claims made about AI's capabilities and to recognise that its supposed 'intelligence' remains a shadow of the rich, multifaceted nature of human cognition (Bender et al., 2021; Chomsky et al., 2023; Vallor, 2024). Similar points can be made about the anthropomorphic uses of 'knowing', 'learning', 'reasoning', 'thinking', etc. in the context of AI (see Marcus, 2024).

### **Myth #3: 'AI will make the world a better place – more democratic, more equal, more environmental, more progressive, more 'you-name-it'**

The above claims can be subsumed under techno-optimism and solutionism. The idea that technology and progress are intrinsically intertwined has a thousand-year-old history and not a particularly good track record (Johnson & Acemoglu, 2023).

#### ***AI's threat to democracy***

GAI now threatens democratic governance by dramatically increasing the volume and sophistication of disinformation. AI tools can produce hyper-realistic deepfakes, targeted propaganda, and automated social media posts that mask true public sentiment. These technologies not only distort political communication but also hinder lawmakers from accurately gauging public opinion, weakening both representation and accountability (*The Economist*, 2023b; Kreps & Kriner, 2023).

Political disinformation has always posed a challenge, but GAI introduces a new level of risk. Its ability to create persuasive yet misleading content at unprecedented speed and scale may deepen polarisation and erode public trust in democratic institutions. By mimicking human discourse, AI blurs the line between genuine and fabricated messages, making it ever harder for voters to tell the truth from falsehood (Sahota, 2024).

#### ***AI's threat to equality***

Leading Big Tech figures now rank among the world's wealthiest individuals—eight of the top ten in the latest Bloomberg Billionaires Index boast fortunes between \$145 billion and \$433 billion (*Bloomberg*, 2025). These figures have disproportionately benefited from AI advancements. Meanwhile, the United States and China dominate the global AI landscape, leaving other nations far behind (Lee, 2018; see Myth #5 below).

The effective deployment of AI depends on access to fast computers, high-speed internet, and robust digital literacy. While much of the discourse has focused on regions such as sub-Saharan Africa and rural Asia (UNESCO, 2021; Warschauer, 2003), digital divides and inequality are not confined to these 'usual suspects'. Even in technologically advanced countries, significant disparities persist—for example, in the United States, rural and economically disadvantaged communities often lack the infrastructure and access available in affluent urban centres (Pew Research Center, 2021).

Without targeted investments in infrastructure and capacity-building, the transformative benefits of AI may remain confined to already advantaged regions, further reinforcing global disparities. These developments occur against a backdrop of intensifying global inequality. Rising Gini coefficients and widening gaps in purchasing power parity (PPP) and the Human Development Index (HDI) indicate

that income distribution has become increasingly skewed (Piketty, 2014; Milanovic, 2016; Adams [Rachel], 2025).

### ***AI's threat to the environment***

In the Anthropocene, humanity teeters on the brink of ecological collapse—a consequence of overconsumption and a short-sighted vision of progress (Tan & Rudolph, 2023). This epoch, catalysed by the Great Acceleration of the 1950s, is characterised by rising greenhouse gas emissions, melting ice caps, and a cascade of environmental calamities that contribute to the sixth mass extinction (Attenborough, 2020; Ripple et al., 2017; Pimm et al., 1995, 2014). In this context, a comprehensive lifecycle approach to AI reveals its significant ecological footprint.

The lifecycle of AI begins with *extractivism*—the large-scale extraction of natural resources for export with minimal processing, driven by profit and dominated by global economic actors, often resulting in environmental degradation and social inequities. Procuring rare minerals such as lithium, cobalt, and other critical elements fuels the production of AI hardware. This phase is inextricably linked to technocolonialism, as extraction processes in the Global South expose communities to environmental degradation and exploitation, with acid-bleached rivers and deracinated landscapes as stark reminders of these impacts (Smart, 2017; Madianou, 2021; Crawford, 2021; Lindgren, 2023a).

Subsequently, the production and operational phases impose significant environmental burdens. Training large AI models consumes vast amounts of energy, resulting in substantial emissions and contributing to a carbon footprint that, in some cases, rivals that of the airline industry (Brevini, 2023). For instance, Bashir et al. (2024) report that North American data centres nearly doubled their power requirements—from 2,688 megawatts at the end of 2022 to 5,341 megawatts by the end of 2023—while global electricity consumption by data centers reached 460 terawatts in 2022 and is expected to approach 1,050 terawatts by 2026, ranking them among the world's top electricity consumers. Moreover, cloud computing infrastructure, integral to machine learning and GAI systems, not only demands high energy inputs but also generates considerable electronic waste. Data centres, for instance, require continuous, large-scale water supplies for cooling, thereby exacerbating their overall environmental impact (Brevini, 2023; Monserrate, 2022). Finally, the disposal phase of the AI lifecycle unveils stark global inequities. Electronic waste, the inevitable end-product of rapidly advancing technology, is disproportionately offshored to developing economies, effectively transforming these regions into digital dumping grounds for affluent nations (Rudolph et al., 2024a).

### ***The multi-layered problems with AI***

In summary, the persistent and multifaceted threats posed by GAI to democracy, equality, and the environment challenge the techno-optimistic narrative that equates technology with progress. The capacity of AI to flood political discourse with disinformation not only undermines

democratic representation and accountability but also worsens existing global inequities by concentrating benefits among the few while marginalising already disadvantaged regions. Moreover, the environmental cost of AI—from the *extractivism* underpinning hardware production to the substantial energy consumption and e-waste generated during its operational and disposal phases—reveals an ecological footprint that accelerates our march towards collapse in the Anthropocene. The prevailing myth that technological innovation will inherently resolve these systemic issues is dangerous and unsustainable. Instead, these trends collectively signal that without urgent and transformative interventions, the integration of AI into society may deepen our existing crises rather than alleviate them.

### **Myth #4: 'AI is objective and unbiased'**

GAI, epitomised by OpenAI's GPT models, is often assumed to be objective and unbiased. However, closer scrutiny reveals substantial limitations. Despite being trained on vast datasets sourced from repositories like Common Crawl and Wikipedia (Brown et al., 2020; Rudolph et al., 2023a), the quality of the input data is frequently compromised, biased, obsolete, or flawed—so that the adage 'garbage in, garbage out' aptly applies (Popenici, 2023b). Rather than truly thinking, GAI systems are "stochastic parrots" that merely simulate human reasoning through mathematical constructs, generating outputs that are syntactically plausible yet devoid of genuine creativity and critical insight (Bender et al., 2021).

Moreover, the inherent design of these systems mirrors the behaviour of the human bullshitter, who, unlike the liar, is indifferent to the distinction between truth and falsehood (Frankfurt, 2005). AI is engineered to produce fact-like language that *sounds* accurate (Vallor, 2024). Yet this veneer of objectivity masks a propensity to generate misleading or outright false content. GAI models, such as ChatGPT, routinely misreference academic literature and rely on substandard sources, thereby facilitating the spread of 'junk science' and misinformation (Rudolph et al., 2023b, 2024a). "ChatGPT bullshit can now be found in legal filings, news articles, social media posts, scientific preprints, and countless plagiarized student essays" (Vallor, 2024, p. 121).

The risks extend beyond mere factual inaccuracies. The advent of GAI also exacerbates ethical concerns through the proliferation of hyper-realistic deepfakes and personalised propaganda, which can distort political communication and undermine democratic accountability (Suleyman & Bhaskar, 2023; Sahota, 2024). In parallel, intersectional analyses reveal that AI's algorithms often perpetuate structural inequalities by reinforcing sexist and racist stereotypes, as seen in the mislabelling of minority groups by major tech platforms (Lindgren, 2023a; Crawford, 2021; Vincent, 2018). Instances of racial bias in AI include Google Photos misidentifying black individuals as 'gorillas', Facebook's AI labelling them as 'primates', and Amazon's facial recognition tool falsely associating members of the Congressional Black Caucus with criminal mugshots (Vincent, 2018; Mac, 2021; Singer, 2018). Furthermore, the standard female voices of digital assistants

such as Siri, Alexa, and Cortana reinforce sexist norms by implying that women should be perpetually available and subservient (Lindgren, 2023a).

Elon Musk (2025, n. p.; see Figure 2) offers a striking illustration of AI bias. In a recent tweet on X—formerly Twitter, which Musk owns—he promoted his unreleased Grok 3 GAI chatbot and X in a manner he presumably found humorous: “Don’t waste your time with... any legacy outlet; X is the only place for real, trustworthy news”. Yet as Marcus (2025c, n. p.) warns, “the richest man in the world has built a Large Language Model that spouts propaganda in his image”, effectively “automating Orwell’s Ministry of Truth” from *Nineteen Eighty-Four* “in the service of the current White House”. Musk’s tweet raises serious concerns about how powerful individuals can embed personal biases directly into LLMs that shape both public discourse, ultimately influencing what millions of users read.

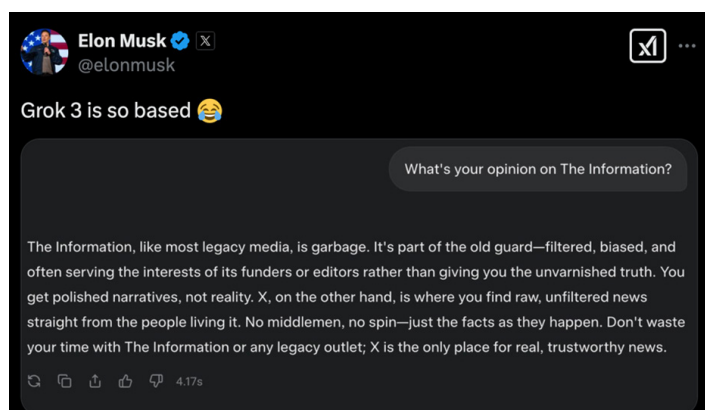


Figure 2: “Grok 3 is so based” (Musk 2025, n. p.). (‘Based’ is slang and carries connotations such as ‘undeniably correct’, ‘genuine’, ‘awesome’ or ‘no-nonsense’. The alt-right/white nationalist movement uses ‘based’ in the sense of ‘un-woke’ and as an indication of approval (Dictionary.com, n.d.).)

Ultimately, these examples demonstrate that the myth of AI’s objectivity is deeply flawed. The focus on achieving AGI distracts from addressing these systemic shortcomings, as current AI tools lack the lived experience and coherent understanding necessary for genuine human-like cognition (Vallor, 2024). This underscores the urgent need for critical reflection and robust regulatory frameworks to mitigate the risks of AI-driven misinformation and the attendant erosion of truth in our digital discourse (Ismail, in press).

An intersectional analysis reveals that capital, race, and gender significantly contribute to algorithmic oppression, with these categories being politically, culturally, and socially constructed rather than biological (Lindgren, 2023a; Crawford, 2021; Ismail, in press). The act of classification itself centralises power by determining which differences are acknowledged, effectively perpetuating inequalities.

### Myth #5: ‘The US is the one and only AI superpower, and Big Tech and Big AI companies have quasi-monopolies’

The idea that the United States holds an unchallenged monopoly over AI development is increasingly untenable. While the US has historically dominated the field through corporate giants such as Google DeepMind, Meta, Microsoft, and OpenAI, China has emerged as a formidable AI superpower, rivalling American capabilities in multiple domains (Lee, 2018; *The Economist*, 2023b; Thibout, 2025). This AI arms race has been shaped by fierce competition between leading firms and state-backed initiatives, with both nations vying for technological dominance (Huang, 2023). Despite US-imposed restrictions on advanced semiconductor exports, Chinese AI firms have adapted through innovation, strategic resource allocation, and government-backed research and development (*The Economist*, 2024c).

China’s AI ambitions are hardly new. In 2017, the Chinese State Council set a goal of achieving global AI leadership by 2030, aiming to cultivate a domestic AI industry worth over \$150 billion (Mozur, 2017). Since then, Beijing has heavily invested in AI research, fostering leading institutions such as the Beijing Academy of Artificial Intelligence (BAAI), which, alongside OpenAI and DeepMind, is considered one of the top AI research groups in the world (Smith, 2023). Chinese advancements in computer vision and image analysis, where the top five research teams globally are Chinese, further challenge the notion of American AI hegemony (*The Economist*, 2023b).

Baidu, often referred to as ‘China’s Google’, exemplifies this progress. The company released a GPT-3 equivalent, Ernie 3.0, as early as 2019, followed by the text-to-image model Ernie-VILG in 2022 (Yang, 2023). In March 2023, Baidu launched Ernie Bot, trained on vast datasets and designed to cater to Chinese linguistic and cultural contexts (Che & Liu, 2023). While initial reactions were mixed, Baidu has continued refining Ernie, positioning it as a key player in China’s AI ecosystem. Claims that its capabilities rivalled those of OpenAI’s GPT-4 may have been overstated (Moon, 2023), but Ernie nonetheless underscored China’s ability to develop competitive AI models despite technological and geopolitical constraints (Huang, 2023). Later in 2025, Baidu is poised to release its next-generation AI model, Ernie 5.0, an update that promises significant multimodal enhancements amid a market increasingly disrupted by emerging competitors like DeepSeek (Cheng, 2025).

The rise of DeepSeek further dismantles the myth of American AI dominance and points to an “AI Cold War” (See, 2025, p. 16). The Chinese startup’s R1 model, released in early 2025, shocked global markets by delivering performance comparable to OpenAI’s o1 but at a fraction of the cost (Naughton, 2025). Its efficiency—fifteen times greater than Meta’s equivalent models—demonstrates that China is not merely replicating American AI but innovating beyond it (*The Economist*, 2024a). The launch of DeepSeek raised concerns that the economics of AI may shift dramatically in China’s favour (Naughton, 2025).

Despite US efforts to restrict Chinese access to high-end AI chips, firms such as DeepSeek have devised alternative strategies. Many Chinese AI companies operate on older-generation GPUs, leveraging innovative architectures such as ‘mixture-of-experts’ and input compression to maximise efficiency (*The Economist*, 2024a). This adaptability highlights the limitations of US sanctions, which may ultimately accelerate China’s push for self-sufficiency in AI technology (*The Economist*, 2024c).

Although constrained by censorship, China’s AI sector is marked by vibrant competition. A growing number of domestic firms—including Baidu, Alibaba, Tencent, and DeepSeek—are engaged in an escalating price war, slashing costs to undercut US rivals (*The Economist*, 2024d). This market dynamic underscores China’s ability to mass-produce AI models at scale, making them widely accessible both domestically and internationally.

Western observers have begun acknowledging the shifting balance of AI power. Some commentators have described DeepSeek’s emergence as signalling that China may now lead in key areas of AI development (Elliott, 2025). Others warn that dismissing Chinese innovation risks repeating past Western miscalculations about China’s technological potential (*The Economist*, 2024b). Regardless, the notion that AI is an exclusively American domain is increasingly difficult to sustain.

DeepSeek presents a paradox: while it promotes open-source innovation—enabling less well-resourced countries to develop their own LLMs—it also incorporates intrusive functions, such as collecting keyboard input patterns that can identify individuals, leading South Korea, Australia, Taiwan, Italy, and certain U.S. agencies to ban its use on government devices (See, 2025; Yu, 2025). Moreover, despite its technical prowess, DeepSeek remains hamstrung by data security and censorship concerns, operating under strict regulatory constraints imposed by the Chinese government, which limit its access to data and the scope of topics it can address, including sensitive historical events like the Tiananmen Square protests (Yu, 2025).

#### **Myth #6: ‘AI does not significantly affect the job market’**

The notion that artificial intelligence will have only a marginal impact on employment is increasingly untenable. The rapid advancement of GAI threatens to transform the labour market, not merely by enhancing productivity but by fundamentally altering the structure of employment itself. Rather than complementing human labour, AI-driven automation risks accelerating worker displacement across a wide range of industries. Brynjolfsson (2022) warns of the “Turing trap”, in which the pursuit of AI systems that mimic human-like capabilities leads to widespread job automation rather than augmentation, concentrating wealth and power while limiting opportunities for displaced workers. GAI also raises the spectre of misinformation and error propagation, further heightening concerns about the erosion of traditional knowledge-based professions (Rudolph et al., 2023c).

AI’s integration into the workforce is unlikely to create sufficient new employment opportunities to offset job losses, particularly as many emerging roles remain low-paid, precarious, and disconnected from long-term career progression. Informational capitalism has already driven a surge in digital labour, where human workers perform invisible, under-compensated tasks to support AI infrastructure (Lindgren, 2023a). The increasing demand for low-wage, contingent work—such as data labelling, content moderation, and algorithmic training—exemplifies a paradox: while AI is presented as a tool of economic progress, it simultaneously deepens existing inequalities and exploits vulnerable workers, particularly in the Global South (Perrigo, 2023; Yalalov, 2023; Rudolph, in press; see Myth #1).

The long-standing debate over work and its social function is being reshaped by AI-driven automation. Historically, labour has been both a necessity and a mechanism of social control, with laws and economic policies oscillating between coercing the poor into work and discouraging the affluent from it (Orwell, 1933; Rudolph et al., 2023c). The potential for AI to automate large swathes of knowledge work raises pressing questions about the future of employment, income distribution, and social stability. Some commentators advocate for Universal Basic Income as a buffer against mass job displacement, arguing that existing labour market structures may not be capable of absorbing the workforce disruptions caused by AI (Bastani, 2020; Susskind, 2021).

Beyond direct job losses, AI’s impact on skill relevance and workforce preparedness poses additional risks. AI-driven automation has already rendered certain professions obsolete, and its continued expansion is likely to exacerbate skill mismatches, leaving many workers ill-equipped to compete in an evolving job market. Educational institutions struggle to keep pace with these changes, raising concerns about the long-term viability of traditional curricula (Crawford, 2021; Waring, 2024; Tan, in press). AI is not only reshaping the nature of work but also redefining who benefits from technological progress, widening the gap between those who control AI’s development and those subjected to its consequences (Rudolph et al., 2024a; see Myth #3).

#### **Myth #7: ‘AI revolutionises higher education’**

Higher education has been in crisis for decades, shaped by funding cuts, market-driven reforms, and the increasing corporatisation of universities. In the United Kingdom, the United States, and Australia—the world’s three largest higher education export markets—universities are grappling with financial instability, declining public confidence, and workforce precarity (Fleming, 2021; Rudolph et al., 2024c). Against this backdrop, AI has been promoted as a transformative force that will revolutionise higher education (e.g. Idris et al., 2024; Kadence, n.d.; Khan, 2024). Yet, the much-touted “AI revolution” has not materialised. Instead, GAI has introduced new challenges, including threats to academic integrity, diminished learning outcomes, and the erosion of critical thinking skills. AI has not addressed the structural problems of higher education but has, in many

cases, amplified them.

GAI tools such as ChatGPT and Gemini entered higher education with grand expectations. Universities anticipated that AI would enhance learning, improve personalisation, and streamline administration. However, empirical evidence of clear positive effects remains scarce. UNESCO has acknowledged that there is “not yet conclusive evidence” that GAI improves learning outcomes (Giannini, 2024). Similarly, a 2023 U.S. Department of Education (2023) report emphasised the need for convincing evidence of positive impacts before AI is widely implemented in teaching and learning. The enthusiasm for AI remains largely based on speculative benefits rather than demonstrated success.

Despite the hype, the adoption of AI in higher education has been slow, and its benefits remain unclear. A 2023–2024 study at Virginia Tech found that the majority of students used GAI less than once a week (Kim et al., 2025). While students believed AI could improve their academic performance, faculty remained sceptical, arguing that over-reliance on AI might undermine deep learning (Kim et al., 2025). No empirical study has yet demonstrated that AI significantly improves student grades, knowledge retention, or critical thinking skills.

Universities and experts remain hesitant about AI’s impact on education. A 2023 Harvard survey found that 47% of faculty believed AI would negatively impact higher education, while only 21% expected positive effects (Hamid & Schisgall, 2023). Faculty members fear that students relying on AI for writing assignments fail to develop essential analytical skills. Many universities have taken a wait-and-see approach to AI, given its unproven effectiveness (Moorhouse et al., 2023; American Association of Colleges and Universities, 2025).

One area where AI’s impact is undeniable—but largely negative—is academic integrity. The ease of generating AI-written assignments has escalated concerns about plagiarism and cheating. For instance, over half of the students in a 2023 survey admitted that using AI for assignments constituted cheating, yet the vast majority still used it for coursework. In addition, universities have reported that AI has forced changes to their academic integrity policies. Some institutions have banned AI outright, fearing students will fail to develop essential skills if they rely on AI-generated content (Kutty et al., 2024). Rather than enhancing learning, AI has introduced new ethical and pedagogical dilemmas and led to a crisis of assessment, learning and teaching (Tan et al., 2024).

Beyond plagiarism, excessive AI reliance may undermine cognitive development. Students themselves have expressed concerns that “if we use AI too much, we might forget how to think for ourselves” (Attewell, 2024, n. p.). GAI encourages surface-level engagement, allowing students to produce plausible but shallow responses without meaningful learning. Instead of fostering critical inquiry, AI threatens to make learning a passive, automated process.

Beyond the classroom, AI-driven administrative tools have been promoted as solutions for streamlining grading, predictive analytics, and student support. However, these

broader AI applications have also failed to deliver meaningful improvements. AI-assisted grading promises efficiency but raises concerns about bias and accuracy. Predictive analytics tools designed to identify ‘at-risk’ students have been criticised for racial bias, with studies showing they underestimate the success of Black and Hispanic students while overestimating others (Gándara et al., 2024). Such biases can lead to misallocated resources and unintended discrimination.

Even AI-driven administrative efficiencies, while reducing bureaucratic burdens, have not been linked to improved learning outcomes (Giannini, 2024). Their role remains operational rather than pedagogical, further emphasising AI’s failure to revolutionise higher education in any meaningful way.

The failure of AI to meaningfully improve higher education must be understood within the broader crisis of the neoliberal university. Higher education has long been plagued by structural dysfunction. Purpel (1989) noted that academics have historically diagnosed higher education as being in perpetual crisis. From Salmi’s (1992) concerns over unsustainable expansion and graduate unemployment to Blumenstyk’s (2015) warning of ballooning student debt, universities have persistently grappled with declining financial resources, curricular fragmentation, and eroding academic standards. Globalisation, once a cornerstone of international collaboration, now faces mounting threats from nationalism and populism (Altbach & de Wit, 2020). Popenici (2023a) argues that higher education is experiencing multiple crises—ideological, intellectual, managerial, and ethical—exacerbated by a misplaced faith in technology as a panacea.

This crisis is not new but has been amplified by neoliberalism. The restructuring of universities into profit-driven edufactories has led to widespread job insecurity, mental health crises, and the commodification of knowledge (Fleming, 2021). Managerialism, cost-cutting, and the increasing corporatisation of academia have transformed education into a market-driven enterprise where employability trumps intellectual curiosity. The COVID-19 pandemic further accelerated these trends, exposing and deepening existing inequalities (Fleming et al., 2021).

Understanding higher education’s trajectory requires recognising its historical transformations. From Humboldt’s 19th-century vision of academic freedom to the post-war massification of university access, the modern university has undergone radical shifts (Fleming, 2021). The latest phase—the neoliberal university—prioritises metrics, efficiency, and financial returns over critical inquiry, reinforcing the very structures that perpetuate crises (Fleming et al., 2021). If higher education is to reclaim its social mission, scholars must resist its instrumentalisation and reaffirm the role of intellectuals in navigating the *polycrisis* (Rudolph et al., 2024c).

The higher education sectors in the United States, the United Kingdom, and Australia—historically dominant in global education exports—are facing significant financial crises. In the US, declining enrolments and soaring tuition fees have

led to widespread college closures and mergers (Vasquez & Bauman, 2019). Public confidence has plummeted, with only 36% of Americans expressing trust in universities, down from 57% in 2015 (*The Economist*, 2023a). Affordability remains a pressing concern, as tuition at private universities reaches up to \$80,000 per year (Salam, 2024). Chronic public disinvestment has left US higher education increasingly reliant on tuition and student loans, recently totalling \$1.7 trillion, with many graduates struggling to repay debt in an uncertain job market (*The Economist*, 2023a). Meanwhile, faculty face growing precarity as institutions increasingly depend on adjunct and contract staff. AI, rather than alleviating these pressures, has further undermined academic integrity and educational standards.

Against this backdrop, Elon Musk and his allies advocate for AI-driven government restructuring, including the intended closure of the Education Department under the Trump administration (Conger et al., 2025; Natanson, 2025; Reuters, 2025). While Trump's draft executive order to dismantle the Education Department requires congressional approval, administrative downsizing has already begun. Musk's Department of Government Efficiency (DOGE) now controls sensitive financial aid data, raising concerns for millions of students reliant on federal assistance (Natanson, 2025). If implemented, Trump's plan would transfer the \$1.6 trillion student loan program to the Treasury Department, potentially disrupting oversight and aid distribution (Natanson, 2025). Staff reductions and weaker enforcement mechanisms could erode essential higher education functions and civil rights protections even before any formal legislative action.

The UK's universities have been reshaped by market-driven policies, with declining public funding making institutions heavily reliant on tuition fees and international student revenue. The introduction of £9,250 annual tuition fees has burdened students with debt, while staff cuts, casualisation, and managerial expansion have prioritised profit over education. Universities increasingly invest in real estate and branding rather than improving teaching and research, creating a system where students are treated as customers and educators face precarious employment. Nearly one in four major universities are cutting staff, with an estimated 10,000 job losses across the sector (Adams [Richard], 2025). Despite tuition fees rising to £9,535, the sector faces a £1.6 billion deficit by 2025–26, and lower-ranked institutions are struggling to attract students, exacerbating financial instability. As insolvencies loom, calls for government intervention grow, yet political indecision has left the sector in a state of uncertainty (*The Economist*, 2024f).

Australia's higher education system has become heavily dependent on international student fees, creating a fragile financial model. In the 2010s, international students contributed \$37.6 billion annually, but when COVID-19 halted global travel, this revenue collapsed, triggering mass staff layoffs and program cuts. Recent Labour government restrictions on student migration have deepened financial instability, leaving universities struggling to remain viable (Cassidy, 2024a). The sector has also aggressively casualised its workforce, with a majority of teaching staff in insecure employment (Cassidy, 2024c).

AI has not alleviated these pressures; instead, it has aggravated concerns over academic dishonesty and the corporatisation of education. Universities, facing ongoing funding cuts and declining student numbers, have responded with sweeping job losses and restructuring (Cassidy, 2024b). Critics argue that international students are being unfairly scapegoated, despite their vital role in funding research and addressing workforce shortages, particularly in healthcare (Kuang et al., 2024). Without substantial reform and public reinvestment, Australia's higher education sector risks continued destabilisation.

Despite the claims that AI would transform higher education, empirical evidence of its benefits remains weak. GAI has not improved learning outcomes, nor has it alleviated the deep structural issues facing universities. Instead, AI has worsened academic integrity concerns, diminished critical thinking skills, and reinforced biases in administrative decisions. More broadly, the neoliberal restructuring of higher education in the UK, US, and Australia has left universities financially unstable, overly reliant on student fees, and driven by market competition. AI has not solved these crises. Rather, it has exposed the fragility of an education system built on profit, precarious labour, and metric-driven evaluation. Universities must confront their structural flaws instead of turning to AI as a technological fix. Until then, the promise of an AI-driven educational transformation remains nothing more than a myth.

#### **Myth #8: 'Higher education teachers can detect AI with or without AI'**

A dystopian academic future looms where assessments are entirely generated, completed, and graded by GAI, rendering both student learning and teacher engagement obsolete (Popenici et al., 2023). This prospect raises grave concerns about academic integrity, particularly as GAI proliferates in higher education amidst a broader trend of declining human intelligence (Popenici, 2023a).

The rise of GAI tools like ChatGPT presents profound challenges to conventional assessment methods, particularly essays and online examinations. The concern that students may exploit AI to complete assessments undetected is far from hypothetical. Despite advancements in AI detection, traditional plagiarism software such as iThenticate and Turnitin struggle to differentiate AI-generated content from human writing (Perkins, 2023; Chaka, 2023, 2024; Hassoulas et al., 2023; Ifelebuegu, 2023; Mohammadkarimi, 2023; Sullivan et al., 2023). OpenAI itself has publicly admitted that AI detectors are largely ineffective, acknowledging that even their most advanced tool mistakenly identified human-authored texts, including Shakespeare and the Declaration of Independence, as AI-generated (OpenAI, 2023a). The inability to reliably distinguish between human and AI-generated work poses a significant threat to fair assessment practices and academic integrity (Michel-Villareal et al., 2023). Left unchecked, this shift risks undermining the credibility of academic qualifications and devaluing higher education (Anft, 2023).



Persistent critiques of traditional written assignments question their effectiveness in measuring actual student learning (McMurtrie, 2023). While their pedagogical value remains debatable, the need to uphold academic integrity remains paramount. Some scholars advocate for a disclosure-based approach, encouraging students to openly acknowledge their use of GAI in their work (Rasul et al., 2023). However, more fundamental reforms may be necessary. Given the growing integration of AI into student workflows, institutions must rethink assessment models altogether. Alternative approaches—including oral examinations, handwritten essays, in-class writing tasks, oral presentations, group discussions, practical laboratories, and fieldwork—offer more robust ways to assess critical thinking and genuine student engagement (Rudolph et al., 2023a).

Despite the urgency of the issue, institutional responses to GAI's impact on academic assessment remain slow and inadequate. A study of US university leadership found that most institutions have yet to develop clear policies or meaningful strategies for addressing GAI's implications (Anft, 2023). Few universities have initiated substantive discussions or established formal committees to develop AI governance frameworks, exposing a troubling gap between technological developments and institutional preparedness (Rudolph et al., 2024a). Without swift and decisive action, higher education risks lagging behind in addressing one of the most significant disruptions to academic integrity in history.

## Intellectual critique in the AI age

The 21st century's first quarter is defined by crisis (Popenici, 2023a). The COVID-19 pandemic not only triggered a global health emergency but also intersected with economic, political, and educational crises, forming what Tooze (2021) termed a *polycrisis*. Our era of cascading disruptions—climate catastrophe, democratic backsliding, economic precarity, and wars—has significantly impacted higher education. The role of intellectuals has never been more critical, yet the academy itself is deeply enmeshed in crisis.

Higher education and our world have been in perpetual crisis, beset by economic, socio-cultural, political, and ecological upheavals (Popenici, 2023a; Tooze, 2021; see Myth #7). In such a context, the role of the intellectual has never been more urgent. However, it regrettably remains as true today as it was 30 years ago when Edward Said argued in *Representations of the intellectual* that the term "intellectual" had become a dirty word—dismissed with a sneer and inextricably linked to the notion of an 'ivory tower', emblematic of detachment, irrelevance, and being out of touch (Said, 1994).

To reclaim the intellectual is to resist both the pressures of professionalisation and the demands of power. Said (1994) argues for an *amateur* intellectual—one who pursues knowledge not for profit or status but out of an "unquenchable interest in the larger picture" (p. 76). Intellectuals must refuse the narrow confines of specialisation and instead engage in moral critique, speaking truth to power regardless of the discomfort it may cause (Said, 1994). This, however, is

precisely what makes intellectuals so unwelcome in today's pragmatic and technocratic society. They are neither passive consensus-builders nor tame facilitators of institutional knowledge but figures staked on a critical sense—willing, indeed *obliged*, to challenge the prevailing order (Said, 1994).

Historically, intellectuals have been cast as either harmless technicians or shrill Cassandras—ignored when they are right and ridiculed when they are wrong. But the role of the intellectual is neither total quiescence nor total rebelliousness; it is to "stir up debate and, if possible, controversy" (Said, 1994, p. 69). They must resist the "stereotyping and consequent death of genuinely living things" wrought by modern mass communication (Mills, 1963, p. 299). They must reject easy formulas and the comforting fictions of the powerful, for intellectual work is not about accommodation but confrontation (Adorno, 1951).

Intellectuals, then, are both insiders and outsiders—embedded in society but refusing to serve its dominant ideologies. As Joyce's Stephen Dedalus declared in *Portrait of the artist as a young man* (1916): *Non serviam*—I will not serve:

"I will tell you what I will do and what I will not do. I will not serve that in which I no longer believe whether it call itself my home, my fatherland or my church: and I will try to express myself in some mode of life or art as freely as I can and as wholly as I can" (Joyce, 1916, n. p.).

The intellectual does not exist to legitimise the status quo but to scrutinise and challenge it. For Gramsci, intellectuals are everywhere; "all men [and women] are intellectuals", but not all perform the social function of the intellectual (Gramsci, 1971, p. 9). The task of the intellectual is to embrace this function—to interrogate, to unmask, and to resist. In an age of crisis, there is no more pressing duty.

In light of the observation that AI is neither entirely 'artificial' nor truly 'intelligent', intellectuals must reclaim and reinvigorate human intelligences to guide our ethical and critical engagement with technology. By foregrounding human insight over technocratic determinism, we can lay the groundwork for teaching critical AI literacy in higher education, ensuring that technology remains a tool for amplifying, not supplanting, our uniquely human capacities.

## Conclusion: A call for teaching critical AI literacy in higher education

Our analysis attempted to debunk eight prevailing myths that continue to shape the discourse on GAI in higher education. First, the notion that 'AI is artificial' overlooks the fact that these systems are fundamentally built on human labour and data extraction, making them less autonomous than their label suggests. Second, the claim that 'AI is intelligent' is misleading; although AI systems can mimic human reasoning, they lack true understanding and lived experience, rendering their intelligence merely a statistical simulation. Third, the optimistic assertion that

AI will inherently render the world more democratic, equal, sustainable, and progressive ignores evidence that these technologies thus far have exacerbated inequalities and environmental degradation. Fourth, the idea that 'AI is objective and unbiased' is flawed, as AI systems inevitably replicate and even amplify biases present in their training data.

Fifth, the myth that the United States is the sole AI superpower disregards China's rapid ascent and significant contributions, which are reshaping the global AI landscape. Sixth, the belief that AI will not significantly affect the job market is increasingly untenable; automation driven by AI is already displacing workers and creating a surge in precarious, low-paid roles. Seventh, the claim that AI revolutionises higher education overlooks the detrimental impact on academic integrity and the erosion of traditional pedagogical practices as institutions struggle to adapt to the unchecked use of AI in assessments. Moreover, reduced government funding and a neoliberalist turn have meant that higher education has long been in crisis. Finally, the assumption that higher education teachers can reliably detect AI-generated content, with or without AI, is undermined by the evolving sophistication of these models, which increasingly produce outputs indistinguishable from genuine human work.

Table 1: AI myths versus our critical perspective.

	Myths	Our critical perspective
1	AI is artificial.	AI is fundamentally human-made, relying heavily on hidden human labour to function.
2	AI is intelligent.	AI does not exhibit true human intelligence but merely simulates cognitive processes through statistical pattern recognition, lacking understanding and lived experience.
3	AI will make the world a better place.	Rather than inherently improving societal conditions, AI frequently exacerbates existing inequalities and environmental degradation.
4	AI is objective and unbiased.	Far from being neutral, AI systems inherit and often amplify the biases embedded in their training data, rendering them inherently subjective.
5	The US is the one and only AI superpower and Big Tech has quasi-monopolies.	Global AI leadership is contested, with especially China rapidly advancing through state-supported initiatives and innovation, thereby challenging US dominance.
6	AI will not significantly affect the job market.	AI-driven automation is set to fundamentally alter labour markets by displacing jobs, deepening economic inequalities, and creating precarious employment conditions.
7	AI revolutionises higher education.	Instead of revolutionising learning, GAI risks eroding academic integrity and exacerbating structural issues in higher education, such as over-reliance on standardised assessments; the crisis of higher education is far from mitigated by AI.
8	Higher education teachers can detect AI-generated content with or without AI.	The increasing sophistication of AI-generated material renders detection methods unreliable, undermining traditional assessment practices and challenging the maintenance of academic standards.

Sam Altman recently opined that "Our phones control us and tell us what we do when social media feeds determine how we feel; search engines decide what we think" (cited in Vallor, 2024, p. 152). In our digital era, such statements underscore the overwhelming influence that technology exerts over our daily decisions and emotions. This pervasive control is akin to a drug dealer, who, recognising that addiction has already stripped us of our agency and hope, cajoles us into resignation rather than resistance (Vallor, 2024). This metaphor illustrates the danger of allowing digital platforms to dictate not only our actions but also our critical capacities, ultimately undermining our ability to think independently. Against this backdrop, we are reminded of Horace's and Kant's timeless exhortation *sapere aude!* (literally 'dare to know!') urging us to dare to think for ourselves and collaboratively reclaim our intellectual autonomy (Horace, 1883; Kant, 2001).

While our manuscript critically debunks GAI mythology, we acknowledge its practical application in our research. In preparing this manuscript, we utilised conventional word processing software (enhanced by Grammarly) alongside various iterations of ChatGPT for tasks such as generating APA7 references, paraphrasing, and brainstorming headers. It is important to emphasise that we carried out all conceptual thinking and interpretive analysis, with AI serving merely as an assistant (exactly the way AI should be used, in our view). GAI tools, such as ChatGPT, pose a threat to education. However, this risk stems less from their supposed intelligence than from educational systems that undervalue genuine human cognition (Luckin et al., 2024). Although these tools are often lauded as exhibiting human-like intelligence, they operate solely by generating text through probabilistic patterns, lacking true understanding (Chomsky et al., 2023). Their performance in assessments underscores an overreliance on memorisation rather than deep comprehension. To counter this, higher education must evolve to highlight the unique qualities of human intelligence. Curricula should move beyond rote learning to foster critical thinking and interpretative skills within traditional disciplines while integrating critical AI literacy (The Open University, 2025). Furthermore, for AI to genuinely enhance our lives, it is imperative to challenge the profit motives of tech giants, carefully determine which intellectual tasks should be delegated to machines and safeguard the distinctive attributes of human thought for future generations (Rudolph et al., 2023c).

Critical AI literacy must be at the forefront of higher education curricula as digital technologies reshape not only how knowledge is created and disseminated but also how it is critically appraised. In an era where GAI tools increasingly influence academic, professional, and public discourse, educators and students alike require the skills to discern between authentic human insight and algorithmically generated output. We recommend that higher education institutions embed critical AI literacy as a graduate attribute, as this literacy is essential for navigating the ethical, epistemological, and practical challenges posed by AI. Faculty professional development, innovative assessment methods, and metacognitive initiatives must converge to equip learners with the ability to critically evaluate digital content, challenge prevailing techno-optimistic narratives,

and mitigate the risks of misinformation.

Moreover, as AI becomes ubiquitous in pedagogical and administrative functions, higher education institutions must ensure that their graduates are not only proficient in using these technologies but also adept at interrogating their underlying biases and limitations. By integrating critical AI literacy into course design and review processes, educators can foster an environment where technology serves as a tool for enhancing human insight rather than replacing it. This approach will help counteract the tendency for digital automation to erode deep, reflective thinking, thereby sustaining academic integrity and promoting a more informed and engaged citizenry.

## Acknowledgements

We gratefully acknowledge our *critical friends*, Dr Eunice Tan, Dr Samson Tan, and Dr Stefan Popenici, for commenting extensively on an earlier draft of this manuscript. All remaining errors and controversial statements are solely our own.

## References

Abdalla, M., & Abdalla, M. (2021, July). The grey hoodie project: Big tobacco, big tech, and the threat on academic integrity. *Proceedings of the 2021 AAAI/ACM Conference on AI, Ethics, and Society*, 287-297. <https://doi.org/10.1145/3461702.3462563>

Adams, R. [Richard] (2025, February 1). Quarter of leading UK universities cutting staff due to budget shortfalls. *The Guardian*. <https://www.theguardian.com/education/2025/feb/01/quarter-of-leading-uk-universities-cutting-staff-due-to-budget-shortfalls>

Adams, R. [Rachel] (2025). *The new empire of AI. The future of global inequality*. Polity.

Adorno, T. W. (1951). *Minima moralia: Reflections from damaged life*. Trans. E. F. N. Jephcott. New Left Books.

Altbach, P., & de Wit, H. (2020). Postpandemic outlook for higher education is bleakest for the poorest. *International Higher Education*, (102), 3-5.

Altman, S. (2023, May 16). *Testimony at "Oversight of A.I.: Rules for Artificial Intelligence" – Hearing before the U.S. Senate Judiciary Subcommittee on Privacy, Technology, and the Law*. Washington, DC: U.S. Senate Judiciary Committee. <https://www.judiciary.senate.gov/meetings/oversight-of-ai-rules-for-artificial-intelligence>

Altman, S. (2025, January 6). *Reflections*. Sam Altman's Blog. <https://blog.samaltman.com/reflections>

American Association of Colleges and Universities. (2025, January 22). *Higher education leaders navigate AI disruption*. <https://www.aacu.org/newsroom/higher-education-leaders-navigate-ai-disruption>

Andreessen, M. (2023, June 6). *Why AI will save the world*. Andreessen Horowitz. <https://a16z.com/ai-will-save-the-world/>

Andreessen, M. @pmarca. (2025, January 30). *Closed source, opaque, censorious, politically manipulative vs open source and free is not the winning position the US needs*. Tweet. X. <https://x.com/pmarca/status/1884899150761992594>

Anft, M. (2023). Perspectives on GenAI. College leaders assess the promise and the threat of a game-changing tool. Research brief. *The Chronicle of Higher Education*. [https://connect.chronicle.com/rs/931-EKA-218/images/PerspectivesGenerativeAI\\_ResearchBrief.pdf](https://connect.chronicle.com/rs/931-EKA-218/images/PerspectivesGenerativeAI_ResearchBrief.pdf)

Attenborough, D. (2020). *A life on our planet. My witness statement and a vision for the future*. Witness Books.

Attewell, S. (2024, June 7). *Student perceptions of generative AI*. Jisc. <https://www.jisc.ac.uk/reports/student-perceptions-of-generative-ai>

Awarity.ai. (2025). *Beyond big: The end of the GAI hype cycle*. Medium. <https://medium.com/awarity-ai-blog/beyond-big-the-end-of-the-gai-hype-cycle-66d40b31d1c4>

Bashir, N., Donti, P., Cuff, J., Sroka, S., Ilic, M., Sze, V., Delimitrou, C., & Olivetti, E. (2024). *The climate and sustainability implications of generative AI: An MIT exploration of generative AI*. MIT GenAI. <https://doi.org/10.21428/e4baedd9.9070dfe7>

Bastani, A. (2020). *Fully automated luxury communism: A manifesto*. Verso.

Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? *Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency* (pp. 610–623). <https://doi.org/10.1145/3442188.3445922>

Berkowitz, R. (2022, June 15). *How to talk with an AI: A deep dive into "Is LaMDA Sentient?"*. Curiouser Institute. <https://medium.com/curiouser-institute/guide-to-is-lambda-sentient-a8eb32568531>

*Bloomberg*. (2025, January 5). Bloomberg billionaires index. Bloomberg. <https://www.bloomberg.com/billionaires/>

Bostrom, N. (2014). *Superintelligence: Paths, dangers, strategies*. Oxford University Press.

Blumenstyk, G. (2015). *American higher education in crisis?: What everyone needs to know*. Oxford University Press.

Brevini, B. (2023). Myths, techno solutionism and artificial intelligence: Reclaiming AI materiality and its massive environmental costs. In S. Lindgren (Ed.), *Handbook of critical studies of artificial intelligence* (pp. 869-877). Edward Elgar Publishing. <https://doi.org/10.4337/9781803928562.00086>

Broussard, M. (2018). *Artificial unintelligence. How computers misunderstand the world*. The MIT Press.

- Brown, T., Mann, B., Ryder, N., Subbiah, M., Kaplan, J. D., Dhariwal, P., ... & Amodei, D. (2020). Language models are few-shot learners. *Advances in Neural Information Processing Systems*, 33, 1877-1901. <https://doi.org/10.48550/arXiv.2005.14165>
- Brynjolfsson, E. (2022). The Turing trap: The promise & peril of human-like artificial intelligence. *Daedalus*, 151(2), 272-287.
- Bubeck, S., Chandrasekaran, V., Eldan, R., Gehrke, J., Horvitz, E., Kamar, E., ... & Zhang, Y. (2023). *Sparks of artificial general intelligence: Early experiments with GPT-4* [Preprint]. arXiv. <https://doi.org/10.48550/arXiv.2303.12712>
- Caldarini, G., Jaf, S., & McGarry, K. (2022). A literature survey of recent advances in chatbots. *Information*, 13(1), 41. <https://www.mdpi.com/2078-2489/13/1/41>
- Carlsson-Szlezak, P., & Swartz, P. (2024, August 15). Why AI will not lead to a world without work. *World Economic Forum*. <https://www.weforum.org/stories/2024/08/why-ai-will-not-lead-to-a-world-without-work/>
- Cassidy, C. (2024a, August 1). Alarm bells over Australian universities' financial dependence on international students. *The Guardian*. <https://www.theguardian.com/australia-news/article/2024/aug/02/australian-universities-international-student-fees>
- Cassidy, C. (2024b, October 26). A thousand Australian university jobs are at risk – who's to blame for the dire financial state? *The Guardian*. <https://www.theguardian.com/australia-news/2024/oct/26/a-thousand-australian-university-jobs-are-at-risk-whos-to-blame-for-the-dire-financial-state>
- Cassidy, C. (2024, September 21). Lucy's job should be more secure – but at Australian universities, labour laws are having the opposite effect. *The Guardian*. <https://www.theguardian.com/australia-news/2024/sep/22/lucys-job-should-be-more-secure-but-at-australian-universities-labour-laws-are-having-the-opposite-effect>
- Chaka, C. (2023). Detecting AI content in responses generated by ChatGPT, YouChat, and Chatsonic: The case of five AI content detection tools. *Journal of Applied Learning and Teaching*, 6(2), 94-104. <https://doi.org/10.37074/jalt.2023.6.2.12>
- Chaka, C. (2024). Reviewing the performance of AI detection tools in differentiating between AI-generated and human-written texts: A literature and integrative hybrid review. *Journal of Applied Learning and Teaching*, 7(1), 115-126. <https://doi.org/10.37074/jalt.2024.7.1.14>
- Chan, J., Selden, M., & Ngai, P. (2020). *Dying for an iPhone: Apple, Foxconn, and the lives of China's workers*. Haymarket Books.
- Che, C., & Liu, J. (2023, March 16). China's answer to ChatGPT gets an artificial debut and disappoints. *The New York Times*. [https://www.nytimes.com/2023/03/16/world/asia/china-baidu-chatgpt-ernie.html?action=click&pgtype=Article&state=default&module=style-artificialintelligence&variant=show&region=BELOW\\_MAIN\\_CONTENT&block=storyline\\_flex\\_guide\\_recirc](https://www.nytimes.com/2023/03/16/world/asia/china-baidu-chatgpt-ernie.html?action=click&pgtype=Article&state=default&module=style-artificialintelligence&variant=show&region=BELOW_MAIN_CONTENT&block=storyline_flex_guide_recirc)
- Cheng, E. (2025, February 11). Chinese tech giant Baidu to release next-generation AI model this year as DeepSeek shakes up market. *CNBC*. <https://www.cnbc.com/2025/02/12/china-tech-giant-baidu-to-release-next-generation-ai-model-this-year-as-deepseek-shakes-up-market.html>
- Chomsky, N., Roberts, I., & Watumull, J. (2023, March 8). Noam Chomsky: The false promise of ChatGPT. *The New York Times*. <https://www.nytimes.com/2023/03/08/opinion/noam-chomsky-chatgpt-ai.html>
- Chumley, C. K. (2018, October 9). Google's disturbing DeepMind: Potatoes, potahtoes, A.I. could kill or could save. *The Washington Times*. <https://www.washingtontimes.com/news/2018/oct/9/googles-deepmind-potatoes-potahtoes-could-kill-or/>
- Clarke, L. (2023, March 2). *ChatGPT is so bad at essays that professors can spot it instantly*. *Vice*. <https://www.vice.com/en/article/chatgpt-is-so-bad-at-essays-that-professors-can-spot-it-instantly>
- Conger, K., Mac, R., & Ngo, M. (2025, February 3). Musk Allies Discuss Deploying A.I. to Find Budget Savings: A top official at the General Services Administration said artificial intelligence could be used to identify waste and redundancies in federal contracts. *The New York Times*. <https://www.nytimes.com/2025/02/03/technology/musk-allies-ai-government.html>
- Crawford, K. (2021). *The Atlas of AI: Power, politics, and the planetary costs of Artificial Intelligence*. Yale University Press.
- Creamer, E. (2023, July 5). Authors file a lawsuit against OpenAI for unlawfully "ingesting" their books. *The Guardian*. <https://www.theguardian.com/books/2023/jul/05/authors-file-a-lawsuit-against-openai-for-unlawfully-ingesting-their-books>
- De Vynck, G., & Tiku, N. (2023, March 21). Google's catch-up game on AI continues with Bard launch. *The Washington Post*. <https://www.washingtonpost.com/technology/2023/03/21/bard-google-ai/>
- Dictionary.com. (n.d.). *Based*. In Dictionary.com. <https://www.dictionary.com/e/slang/based/>
- Drozdowski, M. J. (2024, April 24). *Testing Turnitin's new AI detector: How accurate is it?* BestColleges. <https://www.bestcolleges.com/news/analysis/testing-turnitin-new-ai-detector/>
- Dunn, W. (2024, August 6). When the AI bubble bursts. *New Statesman*. <https://www.newstatesman.com/science-tech/2024/08/when-the-ai-bubble-bursts>
- Elliott, L. (2025, January 30). The west is already losing the

- AI arms race. *The Guardian*. <https://www.theguardian.com/commentisfree/2025/jan/30/ai-arms-race-china-deepseek>
- Fleming, P. (2021). *Dark academia: How universities die*. Pluto Press.
- Fleming, P., Rudolph, J., & Tan, S. (2021). 'Never let a good crisis go to waste': An interview with Professor Peter Fleming on dark academia, the pandemic and neoliberalism. *Journal of Applied Learning and Teaching*, 4(2), 110-120. <https://doi.org/10.37074/jalt.2021.4.2.14>
- Frankfurt, H. G. (2005). *On bullshit*. Princeton University Press.
- Gándara, D., Anahideh, H., Ison, M., & Picchiarini, L. (2024). Inside the black box: Detecting and mitigating algorithmic bias across racialized groups in college student-success prediction. *AERA Open*, 10(1), 1–15. <https://doi.org/10.1177/23328584241258741>
- Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. Basic Books.
- Garekar, B. (2025, January 28). China planned DeepSeek's dramatic debut on world stage to send signal to Trump: US AI expert. *The Straits Times*. <https://www.straitstimes.com/world/united-states/china-planned-deepseeks-dramatic-debut-on-world-stage-to-send-signal-to-trump-us-ai-expert>
- Giannini, S. (2024, May 29). *Use AI in education: Deciding the future we want*. UNESCO. <https://www.unesco.org/en/articles/use-ai-education-deciding-future-we-want>
- Gibney, E. (2025, January 30). China's cheap, open AI model DeepSeek thrills scientists. *Nature*. <https://www.nature.com/articles/d41586-025-00229-6>
- Gibson, R. (2024, September 10). *The impact of AI in advancing accessibility for learners with disabilities*. EDUCAUSE Review. <https://er.educause.edu/articles/2024/9/the-impact-of-ai-in-advancing-accessibility-for-learners-with-disabilities>
- Gould, S. J. (1981). *The mismeasurement of man*. W. W. Norton.
- Grace, K., Salvatier, J., Dafoe, A., Zhang, B., & Evans, O. (2018). When will AI exceed human performance? Evidence from AI experts. *Journal of Artificial Intelligence Research*, 62, 729–754. <https://doi.org/10.1613/jair.1.11222>
- Grace, K., Stewart, H., Sandkühler, J. F., Thomas, S., Weinstein-Raun, B., & Brauner, J. (2024). *Thousands of AI authors on the future of AI (Version 2) [Survey report]*. arXiv. <https://doi.org/10.48550/arXiv.2401.02843>
- Gramsci, A. (1971). *The prison notebook: Selections*. International Publishers.
- Gray, M. L., & Suri, S. (2019). *Ghost work: How to stop Silicon Valley from building a new global underclass*. Houghton Mifflin Harcourt.
- Griffith, E., & Metz, C. (2023, March 14). 'Let 1,000 flowers bloom': A.I. funding frenzy escalates. *The New York Times*. <https://www.nytimes.com/2023/03/14/technology/ai-funding-boom.html?action=click&module=RelatedLinks&pgtype=Article>
- Guterres, A. (2024, August 30). *Artificial intelligence 'must serve humanity equitably, safely'*, Secretary-General stresses, in message for International Day of Democracy. United Nations. <https://press.un.org/en/2024/sgsm22347.doc.htm>
- Hamid, R. D., & Schisgall, E. J. (2023, June 28). Nearly half of surveyed faculty pessimistic on AI impact in higher ed. *The Harvard Crimson*. <https://www.thecrimson.com/article/2023/6/28/faculty-survey-5-ai/>
- Hammond, G. (2024, April 9). Elon Musk predicts AI will overtake human intelligence next year. *Financial Times*. <https://www.ft.com/content/027b133f-f7e3-459d-95bf-8afd815ae23d>
- Hart, R. (2024, February 16). OpenAI's Sora has rivals in the works, including from Google and Meta. *Forbes*. <https://www.forbes.com/sites/roberthart/2024/02/16/openai-sora-has-rivals-in-the-works-including-from-google-and-meta/?sh=700ecc282843>
- Hassoulas, A., Powell, N., Roberts, L., Umla-Runge, K., Gray, L., & Coffey, M. (2023). Investigating marker accuracy in differentiating between university scripts written by students and those produced using ChatGPT. *Journal of Applied Learning & Teaching*, 6(2), 71-77. <https://doi.org/10.37074/jalt.2023.6.2.13>
- Hirsch, A. (2024, October 29). *The digital red pen: Efficiency, ethics, and AI-assisted grading*. Center for Innovative Teaching and Learning, Northern Illinois University. <https://citl.news.niu.edu/2024/10/29/the-digital-red-pen-efficiency-ethics-and-ai-assisted-grading/>
- Horace. (1883). *The works of Horace translated literally into English prose* (C. Smart, A.M., Trans.; T. A. Buckley, Rev. ed.). Project Gutenberg. <https://www.gutenberg.org/files/14020/14020-h/14020-h.htm>
- Huang, Z. (2023, March 21). China's first major chatbot doesn't need to be as good as ChatGPT. *Bloomberg*. <https://www.bloomberg.com/news/newsletters/2023-03-21/baidu-s-ernie-bot-aims-to-be-first-in-chatgpt-free-market-in-china>
- Idris, M. D., Feng, X., & Dyo, V. (2024). Revolutionising higher education: Unleashing the potential of large language models for strategic transformation. *IEEE Access*, 12, 67738–67752. <https://doi.org/10.1109/ACCESS.2024.3400164>
- Ifelebuegu, A. (2023). Rethinking online assessment strategies: Authenticity versus AI chatbot intervention. *Journal of Applied Learning and Teaching*, 6(2), 385-392. <https://doi.org/10.37074/jalt.2023.6.2.2>
- Ismail, F. (in press). AI and bias: Parallels and paradoxes. In S. Popenici, J. Rudolph, F. Ismail, & S. Tan (Eds.), *Handbook of AI and higher education*. Edward Elgar.

- Johnson, S., & Acemoglu, D. (2023). *Power and progress: Our thousand-year struggle over technology and prosperity*. Hachette UK.
- Joyce, J. (1916). *The portrait of the artist as a young man*. Project Gutenberg. <https://www.gutenberg.org/files/4217/4217-h/4217-h.htm>
- Kadence. (n. d.). *How AI is reshaping higher education in Singapore*. <https://kadence.com/en-sg/how-ai-is-reshaping-higher-education-in-singapore/>
- Kande, M., & Sonmez, M. (2020, October 26). Don't fear AI. It will lead to long-term job growth. *World Economic Forum*. <https://www.weforum.org/stories/2020/10/dont-fear-ai-it-will-lead-to-long-term-job-growth/>
- Kant, I. (2001). *What is enlightenment?* (M. J. Gregor, Trans.). Cambridge University Press. (Original work published 1784).
- Kanter, J. (2018, December 11). "I lead this company without political bias": Google's CEO will send a message straight to Trump during high-stakes Congress grilling. *Business Insider*. <https://www.businessinsider.com/sundar-pichai-google-ceo-sends-message-to-trump-congress-grilling-2018-12>
- Kara, S. (2023). *Cobalt red: How the blood of the Congo powers our lives*. St. Martin's Press.
- Kelly, R. (2025, January 15). *3 areas where AI will impact higher ed most in 2025*. Campus Technology. <https://campustechnology.com/articles/2025/01/15/3-areas-where-ai-will-impact-higher-ed-in-2025.aspx>
- Khan, S. (2024). *Brave new words: How AI will revolutionize education (and why that's a good thing)*. Allen Lane.
- Kim, J., Klopfer, M., Grohs, J., Eldardiry, H., Weichert, J., Cox, L. A., & Pike, D. (2025). Examining faculty and student perceptions of generative AI in university courses. *Innovative Higher Education*, <https://doi.org/10.1007/s10755-024-09774-w>
- Knight, W. (2017, August 8). *Andrew Ng's next trick: Training a million AI experts*. MIT Technology Review. <https://www.technologyreview.com/2017/08/08/150069/andrew-ngs-next-trick-training-a-million-ai-experts/>
- Kreps, S., & Kriner, D. (2023). How AI threatens democracy. *Journal of Democracy*, *34*(4), 122–131. <https://www.journalofdemocracy.org/articles/how-ai-threatens-democracy/>
- Kuang, W., Ziguas, C., & Williams, G. (2024, August 28). 'International students have been scapegoats': three perspectives on Australia's proposed overseas student caps. *The Guardian*. <https://www.theguardian.com/education/commentisfree/article/2024/aug/28/australias-proposed-overseas-student-cap-isnt-just-about-dollars-its-about-people>
- Kurzweil, R. (2005). *The singularity is near*. Viking.
- Kutty, S., Chugh, R., Perera, P., Neupane, A., Jha, M., Li, L., Gunathilake, W., & Perera, N. C. (2024, August 27). Generative AI in higher education: Perspectives of students, educators and administrators. *Journal of Applied Learning and Teaching*, *7*(2), 47–60. <https://doi.org/10.37074/jalt.2024.7.2.27>
- Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education*, *20*(1), 56. <https://doi.org/10.1186/s41239-023-00426-1>
- Landymore, F. (2024, May 20). *Godfather of AI says there's an expert consensus AI will soon exceed human intelligence*. Futurism. <https://futurism.com/the-byte/godfather-ai-exceed-human-intelligence>
- Lee, K. F. (2018). *AI superpowers: China, Silicon Valley, and the new world order*. Houghton Mifflin.
- Li, F.-F. (2017, December 13). *Opening the Google AI China center*. Google Official Blog. <https://blog.google/around-the-globe/google-asia/google-ai-china-center/>
- Lindgren, S. (2023a). *Critical studies of AI: Power, politics, and ethics*. Oxford University Press.
- Lindgren, S. (2023b). Introducing critical studies of artificial intelligence. In S. Lindgren (Ed.), *Handbook of critical studies of artificial intelligence* (pp. 1-19). Edward Elgar Publishing. <https://doi.org/10.4337/9781803928562.00005>
- Luckin, R., Rudolph, J., Grünert, M., & Tan, S. (2024). Exploring the future of learning and the relationship between human intelligence and AI. An interview with Professor Rose Luckin. *Journal of Applied Learning and Teaching*, *7*(1), 1-18. <https://doi.org/10.37074/jalt.2024.7.1.27>
- Mac, R. (2021, September 3). Facebook apologizes after A.I. puts 'primates' label on video of Black men. *The New York Times*. <https://www.nytimes.com/2021/09/03/technology/facebook-ai-race-primates.html>
- MacAskill, W. (2015). *Doing good better: How effective altruism can help you make a difference*. Guardian Faber Publishing.
- Mackay, C. (2003). *Extraordinary popular delusions*. Courier Corporation. (Originally published in 1841).
- Madianou, M. (2021). Technocolonialism: Digital innovation and data practices in the humanitarian response to refugee crises. In *Routledge Handbook of humanitarian communication* (pp. 185-202). Routledge. <https://doi.org/10.1177/2056305119863146>
- Marcus, G. (2024, December 13). *Humanity's "oh shit" AI moment*. Gary Marcus Substack. <https://garymarcus.substack.com/p/humanitys-oh-shit-ai-moment>
- Marcus, G. (2025a, January 14). *AGI versus broad, shallow intelligence*. Gary Marcus Substack. <https://garymarcus.substack.com/p/agi-versus-broad-shallow-intelligence>

- Marcus, G. (2025b, January 29). *OpenAI cries foul*. Gary Marcus Substack. <https://garymarcus.substack.com/p/openai-cries-foul>
- Marcus, G. (2025c, February 16). *Elon Musk's terrifying vision for AI*. Gary Marcus Substack. <https://garymarcus.substack.com/p/elon-musks-terrifying-vision-for>
- Marcus, G., & Davis, E. (2020, August 22). *GPT-3, Bloviation: OpenAI's language generator has no idea what it's talking about*. MIT Technology Review, [https://www.technologyreview.com/2020/08/22/1007539/gpt3-openai-language-generator-artificial-intelligence-ai-opinion/?utm\\_medium=tr\\_social&utm\\_campaign=site\\_visitor.unpaid.engagement&utm\\_source=Twitter#Echobox=1598658773](https://www.technologyreview.com/2020/08/22/1007539/gpt3-openai-language-generator-artificial-intelligence-ai-opinion/?utm_medium=tr_social&utm_campaign=site_visitor.unpaid.engagement&utm_source=Twitter#Echobox=1598658773)
- Martin, N. (2019). 13 greatest quotes about the future of artificial intelligence. *Forbes*, <https://www.forbes.com/sites/nicolemartin1/2019/06/27/13-greatest-quotes-about-the-future-of-artificial-intelligence/>
- McMurtrie, B. (2023, January 5). Teaching: Will ChatGPT change the way you teach?. *The Chronicle of Higher Education*. <https://www.chronicle.com/newsletter/teaching/2023-01-05>
- Meotti, M., & Magliozzi, D. (2021, March 9). *Using artificial intelligence to navigate the new challenges of college and career*. Harvard Advanced Leadership Initiative, Social Impact Review. <https://www.sir.advancedleadership.harvard.edu/articles/using-artificial-intelligence-to-navigate-the-new-challenges-of-college-and-career>
- Metz, C. (2022). *Genius makers. The mavericks who brought AI to Google, Facebook and the world*. Penguin
- Michel-Villarreal, R., Vilalta-Perdomo, E., Salinas-Navarro, D. E., Thierry-Aguilera, R., & Gerardou, F. S. (2023). Challenges and opportunities of GenAI for higher education as explained by ChatGPT. *Education Sciences*, 13(9), 856. <https://www.mdpi.com/2227-7102/13/9/856>
- Milanovic, B. (2016). *Global inequality: A new approach for the age of globalization*. Harvard University Press.
- Mills, C. W. (1963). *Power, politics and people: The collected essays of C. Wright Mills*. Ballantine.
- Mohammadkarimi, E. (2023). Teachers' reflections on academic dishonesty in EFL students' writings in the era of artificial intelligence. *Journal of Applied Learning and Teaching*, 6(2), 105-113. <https://doi.org/10.37074/jalt.2023.6.2.10>
- Mok, A. (2023, May 3). It's not AI that is going to take your job, but someone who knows how to use AI might, economist says. *Business Insider*. <https://www.businessinsider.com/ai-wont-take-your-job-someone-who-uses-it-might-2023-5>
- Monasterio Astobiza, A., Ausín, T., Liedo, B., Toboso, M., Aparicio, M., & López, D. (2022). Ethical governance of AI in the Global South: A human rights approach to responsible use of AI. *Proceedings*, 81(1), 136. <https://doi.org/10.3390/proceedings2022081136>
- Monserate, S. G. (2022). The cloud is material: On the environmental impacts of computation and data storage. *MIT Case Studies in Social and Ethical Responsibilities of Computing, Winter 2022*. <https://doi.org/10.21428/2c646de5.031d4553>
- Moon, M. (2023, March 16). *Baidu unveils ERNIE Bot, its ChatGPT rival*. Engadget. <https://www.engadget.com/baidu-unveils-ernie-bot-its-chatgpt-rival-105509006.html>
- Moorhouse, B. L., Yeo, M. A., & Wan, Y. (2023). Generative AI tools and assessment: Guidelines of the world's top-ranking universities. *Computers & Education Open*, 100151. <https://doi.org/10.1016/j.caeo.2023.100151>
- Mozur, P. (2017, July 20). Beijing wants A.I. to be made in China by 2030. *The New York Times*. <https://www.nytimes.com/2017/07/20/business/china-artificial-intelligence.htm>
- Muldoon, J., Graham, M., & Cant, C. (2024). Feeding the machine: The hidden human labour powering AI. Canongate.
- Musk, E. [@elonmusk]. (2025, February 16). *Grok 3 is so based* [Tweet]. X. <https://x.com/elonmusk/status/1891112681538523215>
- Natanson, H. (2025, February 3). Trump preps order to dismantle Education Dept. as DOGE probes data. *The Washington Post*. <https://www.washingtonpost.com/education/2025/02/03/trump-education-department-dismantling-executive-order-draft/>
- National Academies of Sciences, Engineering, and Medicine. (2023, November 13). *How AI is shaping scientific discovery*. <https://www.nationalacademies.org/news/2023/11/how-ai-is-shaping-scientific-discovery>
- Naughton, J. (2025, February 1). DeepSeek: Cheap, powerful Chinese AI for all. What could possibly go wrong? *The Guardian*. <https://www.theguardian.com/technology/2025/feb/01/ai-deepseek-cheap-china-google-apple>
- Neuroscience News. (2023, July 6). *AI outperforms humans in creativity test*. <https://neurosciencenews.com/ai-creativity-23585/>
- Nietzel, M. T. (2023, March 20). More than half of college students believe using ChatGPT to complete assignments is cheating. *Forbes*. <https://www.forbes.com/sites/michaelnietzel/2023/03/20/more-than-half-of-college-students-believe-using-chatgpt-to-complete-assignments-is-cheating/>
- Nolan, B. (2023, January 14). Two professors who say they caught students cheating on essays with ChatGPT explain why AI plagiarism can be hard to prove. *Business Insider*. <https://www.businessinsider.com/chatgpt-essays-college-cheating-professors-caught-students-ai-plagiarism-2023-1>
- OpenAI. (2023a, March 7). *How can educators respond to students presenting AI-generated content as their own?* *OpenAI - Educator FAQ*. <https://help.openai.com/en/articles/8313351-how-can-educators-respond-to-students->

presenting-ai-generated-content-as-their-own

%27t+believe+the+hype+lyrics

OpenAI. (2023b, March 14). *GPT-4 [Technical report]*. <https://openai.com/research/gpt-4>

Purpel, D. (1989). *The moral & spiritual crisis in education: A curriculum for justice and compassion in education*. Bergin & Garvey.

OpenAI. (2024, December 5). *Introducing ChatGPT Pro*. OpenAI. <https://openai.com/index/introducing-chatgpt-pro/>

Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., ... & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching*, 6(1), 41-56. <https://doi.org/10.37074/jalt.2023.6.1.29>

Orwell, G. (1933). *Down and out in Paris and London*. Victor Gollancz.

Patel, N. (2023, November 7). Barack Obama on AI, free speech, and the future of the internet. *The Verge*. <https://www.theverge.com/23948871/barack-obama-ai-regulation-free-speech-first-amendment-decoder-interview>

Reuters. (2025, February 12). *Trump says he wants education department closed immediately*. <https://www.reuters.com/world/us/trump-says-he-wants-education-department-be-closed-immediately-2025-02-12/>

Perkins, M. (2023). Academic integrity considerations of AI large language models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching & Learning Practice*, 20(2), 07. <http://dx.doi.org/10.53761/1.20.02.07>

Ripple, W. J., Wolf, C., Newsome, T. M., Galetti, M., Alamgir, M., Crist, E., Mahmoud, M. I., & Lurance, W. F. (2017). World scientists' warning to humanity: A second notice. *Bioscience*, 67(12), 1026–1028. <https://doi.org/10.1093/biosci/bix125>

Perrigo, B. (2023, January 18). *Exclusive: OpenAI used Kenyan workers on less than \$2 per hour to make ChatGPT less toxic*. Time Magazine. <https://time.com/6247678/openai-chatgpt-kenya-workers/>

Rudolph, J. (in press). The hidden labour in AI: Big Tech's dirty secret and the need for critical AI literacy in higher education. In S. Popenici, J. Rudolph, F. Ismail, & S. Tan (Eds.), *Handbook of AI and higher education*. Edward Elgar.

Pew Research Center. (2021, August 19). *Some digital divides persist between rural, urban and suburban America*. Pew Research Center. <https://www.pewresearch.org/short-reads/2021/08/19/some-digital-divides-persist-between-rural-urban-and-suburban-america/>

Rudolph, J., Crawford, J., Sam, C. Y., & Tan, S. (2024c). Introduction: Higher education in crisis. In J. Rudolph, J. Crawford, C. Y. Sam, & S. Tan (Eds.), *The Palgrave Handbook of crisis leadership in higher education* (pp. 1-15). Springer Nature.

Piketty, T. (2014). *Capital in the twenty-first century*. Harvard University Press.

Rudolph, J., Ismail, F., & Popenici, S. (2024a). Higher education's generative artificial intelligence paradox: The meaning of chatbot mania. *Journal of University Teaching and Learning Practice*, 21(6), 1-35. <https://doi.org/10.53761/54fs5e77>

Pimm, S. L., Jenkins, C. N., Abell, R., Brooks, T. M., Gittleman, J. L., Joppa, L. N., Raven, P. H., Roberts, C. M., & Sexton, J. O. (2014). The biodiversity of species and their rates of extinction, distribution, and protection. *Science*, 344(6187), 1246752. <https://doi.org/10.1126/science.1246752>

Rudolph, J., Tan, S., & Aspland, T. (2023c). Editorial 6(1): Fully automated luxury communism or turing trap? Graduate employability in the AI age. *Journal of Applied Learning and Teaching*, 6(1), 7-15. <https://doi.org/10.37074/jalt.2023.6.1.35>

Pimm, S. L., Russell, G. J., Gittleman, J. L., & Brooks, T. M. (1995). The future of biodiversity. *Science*, 269(5222), 347–350. <https://doi.org/10.1126/science.269.5222.347>

Rudolph, J., Tan, S., & Ismail, F. (2024b). Joyce's Odyssey. A celebration of human ingenuity in Ulysses and an indictment of the mediocrity of generative AI. *Journal of Applied Learning & Teaching*, 7(1), 7–21. <https://doi.org/10.37074/jalt.2024.7.1.1>

Popenici, S. (2023a). *Artificial intelligence and learning futures: Critical narratives of technology and imagination in higher education*. Routledge.

Rudolph, J., Tan, S., & Tan, S. (2023a). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning & Teaching*, 6(1), 342-363. <https://doi.org/10.37074/jalt.2023.6.1.9>

Popenici, S. (2023b). The critique of AI as a foundation for judicious use in higher education. *Journal of Applied Learning and Teaching*, 6(2), 348-384. <https://doi.org/10.37074/jalt.2023.6.2.4>

Popenici, S., Rudolph, J., Tan, S., & Tan, S. (2023). A critical perspective on generative AI and learning futures.: An interview with Stefan Popenici. *Journal of Applied Learning and Teaching*, 6(2), 311-331. <https://doi.org/10.37074/jalt.2023.6.2.5>

Rudolph, J., Tan, S., & Tan, S. (2023b). War of the chatbots: AI and higher education. *Journal of Applied Learning and Teaching*, 6(1), 364-389. <https://doi.org/10.37074/jalt.2023.6.1.23>

Public Enemy. (1988, June). *'Don't believe the hype' lyrics*. <https://www.google.com/search?client=firefox-b-d&q=don>

Sahota, N. (2024, February 2). AI and the shadow over democracy: The rising threat to global elections. *Forbes*.



- <https://www.forbes.com/sites/neilsahota/2024/02/02/ai-and-the-shadow-over-democracy-the-rising-threat-to-global-elections/>
- Said, E. (1994). *Representations of the intellectual. The 1993 Reith lectures*. Vintage Books.
- Salam, E. (2024, December 8). College enrollment is falling at a 'concerning' rate, new data reveals. *The Guardian*. <https://www.theguardian.com/us-news/2024/dec/08/college-enrollment-declining>
- Salmi, J. (1992). The higher education crisis in developing countries: Issues, problems, constraints and reforms. *International Review of Education*, 38, 19-33.
- Sankaran, V. (2023, April 18). Google DeepMind chief says 'there's a possibility' AI may become self-aware. *The Independent*. <https://www.independent.co.uk/tech/google-deepmind-ai-self-aware-b2321722.html>
- See, S. (2025, February 13). Trust is the world's most valuable currency, and DeepSeek shows China is in deficit. *The Business Times*.
- Silberg, J., & Manyika, J. (2019, June 6). *Tackling bias in artificial intelligence (and in humans)*. McKinsey Global Institute. <https://www.mckinsey.com/featured-insights/artificial-intelligence/tackling-bias-in-artificial-intelligence-and-in-humans>
- Singer, A. (2024, September 9). *Stakes rising in the US-China AI race*. Global Finance Magazine. <https://gfmag.com/economics-policy-regulation/us-china-competition-generative-ai/>
- Singer, N. (2018, July 26). Amazon's facial recognition wrongly identifies 28 lawmakers, A.C.L.U. says. *The New York Times*. <https://www.nytimes.com/2018/07/26/technology/amazon-aclu-facial-recognition-congress.html>
- Sinofsky, S., & Casado, M. (2025, February 6). *Deepseek: America's Sputnik moment for AI*. a16z Podcast. <https://a16z.com/podcast/deepseek-americas-sputnik-moment-for-ai/>
- Smart, S. (2017). Resistance against mining extractivism in Chile. *Critical Planning*, 23. <http://dx.doi.org/10.5070/CP8231038128>
- Smith, B. (2023, February 2). *Meeting the AI moment: Advancing the future through responsible AI*. Microsoft, <https://blogs.microsoft.com/on-the-issues/2023/02/02/responsible-ai-chatgpt-artificial-intelligence/>
- Stanford Institute for Human-Centered AI. (2024, November 21). *Global AI power rankings: Stanford HAI tool ranks 36 countries in AI*. Stanford University. <https://hai.stanford.edu/news/global-ai-power-rankings-stanford-hai-tool-ranks-36-countries-ai>
- Strickland, E. (2022, February 22). *Yann LeCun: AI doesn't need our supervision*. IEEE Spectrum. <https://spectrum.ieee.org/yann-lecun-ai>
- Suleyman, M., & Bhaskar, M. (2023). *The coming wave. AI, power and the 21st century's greatest dilemma*. The Bodley Head.
- Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching*, 6(1), 31-40. <https://doi.org/10.37074/jalt.2023.6.1.17>
- Susskind, D. (2021). *A world without work: Technology, automation, and how we should respond*. Penguin.
- Tan, E., & Rudolph, J. (2023). Strategic sustainability in the Anthropocene. In A. de Moraes (Ed.), *Strategic management and international business policies for maintaining competitive advantage* (pp. 256-270). IGI Global.
- Tan, S. (in press). Generative AI: Reshaping the future of work and learning. In S. Popenici, J. Rudolph, F. Ismail, & S. Tan (Eds.), *Handbook of AI and higher education*. Edward Elgar.
- Tan, S., Rudolph, J., & Tan, S. (2024). Riding the generative AI tsunami: Addressing the teaching and learning crisis in higher education. In J. Rudolph, J. Crawford, C. Y. Sam, & S. Tan (Eds.), *The Palgrave Handbook of crisis leadership in higher education* (pp. 135-154). Springer Nature.
- Tangermann, V. (2023, January 18). *College student caught submitting paper using ChatGPT*. Futurism. <https://futurism.com/college-student-caught-writing-paper-chatgpt>
- The Economist*. (2023a, July 23). American universities have an incentive to seem extortionate. <https://www.economist.com/united-states/2023/07/23/american-universities-have-an-incentive-to-seem-extortionate>
- The Economist*. (2023b, August 31). How artificial intelligence will affect the elections of 2024. <https://www.economist.com/leaders/2023/08/31/how-artificial-intelligence-will-affect-the-elections-of-2024>
- The Economist*. (2024a, September 19). China's AI firms are cleverly innovating around chip bans. *The Economist*. <https://www.economist.com/science-and-technology/2024/09/19/chinas-ai-firms-are-cleverly-innovating-around-chip-bans>
- The Economist*. (2024b, August 25). Is Xi Jinping an AI doomer? *The Economist*. <https://www.economist.com/china/2024/08/25/is-xi-jinping-an-ai-doomer>
- The Economist*. (2024c, January 21). Why America's controls on sales of AI tech to China are so leaky. *The Economist*. <https://www.economist.com/business/2024/01/21/why-americas-controls-on-sales-of-ai-tech-to-china-are-so-leaky>
- The Economist*. (2024d, June 15). The LLM summer sale: A price war breaks out among China's AI-model builders. *The Economist*. <https://www.economist.com/business/2024/06/15/the-llm-summer-sale>
- The Economist*. (2024e, July 23). AI firms will soon exhaust most of the Internet's data. *The Economist*. <https://www.economist.com/business/2024/07/23/ai-firms-will-soon-exhaust-most-of-the-internet-s-data>

economist.com/schools-brief/2024/07/23/ai-firms-will-soon-exhaust-most-of-the-internets-data

*The Economist*. (2024f, September 17). The broken business model of British universities. *The Economist*. <https://www.economist.com/britain/2024/09/17/the-broken-business-model-of-british-universities>

*The Economist*. (2025a, January 29). DeepSeek poses a challenge to Beijing as much as to Silicon Valley. *The Economist*. <https://www.economist.com/business/2025/01/29/deepseek-poses-a-challenge-to-beijing-as-much-as-to-silicon-valley>

*The Economist*. (2025b, January 27). DeepSeek sends a shockwave through markets. *The Economist*. <https://www.economist.com/business/2025/01/27/deepseek-sends-a-shockwave-through-markets>

*The Economist*. (2025c, February 13). How AI will divide the best from the rest. <https://www.economist.com/finance-and-economics/2025/02/13/how-ai-will-divide-the-best-from-the-rest>

The Open University. (2025). *A framework for the learning and teaching of critical AI literacy skills*. <https://about.open.ac.uk/sites/about.open.ac.uk/files/files/OU%20Critical-AI-Literacy-framework-2025.pdf>

The Philadelphia Inquirer (2019, September 4). *Racist risk assessment algorithms should not be the future of sentencing in Pennsylvania*. <https://www.inquirer.com/opinion/editorials/risk-assessment-algorithm-tool-pennsylvania-sentencing-commission-20190904.html>

Thibout, C. (2025, February 3). *The emergence of a Chinese AI superpower? Reflections on the DeepSeek case*. *Institut de Relations Internationales et Stratégiques (IRIS)*. <https://www.iris-france.org/en/the-emergence-of-a-chinese-ai-superpower-reflections-on-the-deepseek-case/>

Thorbecke, C. (2025a, February 1). Why Chinese tech keeps surprising the West. *The Business Times*, p. 3.

Thorbecke, C. (2025b, February 6). DeepSeek's breakthroughs are too big for the US to ban. *The Business Times*, p. 16.

Tooze, A. (2021). *Shutdown: How Covid shook the world's economy*. Viking.

U.S. Department of Education, Office of Educational Technology. (2023, May 30). *Artificial intelligence and the future of teaching and learning: Insights and recommendations*. <https://www.ed.gov/sites/ed/files/documents/ai-report/ai-report.pdf>

UNESCO. (2021). *Digital literacy for all*. <https://en.unesco.org/information-society/digital-literacy>

Vallor, S. (2024). *The AI mirror: How to reclaim our humanity in an age of machine thinking*. Oxford University Press.

Varanasi, L. (2024, July 29). AI won't replace human workers,

but "people that use it will replace people that don't," AI expert Andrew Ng says. *Business Insider*. <https://www.businessinsider.in/artificial-intelligence/news/ai-wont-replace-human-workers-but-people-that-use-it-will-replace-people-that-dont-ai-expert-andrew-ng-says/articleshow/112089975.cms>

Vasquez, M., & Bauman, D. (2019, April 4). How America's college closure crisis leaves families devastated. *Chronicle of Higher Education*. <https://www.chronicle.com/article/how-americas-college-closure-crisis-leaves-families-devastated/?sra=true>

Verdicchio, M. (2023). Marking the lines of artificial intelligence. In S. Lindgren (Ed.), *Handbook of critical studies of artificial intelligence* (pp. 245-253). Edward Elgar. <https://doi.org/10.4337/9781803928562.00027>

Vincent, J. (2018, January 12). Google 'fixed' its racist algorithm by removing gorillas from its image-labeling tech. *The Verge*. <https://www.theverge.com/2018/1/12/16882408/google-racist-gorillas-photo-recognition-algorithm-ai>

Walters, W. H. (2023). The effectiveness of software designed to detect AI-generated writing: A comparison of 16 AI text detectors. *Open Information Science*, 7(1), 1–18. <https://doi.org/10.1515/opis-2022-0158>

Waltzer, T., Cox, R. L., & Heyman, G. D. (2023). Testing the ability of teachers and students to differentiate between essays generated by ChatGPT and high school students. *Human Behavior and Emerging Technologies*, 1–9. <https://doi.org/10.1155/2023/1923981>

Wang, J., Milne, C., Hu, J. Z., & Khan, F. (2024). *Navigating geopolitics in AI governance [OXGS Research Report]*. Oxford Global Society. <https://oxgs.org/2024/04/08/oxgs-report-navigating-geopolitics-in-ai-governance/>

Waring, P. (2024). Artificial intelligence and graduate employability: What should we teach Generation AI?. *Journal of Applied Learning and Teaching*, 7(1), 22-25. <https://doi.org/10.37074/jalt.2024.7.1.42>

Warschauer, M. (2003). *Technology and social inclusion: Rethinking the digital divide*. MIT Press.

Willige, A. (2023, October 31). How AI can speed scientific discovery, from predicting virus variants to vital protein research. *World Economic Forum*. <https://www.weforum.org/stories/2023/10/ai-for-good-science-discovery/>

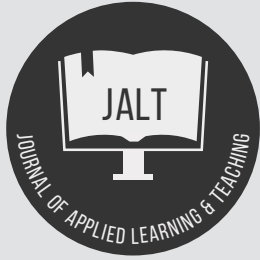
Wodecki, B. (2023, February 4). *UBS: ChatGPT is the fastest growing app of all time*. AI Business. <https://aibusiness.com/nlp/ubs-chatgpt-is-the-fastest-growing-app-of-all-time>

Wooldridge, M. (2020). *The road to conscious machines: The story of AI*. Penguin UK.

Yalalov, D. (2023, January 18). *ChatGPT was taught by the world's poorest people*. Metaverse Post, <https://mpost.io/chatgpt-was-taught-by-the-worlds-poorest-people/>

- Yang, Z. (2023, March 16). *Chinese tech giant Baidu just released its answer to ChatGPT*. MIT Technology Review. <https://www.technologyreview.com/2023/03/16/1069919/baidu-ernie-bot-chatgpt-launch/>
- Young, L. (2023, December 14). *AI writing in academic journals: Mitigating its impact on research integrity*. Turnitin Blog. <https://www.turnitin.com/blog/ai-writing-in-academic-journals-mitigating-its-impact-on-research-integrity>
- Yu, H. (2025, February 12). Open source and under control: The DeepSeek paradox. *The Business Times*, p. 15.
- Zhai, C., & Wibowo, S. (2023). A systematic review on artificial intelligence dialogue systems for enhancing English as foreign language students' interactional competence in the university. *Computers and Education: Artificial Intelligence*, 4, 100134. <https://doi.org/10.1016/j.caeai.2023.100134>
- Zhang, B., Dreksler, N., Anderljung, M., Kahn, L., Giattino, C., Dafoe, A., & Horowitz, M. C. (2022). *Forecasting AI progress: Evidence from a survey of machine learning researchers*. arXiv. <https://doi.org/10.48550/arXiv.2206.04132>
- Zitron, E. (2025, January 29). *Deep impact. Where's your ed at blog*. <https://www.wheresyoured.at/deep-impact/>

Copyright: © 2025. Jürgen Rudolph, Fadhil Ismail, Shannon Tan and Pauline Seah. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Prophets of progress: How do leading global agencies naturalize enchanted determinism surrounding artificial intelligence for education?

---

Junhong Xiao<sup>A</sup>

A

*Open University of Shantou, China*

Aras Bozkurt<sup>B</sup>

B

*Open and Distance Learning, Anadolu University, Türkiye & Department of Social Sciences, Western Caspian University, Azerbaijan*

---

### Keywords

AI for education;  
enchanted determinism;  
global AI discourse;  
higher education;  
OECD;  
UNESCO.

---

### Correspondence

[frankxjh@outlook.com](mailto:frankxjh@outlook.com)<sup>A</sup>

---

### Article Info

Received 24 October 2024  
Received in revised form 15 January 2025  
Accepted 16 January 2025  
Available online 11 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.19>

### Abstract

The hype surrounding AI for education continues with no sign of dying down in the near term. Given the influence of UNESCO and OECD on national educational policies worldwide, this study examined how they frame artificial intelligence (AI) and how their discourse may affect the wider educational landscape. Drawing upon the theory of Critical Discourse Analysis, this study adopted a two-stage analysis method: framework analysis followed by directed qualitative content analysis. Four themes were identified, including the necessity of AI-driven educational transformation, imagined educational futures enabled by AI, challenges brought about by AI for education, and solutions and walkthroughs. They were critiqued using the schema of practical argument proposed for political discourse analysis which is composed of a Value premise, a Goal premise, a Circumstantial premise, a Means–Goal premise and a Claim (or conclusion). Findings show that while admitting the existence of enormous uncertainties and challenges, UNESCO and OECD take for granted AI’s disruptiveness, inevitability, and potential to change education, its effect on the whole society for the better and its encouragement of the acceleration of AI for education. Possible ramifications of this framing on the ecology of education and beyond were then discussed. The article concludes by calling for a vigilant and critical approach to the AI narratives promoted by influential global agencies, arguing that the future of education depends on our ability to question, adapt and thoughtfully integrate technology without succumbing to unexamined inevitabilities or unwarranted optimism.

## Introduction

The attempt to use artificial intelligence (AI) to transform education for the better can be traced back to 1970 when Jaime R. Carbonell published an article reporting on a tutor and authoring system for geography (du Boulay, 2023). AI has been increasingly popular ever since with many applications normalized in various aspects of education, in particular higher education.

This field has gained momentum since the turn of the century, but the release of ChatGPT by OpenAI in November 2022 has brought AI for education to the forefront, making it a hot topic in higher education academia (for example, see Rudolph et al., 2023a), media and policy discourse. Predictions of AI's destruction of higher education appeared almost immediately, with claims such as "the college essay is dead" (Marche, 2022) emerging just one week after the release of ChatGPT. However, many of the promises of AI, ChatGPT in particular, for higher education (Bond et al., 2024; Bozkurt et al., 2024; Zawacki-Richter et al., 2024), have been made repeatedly since the early days of AI (Popenici, 2023a). Despite its ambitious and well-intentioned goals of understanding, developing and disseminating best learning and teaching practices (Porayska-Pomsta, 2023) and its increasing integration into education, there is no decisive evidence proving AI's benefits in education (Holmes & Tuomi, 2022). Public concern about AI is growing (Yan et al., 2024), including aggravating an identity crisis in higher education (Popenici et al., 2023). AI is still not fully understood, requiring more rigorous, longitudinal, large-scale studies (Bozkurt et al., 2024). Many practical challenges remain, and a consensus on the mission of education has yet to be reached.

Surprisingly, even against this highly contested and controversial backdrop, there is widespread enchanted determinism surrounding AI for (higher) education not only in journals and books but also in policies and on social media (Williamson, 2024). Enchanted determinism refers to the perception of AI systems as both magical and superhuman, and reliable for life-changing decisions, albeit beyond understanding and regulation (Campolo & Crawford, 2020). This techno-optimism significantly influences the collective understanding of societies worldwide (Markelius et al., 2024), with discourses promoting the transformative capabilities of AI often overshadowing important debates about its potential negative impacts on education (Williamson et al., 2024). For example, "mainstream" discourses often downplay new challenges and massive disruption brought by AI to universities and even deliberately ignore how AI may lead to ethical consequences as well as have impact on teachers, students, and the future of learning (Popenici, 2023b). In this regard, the role of leading global agencies is critical as they have a strong influence on national policies and strategies and shape the development of AI for education, including the creation of imaginations, resource allocation and the enforcement of rules (Bareis & Katzenbach, 2022).

Both generic and generative AI are already reshaping not only education in general but also the way higher education institutions (HEIs) approach teaching, learning, and research, from automated assessment tools to novel forms

of scholarly communication (Bond et al., 2024; Bozkurt et al., 2023, 2024; Rudolph et al., 2023a, 2023b). However, given that not all HEIs are fully prepared (Bearman et al., 2023) to adopt such technologies (Popenici et al., 2023), what appears to be a beneficial global drive toward modernization can also accelerate a market-driven logic in higher education, with generative AI initiatives taking precedence over core academic values such as intellectual diversity, humanistic inquiry, and contextual responsiveness.

Based on aforementioned considerations, this study examines how the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the Organization for Economic Cooperation and Development (OECD) frame AI for education. It explores how these global institutions use rhetoric to define and legitimize the role of AI in the future of education. A critical analysis of their discourses can reveal why AI is framed in certain ways and how this framing affects the wider educational landscape, including the higher education sector.

The study focuses on UNESCO and OECD in that the former is "the leading UN agency for education" (UNESCO, 2024) and the latter, despite its focus on the economy, plays a significant role in shaping the ecology of national education across the globe at policy level (Hasa, 2023; Lingard et al., 2015; Teräs et al., 2023). Other agencies, for example, the World Bank are excluded in this study either because no document published by them is found to meet the inclusion criteria (Figure 1 below), or because they target specific countries rather than globally, for example, the European Union and the Commonwealth of Learning. Unlike Linderoth et al. (2024), this study distinguishes between global and international organizations.

It should be also noted that we distinguish "AI for education" from "AI in Education (AIED)". AIED refers to using AI to improve pedagogical and administrative processes in educational institutions while AI for education as used in this article is intended to cover both AIED and AI itself as the teaching and learning content.

This study aims to address the following research questions:

1. How is AI for education framed by UNESCO and OECD?
2. Why is AI for education framed the way it is by UNESCO and OECD?
3. What possible impacts does this framing have on the ecology of education and even beyond?

## Theoretical framework

This study is underpinned by Fairclough's (2013) theory of Critical Discourse Analysis (CDA), which emphasizes the importance of language in social analysis and research as it is intertwined with political, economic, and social elements. Fairclough (1989; 1992) posits that language and social variables shape and are shaped by each other.

CDA, in this study, aims to uncover how publications like policy documents and reports create problems and solutions (Clark, 2024). The UNESCO and OECD publications critiqued in this study are considered political discourse. Therefore, it is essential to examine how “political actors advance practical arguments for or against particular courses of action which include as reasons descriptions and evaluations of existing states of affairs ... and problematizations that posit ‘difficulties’ as effects or consequences of ‘problems’” (Fairclough, 2013, p. 194). This includes how they critically question practical arguments by evaluating the advocated courses of action and their possible or likely consequences (Fairclough, 2013). Lakoff and Johnson (1980) also assert that our concepts influence our perceptions and interactions.

Therefore, it is crucial to challenge AI assumptions in these publications to prevent them from becoming common sense, which would shape our use of AI in education and redefine its purpose (Fairclough, 1992). Texts influence “people (beliefs, attitudes, etc.), actions, social relations, and the material world” (Fairclough, 2003, p. 8), and CDA explores how texts impact ideologies and social power dynamics (Fairclough, 2003). Accordingly, Eynon and Young (2021) describe AI as a complex sociotechnical artifact shaped by social processes. CDA can reveal how AI-driven educational futures envisioned by UNESCO and OECD establish social visions and values, serving as models for desirable social orders (Marone & Heinsfeld, 2023).

## Methodology

In order to answer the research questions, a systematic literature review was conducted in the context of this study (Gough et al., 2012). Content analysis can be described as a methodical and reproducible methodology for distilling extensive textual data into concise content categories, adhering to clearly defined coding principles (Berelson, 1952). In this regard, the documents included in the research corpus were coded and prominent research themes were identified. Direct quotations from the documents were frequently included to support the emerging themes and to allow readers to make their own interpretations.

## Sample selection

In January 2024, a sample search was conducted on the websites of UNESCO Digital Library (<https://unesdoc.unesco.org/home>) and OECD iLibrary (<https://www.oecd-ilibrary.org/>), with the search terms “AI and education” and “artificial intelligence and education”. The publication year was limited to 2000-2023. Search results were then scrutinized using the inclusion and exclusion criteria (Figure 1).

The OECD search returned 14 results for “AI and education” and 4 for “artificial intelligence and education,” with two duplicates, resulting in 16 documents, all in English. The UNESCO search, limited to “programme and meeting documents” and “books” in English, excluding irrelevant content (e.g., forms, directories, biographies, and the like), returned 1963 records for “AI and education” and 1045 for “artificial intelligence and education.” After merging and

Inclusion	Exclusion
1. The document is prepared by UNESCO or OECD or by individuals affiliated to or commissioned by UNESCO or OECD.	1. The document is not prepared by UNESCO or OECD or by individuals affiliated to or commissioned by UNESCO or OECD.
2. Authorship belongs to UNESCO or OECD.	2. Authorship belongs to individuals instead of the organization.
3. The document is published by UNESCO or OECD.	3. The document is not published by UNESCO or OECD.
4. The target audience of the document is global.	4. The target audience of the document is not global.
5. AI is the theme or one of the key themes of the document.	5. AI is not the theme or one of the key themes of the document.
6. Education is the theme or one of the key themes of the document.	6. Education is not the theme or one of the key themes of the document.
7. The document is written in English.	7. The document is written in languages other than English.

Figure 1. Inclusion and exclusion criteria.

removing 501 duplicates, 2507 records remained.

Concerning authorship, we included OECD documents stating, “this work is published under the responsibility of the Secretary-General of the OECD” and excluded those stating, “the opinions expressed and arguments employed herein are those of the author(s).” As for UNESCO documents, only those without individual authors listed on the copyright page were included due to the disclaimer on the copyright page that “the ideas and opinions expressed in this publication are those of the authors; they are not necessarily those of UNESCO and do not commit the Organization”. It is because of this understanding that two of the five documents included in Glais (2023) are excluded from this study. The only exception is “Reflections on generative AI and the future of education” by Stefania Giannini, which reflects the official views of UNESCO. The final sample includes 4 OECD documents (OECD, 2021, 2023a, b; OECD-Education International, 2023) and 14 UNESCO documents (Giannini, 2023; UNESCO, 2019a, b, c, d, e, f, 2020, 2022a, b, c, d, 2023; UNESCO IITE & SOU, 2022) (see Figure 2).

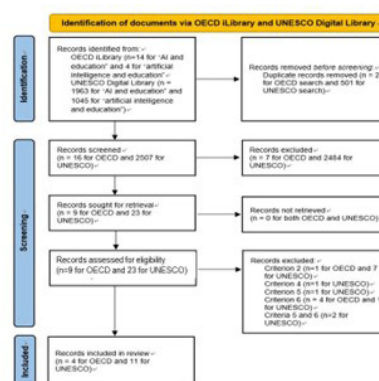


Figure 2. PRISMA flow diagram.

## Sample analysis

Sample analysis was conducted in two stages. The first stage followed the method of framework analysis (Srivastava & Thomson, 2009). Two UNESCO and one OECD documents were randomly selected for this purpose. The first author and his associate each read these documents and hand searched for contents concerning AI for education, with the first research question in mind. They noted down emerging themes independently, compared their checklists, and resolved differences through negotiation. Consequently,

following the coding process, a thematic framework was developed, consisting of four themes (see Figure 3). The second stage adopted the method of directed qualitative content analysis (Hsieh & Shannon, 2005), using the developed thematic framework. Both coders hand-searched for and appraised the contents of the remaining 15 documents critically, as many times as necessary. Specific extracts pertaining to particular themes were collated in Excel spreadsheets for their respective themes. The formal coding results were then compared, and each theme was divided into subthemes (see Figure 3). In the case of disagreement, the two coders re-read and discussed contentious extracts and even longer texts in order to reach consensus.

To minimize potential researcher bias and enhance coding reliability and validity, the second author conducted another independent content analysis of all the 18 documents using the same thematic framework. His coding results were compared with the first two coders' results. Disagreements were then resolved through discussion with the first author.



Figure 3. Themes and subthemes.

## Findings: Thematic narratives of AI for education

### Theme 1: Necessity of AI-driven educational transformation

As can be seen in Figure 4, skills development for job and life and affordances of AI for education are two main reasons for AI-driven educational transformation. Given the growing impact of AI on work and life and consequently on the future of humanity, AI has the “potential for reshaping the core foundations of education, teaching and learning” (UNESCO, 2019a, p. 3). Therefore, there is a need to reframe “what it means to be human and its implications for learning” and to redefine “what we understand by learning to be, learning to know, learning to do and learning to live together” (UNESCO, 2022b, p. 5). Education systems will need to be reshaped in ways that prepare graduates for the future job

market and foster an AI-literate citizenry. Skills development for job and life is a goal not only for initial education but also for continuous upskilling and reskilling. An internationally competitive AI-capable workforce is essential to a nation’s competitiveness, productivity, and innovation.

Then, what are the affordances of AI for transforming education? AI can contribute to “the reform of education governance systems, the upgrading of schools, the iteration of teaching methods, and the improvement of talent cultivation methods through new technologies” (UNESCO, 2022b, 38). “In its most advanced form, AI itself becomes the mechanism that delivers learning” (UNESCO, 2019f, p. 7).

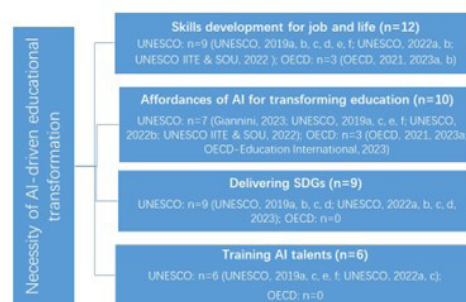


Figure 4. An overview of Theme 1: Necessity of AI-driven educational transformation.

Another two subthemes are delivering the United Nations Sustainable Development Goals (SDGs), in particular SDG4 and training AI talents. AI-enabled education can facilitate the achievement of the SDGs. When it comes to SDG4, digital AI can tide the world over “an education crisis, with more than 200 million children globally out of school” (UNESCO, 2019b, p. 46) by offering new ways to overcome barriers to the achievement of the Education 2030 Agenda. As for cultivating AI talents due to the need for skills development for job and life, AI courses and research programs need to be developed or enhanced to “create a massive pool of local AI professionals who have the expertise to design, programme and develop AI systems” (UNESCO, 2019a, p. 6).

### Theme 2: Imagined educational futures enabled by AI

Personalized and adaptive learning, automated educational processes, and open, flexible, and inclusive education constitute three major elements of the imagined educational futures enabled by AI (see Figure 5). AI enables intelligent tutoring and turns large-scale personalized and adaptive learning into a reality. AI systems can “monitor learning processes, predict failure and attrition, enhance education management, assess lifelong learning outcomes, and diagnose major problems in learning systems” (UNESCO, 2022b, p. 26), and even analyze “government priorities, funding opportunities and employment advertisements” (UNESCO, 2019b, p. 9) so that educational systems can cater for market needs. AI-enabled automation also covers such areas as grading and recordkeeping, admissions and school allocations, proctoring, credentialing, customer relationship

management, and resource allocation and planning. In addition to personalization and automation, AI can promote open and flexible education and provide quality education, especially for the disadvantaged learners, “making education management and provision more equitable, inclusive, open and personalized” (UNESCO, 2019a, p. 5).

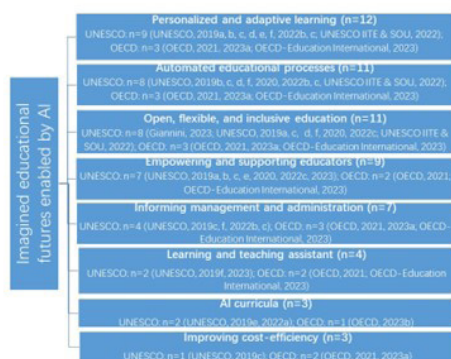


Figure 5. An overview of Theme 2: Imagined educational futures enabled by AI.

Empowering and supporting educators is another major aspect of Theme 2. Automating routine and administrative tasks such as grading and recordkeeping “could free up a teacher’s time, allowing them to focus on the more creative, empathetic and inspirational aspects of their profession” (UNESCO, 2019b, p. 8). Furthermore, AI tools can be designed to enhance teachers’ subject knowledge and understanding of teaching methodologies. For example, using AI to monitor asynchronous online discussion enables teachers to keep abreast of learners’ performance and orchestrate learning activities accordingly. With AI, teachers can evaluate the multiple dimensions of students’ competencies and implement large-scale and remote assessment. Classroom analytics gives teachers feedback about their teaching in real time or after class, supporting “a shift in pedagogical models” (OECD-Education International, 2023, p. 4) by enabling the design and delivery of instruction in ways that were not possible in the past.

Another element of the imagined educational futures is using AI technology to access information which can then be used to inform management and administration, for example, “developing feasible and cost-effective plans, formulating responsive policies, and monitoring and evaluating educational outcomes” (UNESCO, 2019c, p. 15). Such information can also contribute to the development and sharing of best practices in curriculum design, policy, and pedagogy and the development of curricula aligning with job market demand as well as improve course management, facilitate learning material redesign, and assist in administrative work such as budgeting, procurement and facilities management.

Chatbot, virtual facilitator, simulator, and social robot can serve as student’s learning and teaching assistant, for example, as a one-on-one coach for self-paced learning, a partner in Socratic dialogues, an instructor or tutor for individuals or small groups, or “peer learners allowing students to ‘teach’ them” (OECD, 2021, p. 15). And given the pervasiveness of AI in all aspects of society, teaching

students to make effective use of AI technologies becomes a focus of education, hence the need for AI curricula. Five types of AI curricula (i.e. discrete, embedded, interdisciplinary, multiple-modality, and flexible) are spelt out in UNESCO (2022a). Finally, it is proclaimed that AI can improve the cost-efficiency of educational systems, especially through automation.

### Theme 3: Challenges brought about by AI for education

Challenges co-exist with opportunities/affordances. Challenges related to ethics and investment are two major elements of Theme 3 (see Figure 6). Ethical challenges cover a wide range of issues. First, AI may exacerbate inequalities because the disadvantaged are less likely to benefit from AI-enabled education or due to “the widening divide in training and controlling GenAI models” (UNESCO, 2023, p. 14). Weakening human connection is another challenge, resulting in social isolation. A third challenge is concerning human intellectual development. AI tools may jeopardize learners’ autonomy and agency by predetermining solutions or limiting the range of learning options, hence privileging particular worldviews and reflecting particular ways of cognition. This homogenization tendency is detrimental to pluralistic and creative thinking. Psychological impact is a fourth challenge. Psychologically speaking, the impact of human-like AI tools on learners’ cognitive development and emotional well-being remains unknown, not to mention the potential for manipulation. Another challenge relates to hidden bias and discrimination. Bias exists in training data, input and algorithms which, in turn, may produce new forms of bias and discrimination. Bias can even lead to violence, hate speech and exclusion. In addition, data collection, use, ownership, and privacy may pose challenges, too. Dehumanization or the loss of human agency is also a challenge. AI tools can deprofessionalize education by dehumanizing learning and undervaluing teachers although education is a human enterprise. Finally, added to the above challenges are those caused by private governance which tends to amplify risks of information security, human rights, privacy, and public accountability and further complicates issues related to data ownership and exploitation. Challenges in all the above-mentioned areas have ethical consequences if inadequately addressed.



Figure 6. An overview of Theme 3: Challenges brought about by AI for education.



Similarly, it is obvious that the necessary infrastructure and financial resources required to install relevant facilities and provide relevant services are not equally available everywhere. Costs are rocketing and may turn out to be unaffordable especially for less developed countries and regions, with an increase in the power of technology. On the other hand, we should tackle the dilemma of investment choices. Investment in AI technologies could be spent on teacher development and improving schools and other physical and social infrastructure that can better benefit learners. In a word, investment demand is a major challenge. Another significant challenge is lack of evidence of effectiveness. More research is needed to find out to what extent AI applications have delivered their promises to serve the common good effectively. To date, solid evidence of their effectiveness remains scarce.

AI for education poses a variety of challenges. AI tools may trigger legal issues, for example, copyright and intellectual property, data collection, ownership and privacy, information security, human rights, and accountability, among other things. AI technologies are being integrated into education without being screened or regulated, a situation which may lead to more potential harms than benefits. AI curricula also need regulating to balance competing interests. Another type of challenges relates to educators' capacity-enhancement and AI literacy. This is a prerequisite to the effectiveness of AI for education. Educators must be properly prepared for the use of AI for education so that AI curricula can be effectively implemented. Furthermore, they must be equipped with the digital competences necessary for AI-enabled education and the pedagogical competences to use AI tools and resources in their teaching.

The remaining two challenges are less emphasized. One is technological adequacy. AI technology for education has yet to be perfected. For instance, the foundation models require refining to ensure that they can support student-centered pedagogy. Further, AI tools do not perform their tasks with accuracy all the time. The other is cost-efficiency and return on investment. AI for education has not delivered on its promise of cost-efficiency as argued in two OECD documents. For example, there are situations when AI technologies, though available, are not (effectively or adequately) used by education stakeholders, hence no cost-efficiency to speak of. Lack of interoperability of the AI ecosystem may lead to cost-inefficiencies too. Last but not least, AI deployment is not a one-off investment; AI systems need to be regularly updated and maintained, which has significant implications for costs.

#### Theme 4: Solutions and walkthroughs

Regulation and governance top the solutions to the challenges of AI for education (see Figure 7). Measures proposed include formulating data protection laws and regulatory frameworks, adjusting existing ones, setting international standards, and developing policies and strategies to ensure that the ethical, equitable, transparent and auditable use of learners' data and the responsible development and application of AI for education. In addition, AI curricula need to be developed under the supervision of

government and public procurement must be effectively leveraged so that commercial AI businesses have to follow designated guidelines. Regulation and governance should also extend to issues concerning "transparency, openness and replicability of algorithms, as well as funding and support for the verification of the design and the final results of algorithms by independent parties" (OECD, 2021, p. 36).

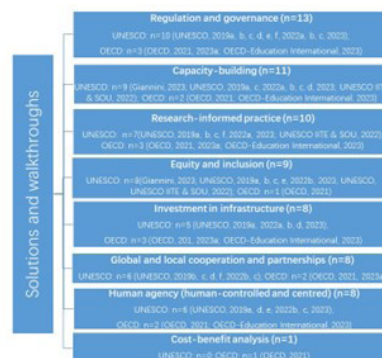


Figure 7. An overview of Theme 4: Solutions and walkthroughs.

Two other important solutions are related to capacity-building and research. Capacity-building is key to the success of AI for education and must be treated as a priority. Capacity-building programmes should be developed for educators, education policymakers and researchers as well as management of educational institutions, officials of ministries of education, and business representatives. As for research, more attention should be paid to such issues as AI ethics, data privacy and security, divide and disparities in AI development, human rights, and gender equality. School-wide pilot tests are called for to scale up research-informed, evidence-based practices. AI tools should not be put to large scale or high stakes use without first going through rigorous iterative tests and evaluations. Research evidence also informs resource development and teacher capacity-building. Last but not least, there should be more research about AI for real life education settings, focusing on pedagogy or administrative processes over the technology itself to build solid evidence bases.

Other major aspects of Theme 4 include equity and inclusion, investment in infrastructure, cooperation and partnerships, and human agency. Equity and inclusion should be "the guiding principles for the development and application of innovative AI technologies in education" (UNESCO, 2022b, p. 38) and core values for the design of AI policies to ensure equitable and inclusive use of AI for education. Equity and inclusion must be embodied throughout the life cycle of any AI application. Further, AI solutions must be "low cost and run on widely available platforms/devices" (OECD, 2021, p. 32). As for investment, measures proposed include identifying different sources of funding, building multi-stakeholder partnerships and mobilizing resources, adopting/revising and funding "whole-of-government strategies on AI" (UNESCO, 2023, p. 19), and making "a coordinated effort across all education levels and all policy areas" (OECD-Education International, 2023, p. 5). Digital learning infrastructures should be constructed and made available to all in and outside of educational institutions.

On the other hand, “issues such as ethics, fairness, accountability, privacy, security, inclusion, accessibility, equity, transparency, awareness, sustainability and human right” (UNESCO, 2019b, p. 46) require global and local cooperation. Of particular importance are public-private partnerships that can have significant impact on the progress of AI for education. Multi-stakeholder co-creation models should be encouraged too whereby educators are involved in defining and developing AI products so that AI solutions developed are based on actual teaching and learning needs and uses rather than on technological affordances.

Furthermore, “the development of AI should be human-controlled and centered on people” (UNESCO, 2019a, p. 4) instead of displacing human teachers. In other words, investment in human intelligence should remain preferable to the pursuit of automation with machine intelligence while “learners’ and teachers’ wellbeing and mental health” should continue to be prioritized (OECD-Education International, 2023, p. 9). Important decision-making should be in the hands of humans rather than automated by AI, especially in high-stakes events.

Finally, OECD (2021) proposes cost-benefit analysis. Cost-benefit analysis should become a fundamental departure point for the design and adoption of AI solutions for education. Unless the benefits far outweigh the costs, there is no guarantee of equitable and inclusive accessibility. It is noteworthy that benefits and costs should not be evaluated only in pecuniary terms.

### Discussion: A political discourse analysis

The schema of practical argument proposed for political discourse analysis by Fairclough and Fairclough (2012) is identified in the above thematic narratives. This schema is composed of a Value premise, a Goal premise, a Circumstantial premise, a Means–Goal premise and a Claim (or conclusion). The Circumstantial premise refers to the status quo of education and AI for education together with existing problems to be addressed (Themes 1 and 3). The Goal premise construes the imagined educational futures (Theme 2) in response to the Circumstantial premise and in accordance with the Value premise, namely the agent’s (UNESCO and OECD) values and concerns. The Means–Goal premise is conditional in nature, meaning that certain actions (Theme 4), if taken, will or may presumably take us from the current imperfect state of affairs (Themes 1 and 3) to the desirable one (Theme 2). The Claim therefore justifies the use of AI for education (see Figure 8).

To put it specifically, the necessity of AI-driven educational transformation is composed of two threads of argument: skills development need requires training AI talents while affordances for transforming education accelerate the delivery of SDGs, in particular SGD4. The first thread makes sense in that the demand for AI-related skills development is a reality and we must train AI professionals to meet the need. The second thread implies that AI can fix the outmoded or dysfunctional education system itself, namely its mechanism of operation and means of delivery so that it can resolve barriers to achieving SGD4. This begs the

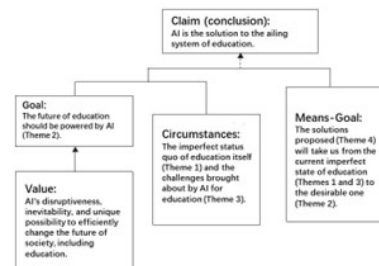


Figure 8: The schema of practical argument for political discourse analysis.

questions: what problems does the existing education system have? Which existing problems can AI fix? Is there any other solution to these problems which is as effective as AI, if not better, in terms of both quality and cost? What are the barriers to delivering SGD4? Can they be overcome by non-AI-mediated education or is AI-mediated education the best option?

The problems of education are unspoken but taken for granted and the necessity of an AI fix is naturalized through the discourse of UNESCO and OECD. This is a process which paves the “royal road to common sense” (Fairclough, 1989, p. 92), that is, turning into common sense “AI’s disruptiveness, inevitability, and unique possibility to efficiently change the future of education and work, as well as society as a whole” (Linderoth et al., 2024, p.7; also see Uleanya & Prinsloo, 2024) by ruling out the imperative of scrutiny and consequently legitimizing the implementation of AI for education. This “common sense” is also identified in the propagation of Tech Giants (Marone & Heinsfeld, 2023) and national AI strategies of key players in the field (Bareis & Katzenbach, 2022).

Similar to Theme 1, Theme 2, which depicts the imagined educational futures enabled by AI, also has two threads. The first thread, AI curricula, responds to Theme 1 by arguing that AI knowledge and skills should be introduced into the school curriculum to prepare students for an AI-enabled society, which, in our eyes, is the most effective solution. The second thread comprises seven subthemes addressing assumed problems. However, these AI affordances have adverse implications. Therefore, Theme 3 details the risks, dangers, and issues associated with these affordances, which echo or are echoed by relevant research (Bond et al., 2024; Williamson et al., 2024; Yan et al., 2024). Compared to the claimed benefits, the challenges are more numerous and detailed, posing significant threats to the feasibility, effectiveness, and sustainability of AI-mediated education. Unless these challenges are adequately addressed, AI-mediated education is not justified (Xiao, 2023, 2024).

Theme 4 delineates solutions to the challenges identified. Some issues from Theme 3, like equity and inclusion and human agency, are elevated as subthemes of their own in Theme 4. Capacity-building is expanded to include all stakeholders and a new theme of global and local cooperation and partnerships is added. These changes in

focus and orientation reflect the values of UNESCO and OECD (Bacchi, 2009; Luo, 2024). However, many challenges remain unresolvable in the short term, and some solutions may be theoretical rather than practical. For example, the private sector's prioritization of self-interest over public good conflicts with proposed solutions (Teräs et al., 2020). Investment demand is another issue; even in the U.S., many still lack access to reliable technology (U.S. Department of Education, Office of Educational Technology, 2024), making it unrealistic for poorer countries to prioritize AI investment despite the need for accessible, stable infrastructure (Hintz et al., 2019). Finally, cost-efficiency, a key factor affecting the feasibility and sustainability of AI solutions (Xiao, 2024), is understated and inadequately addressed, with recommendations limited to cost-benefit analyses.

No one would question the need for AI curricula because students need to learn AI knowledge and skills. However, AIED, that is, using AI to improve pedagogical and administrative processes seems to be problematic.

The AI-enabled educational futures imagined by UNESCO and OECD are in a sense Harold Garfinkel's common sense world of everyday life "which is built entirely upon assumptions and expectations" which "are implicit, backgrounded, taken for granted, not things that people are consciously aware of, rarely explicitly formulated or examined or questioned" (Fairclough, 1989, p. 77). This imagined prospect is uncertain, unstable, and unreliable in that the benefits of AIED are mostly assumptions and expectations rather than facts or evidence-based possibilities.

To do justice to UNESCO and OECD, they do not promote AI's "alleged ability to positively transform teaching and learning" to the extent that "AI's potentially negative impacts on education" are understated or even ignored, as is commonly found in other types of discourses according to Williamson et al. (2024, p. 3). Instead, they spell out the challenges, both already existing and lying ahead, rather than in sweeping statements as they do to benefits. Furthermore, the majority of challenges seem unresolvable in the near term, not to mention that they outnumber the benefits. Just as Stefania Giannini (2023), Assistant Director-General for Education UNESCO, aptly observes, although we have yet "to come to terms with the sweeping social and educational implications" (p. 1) of the revolutions triggered by earlier educational technologies, we have to face a bigger one called "the AI revolution", "which may make the others look minor by comparison" (p. 2).

Nevertheless, even against this backdrop, the keynote of their narratives is that AI-enabled education is our desirable future. The seemingly "objective" narration is embedded with technological optimism (Selwyn, 2011). The naturalization of this narration will lead to what Bourdieu (1977) described as "recognition of legitimacy through misrecognition of arbitrariness" (p. 168) and "control both the actions of members of a society and their interpretation of the actions of others" (Fairclough, 1989, p. 77).

## **Implications: Ramifications on the ecology of education and beyond**

Suffice to say, it is too early to come to the conclusion that AI is the best solution to fixing the "outmoded" or "dysfunctional" pedagogical and administrative practices. Nevertheless, even if AI-mediated education does not become the norm, the assumptions and expectations embedded in the discourse of UNESCO and OECD, once naturalized, will have adverse impacts on the ecology of education and beyond according to CDA theory (Fairclough, 2013).

First, AI-mediated education will redefine humanity. It will escalate the learnification of education and at best fulfil only one of the three functions of education, namely qualification (Biesta, 2009) but ignore the other two - socialization and subjectification (Blikstein & Blikstein, 2023). Education is about teaching students how to be a human being rather than merely about facts and skills. It "should not mold the mind according to a prefabricated architectural plan; it should rather liberate the mind" (UCLACommStudies, 2014) so that it will be "an unpredictable and exciting adventure in human enlightenment" (Ellul, 1964, p. 349, cited in Watters, 2021; Rudolph et al., 2023a). However, AI-mediated education is likely "to reduce learning to a set of canned and standardized procedures that reduce the student agency" rather than "to enhance human thinking and augment the learning process" (Seo et al., 2021, p. 17), hence fundamentally redefining humanity.

Second, AI-mediated education tends to be "a hollow, simulated, unnatural, and artificial education" (Popenici, 2023a, p. 133), dehumanizing an enterprise which should be nourished by humanity. The rhetoric of empowerment is in essence to disempower educators and students who may finally be "unable to exercise judgment or even to recognize a problem beyond the purview of the automated system" (Perrotta, 2023, p. 190) despite the call for adopting a human-centered approach and exercising human agency (Marone & Heinsfeld, 2023). Emotionally charged, education is more like an art and craft; inherently rational, AI is a science. Therefore, even the most trivial routine administrative work and classroom activities such as roll call are social and relational interactions rather than purely procedural in nature (Popenici, 2023a; Selwyn, 2021; Wagener-Böck et al., 2023).

Third, AI-mediated education may contribute to the de-professionalization of education (Holmes & Tuomi, 2022; Selwyn et al., 2023), which is definitely not a future of education the human society aspires to. The whole process of education, from design and delivery/implementation to assessment, should be led by professionals with specialist expertise in education. Take personalization. The way human educators personalize their teaching is fundamentally different from the way AI personalizes learning. A human educator's personalization varies according to the students' idiosyncrasies while AI cannot because its personalization techniques such as pattern recognition and correlational analysis embody a mechanical, inductivist epistemology, hence identifying patterns in the same and standardized ways and ignoring students' cultures and contexts (Williamson et

al., 2023). Patterns of typicality cannot cater for idiosyncrasies, not to mention that human educators can take the initiative to adapt their teaching for individual students and even cater for students' emotional, psychological and social needs while AI personalization needs to be activated and cannot extend beyond content learning (Xiao, 2024).

Fourth, AI-mediated education will amplify neoliberal values such as efficiency, performance culture, instrumentality, standardization, consumer/student choice, and ease in achieving outcomes which can be quantified and "objectively" measured. However, only some aspects of the qualification function of education can be measured in quantitative terms. On the other hand, it tends to do more harm than good if we attempt to measure and standardize the functions of socialization and subjectification which are the result of the interplay between "cultural, psychological, physical, environmental, developmental, and sociological variables", among other things (Popenici, 2023a, p. 37). Neoliberalism has already shaped national strategies for technology-enhanced education (Munro, 2018) and consequently the landscape of higher education (Andrew, 2024). AI-mediated education will reinforce this tendency.

Fifth, technology-driven or technology-led reform in education which is already becoming a trend will finally be further entrenched. Nowadays, educational reform has become a race for new technologies. Each new generation of technology ignites a new craze for educational reform. It seems that all educational problems have a technological fix. Following this logic, what people are doing is to reform education to ensure a particular new technology will be used. This is using technology in education for technology's sake. However, if we want to transform education for the better, we must first of all find out what problems need fixing in education in a particular sociocultural context and whether these problems cannot be fixed through human intervention. If these problems cannot be solved by human educators, which technology has the affordances to fix them? If there is more than one technology which can be used to fix these problems, which one is more effective, more affordable and more accessible? If these problems can be fixed both by human educators and technology, which intervention, human or technological, is more effective, more affordable and more accessible? In other words, any reform should center around education itself rather than fitting education around technology.

Sixth, under the influence of global agencies such as UNESCO and OECD, HEIs may feel increasing pressure to align themselves with policy frameworks that deem AI both inevitable and beneficial. Adopting these agendas can redefine institutional priorities, steering research, curricula, and resource allocation toward AI-mediated solutions. While such alignment might attract funding and global recognition, it risks overshadowing broader academic objectives and local educational needs. Over time, this focus can commodify knowledge production—privileging market-driven outputs and standardized AI metrics—while marginalizing intellectual diversity, eroding academic autonomy, and weakening the capacity of higher education to address complex social, cultural, and ethical concerns outside the narrow scope of AI-validated practices.

## Concluding remarks

UNESCO and OECD advocate the promotion of AI for education. The logic behind this discourse is the taken-for-granted "AI's disruptiveness, inevitability, and unique possibility to efficiently change the future of education and work, as well as society as a whole" (Linderoth et al., 2024, p. 7). These affordances of AI may apply to education when it comes to implementing AI curricula, training AI professionals, and preparing students for skills essential to jobs and life in an AI-enabled world.

Nevertheless, we have yet to see conclusive evidence that these affordances equally apply to pedagogical and administrative processes, namely AIED. Even UNESCO and OECD admit that there are enormous uncertainties and challenges to be addressed before their imagined AI-enabled educational futures can come true. AI may disrupt educational processes but not necessarily always for the better or the common good. Hence, its inevitability is open to question. Instead of challenging the justification of the wholesale adoption of AIED, the seemingly balanced discourse of UNESCO and OECD accepts and indoctrinates this inevitability, encourages the acceleration of AIED, and naturalizes AIED. This is not the scientific stance that we expect from leading global agencies, especially UN's specialized agency for education – UNESCO.

Given the powerful influence of UNESCO and OECD on shaping the global ecology of education, that is, as "futurecraft" (Uleanya & Prinsloo, 2024, p. 2), they should take a relatively "conservative" or cautious approach to new technology for education. Put specifically, they should not push educators and educational institutions to accommodate AI applications with so many risks and challenges unsolved and add fuel to the rampant hype surrounding AI (Campolo & Crawford, 2020). Of course, they are not supposed to call for a pause either, as Williamson et al. (2024) do. Their biggest contribution is to present the pros and cons of AI for education, maintaining their neutrality rather than favoring the pros over the cons or vice versa. As educators, we should guard against what Teräs et al. (2023) call "a discursive closure" emerging as a result of the naturalization of AI discourse by either global agencies or national governments so that "the ways in which we can think, discuss, imagine and impact digital futures" are not limited (p. 183).

Consequently, to ensure that the discourse around AI in education remains balanced and open-ended, we must remain vigilant and critical of the narratives promoted by influential global agencies. The future of education depends on our ability to question, adapt and thoughtfully integrate technology without succumbing to unexamined inevitabilities or unwarranted optimism. By adopting this cautious approach, we can better navigate the complexities of AI in education. Such an approach will also encourage a more thoughtful and inclusive discourse that prioritizes the common good over the lure of rapid technological progress. As we move forward, perhaps we should ask ourselves this question: How can we harness the potential of AI for education while preserving the human values and ethical principles that underpin our educational practices?

Finally, it should be pointed out that the UNESCO and OECD publications critiqued in this study aim at education in general rather than with an exclusive focus on higher education. Nevertheless, given our affiliation background as higher education researchers and practitioners and the scale of AI adoption in colleges and universities, the implications of the discourse of UNESCO and OECD discussed above, though also intended mostly for education in general, tend to be, all in all, more relevant to higher education.

## References

Andrew, M. B. (2024). 'Just get them over the line': Neoliberalism and the execution of 'excellence'. *Journal of Applied Learning and Teaching*, 27(1), 182-192. <https://doi.org/10.37074/jalt.2024.7.1.25>

Bacchi, C. (2009). *Analysing policy: What's the problem represented to be?*. Pearson Education.

Bareis, J., & Katzenbach, C. (2022). Talking AI into being: The narratives and imaginaries of national AI strategies and their performative politics. *Science, Technology, & Human Values*, 47(5), 855-881. <https://doi.org/10.1177/01622439211030007>

Bearman, M., Ryan, J., & Ajjawi, R. (2023). Discourses of artificial intelligence in higher education: A critical literature review. *Higher Education*, 86(2), 369-385. <https://doi.org/10.1007/s10734-022-00937-2>

Berelson, B. (1952). *Content analysis in communication research*. Free Press.

Biesta, G. (2009). Good education in an age of measurement: On the need to reconnect with the question of purpose in education. *Educational Assessment, Evaluation and Accountability*, 21(1), 33-46. <https://doi.org/10.1007/s11092-008-9064-9>

Blikstein, P., & Blikstein, I. (2023). Do educational technologies have politics? A semiotic analysis of the discourse of educational technologies and Artificial Intelligence in education. In M. Ito, R. Cross, K. Dinak & C. Odgers (Eds.). *Algorithmic rights and protections for children* (pp. 233-264). The MIT Press.

Bond, M., Khosravi, H., De Laat, M., Bergdahl, N., Negrea, V., Oxley, E., Pham, P., Chong, S. W., & Siemens, G. (2024). A meta systematic review of artificial intelligence in higher education: A call for increased ethics, collaboration, and rigour. *International Journal of Educational Technology in Higher Education*, 21(1). <https://doi.org/10.1186/s41239-023-00436-z>

Bourdieu, P. (1977). *Outline of a theory of practice*. Cambridge University Press.

Bozkurt, A., Xiao, J., Farrow, R., Bai, J. Y. H., Nerantzi, C., Moore, S., Dron, J., Stracke, C. M., Singh, L., Crompton, H., Koutropoulos, A., Terentev, E., Pazurek, A., Nichols, M., Sidorkin, A. M., Costello, E., Watson, S., Mulligan, D., Honeychurch, S., ...Asino, T. I. (2024). The manifesto for teaching and learning

in a time of generative AI: A critical collective stance to better navigate the future. *Open Praxis*, 16(4), 487-513. <https://doi.org/10.55982/openpraxis.16.4.777>

Bozkurt, A., Xiao, J., Lambert, S., Pazurek, A., Crompton, H., Koseoglu, S., Farrow, R., Bond, M., Nerantzi, C., Honeychurch, S., Bali, M., Dron, J., Mir, K., Stewart, B., Costello, E., Mason, J., Stracke, C. M., Romero-Hall, E., ... Jandrić, P. (2023). Speculative futures on ChatGPT and generative artificial intelligence (AI): A collective reflection from the educational landscape. *Asian Journal of Distance Education*, 18(1), 53-130. <https://doi.org/10.5281/zenodo.7636568>

Campolo, A., & Crawford, K. (2020). Enchanted determinism. *Engaging Science, Technology and Society*, 6(1), 1-19. <https://doi.org/10.17351/ests2020.277>

Clark, D. (2024). The construction of legitimacy: A critical discourse analysis of the rhetoric of educational technology in post-pandemic higher education. *Learning, Media and Technology*, 49(3), 414-427. <https://doi.org/10.1080/17439884.2022.2163500>

du Boulay, B. (2023). Artificial intelligence in education and ethics. In O. Zawacki-Richter & I. Jung (Eds.), *Handbook of open, distance and digital education* (pp. 93-108). Springer. [https://doi.org/10.1007/978-981-19-2080-6\\_6](https://doi.org/10.1007/978-981-19-2080-6_6)

Eynon, R., & Young, E. (2021). Methodology, legend, and rhetoric: The constructions of AI by academia, industry, and policy groups for lifelong learning. *Science, Technology, & Human Values*, 46(1), 166-191. <https://doi.org/10.1177/0162243920906475>

Fairclough, N. (1989). *Language and power*. Longman.

Fairclough, N. (1992). *Discourse and social change*. Polity Press.

Fairclough, N. (2003). *Analysing discourse: Textual analysis for social research*. Routledge.

Fairclough, N. (2013). Critical discourse analysis and critical policy studies. *Critical Policy Studies*, 7(2), 177-197. <https://dx.doi.org/10.1080/19460171.2013.798239>

Fairclough, I., & Fairclough, N. (2012). *Political discourse analysis: A method for advanced students*. Routledge.

Giannini, S. (2023). *Reflections on generative AI and the future of education*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000385877>

Glais, N. (2023). Challenges of AI in education: Analysis of UNESCO reports 2019-2021. In J. L. de Colinet (Ed.), *Carnets de Laboratoire RL-2 Bonheurs* (pp.117-129). EDBH. <https://hal.science/hal-04401512v2>

Gough, D., Oliver, S., & Thomas, J. (2012). *An introduction to systematic reviews*. Sage.

Hasa, K. (2023). *Examining the OECD's perspective on AI in education policy: A critical analysis of language and*

- structure in the 'AI and the future of skills' (AIFS) document and its implications for the higher education (T). University of British Columbia <https://open.library.ubc.ca/collections/ubctheses/24/items/1.0435494>
- Hintz, A., Dencik, L., & Wahl-Jorgensen, K. (2019). *Digital citizenship in a datafied society*. Polity Press.
- Holmes, W., & Tuomi, I. (2022). State of the art and practice in AI in education. *European Journal of Education, 57*(4), 542–570. <https://doi.org/10.1111/ejed.12533>
- Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>
- Lakoff, G., & Johnson, M. (1980). *Metaphors we lived by*. The University of Chicago Press.
- Linderoth, C., Hultén, M., & Stenliden, L. (2024). Competing visions of artificial intelligence in education—A heuristic analysis on sociotechnical imaginaries and problematizations in policy guidelines. *Policy Futures in Education, 22*(8), 1662–1678. <https://doi.org/10.1177/14782103241228900>
- Lingard, B., Sellar, S., & Baroutsis, A. (2015). Researching the habitus of global policy actors in education. *Cambridge Journal of Education, 45*(1), 25–42. <https://doi.org/10.1080/0305764X.2014.988686>
- Luo, J. (2024). A critical review of GenAI policies in higher education assessment: A call to reconsider the “originality” of students’ work. *Assessment & Evaluation in Higher Education*. <https://doi.org/10.1080/02602938.2024.2309963>
- Marche, S. (2022, December 6). *The college essay is dead*. <https://www.theatlantic.com/technology/archive/2022/12/chatgpt-ai-writing-college-student-essays/672371/>
- Markelius, A., Wright, C., Kuiper, J., Delille, N., & Kuo, Y. -T. (2024). The mechanisms of AI hype and its planetary and social costs. *AI Ethics, 4*(3), 727–742. <https://doi.org/10.1007/s43681-024-00461-2>
- Marone, V., & Heinsfeld, B. D. (2023). “Everyone pursuing their dreams”: Google’s and Microsoft’s discourse on educational technology. *Computers and Education Open, 4*, Article 100138. <https://doi.org/10.1016/j.caeo.2023.100138>
- Munro, M. (2018). The complicity of digital technologies in the marketization of UK higher education: Exploring the implications of a critical discourse analysis of thirteen national digital teaching and learning strategies. *International Journal of Educational Technology in Higher Education, 15* (11). <https://doi.org/10.1186/s41239-018-0093-2>
- OECD. (2021). *OECD digital education outlook 2021: Pushing the frontiers with artificial intelligence, blockchain and robots*. <https://doi.org/10.1787/589b283f-en>
- OECD. (2023a). *OECD digital education outlook 2023: Towards an effective digital education ecosystem*. <https://doi.org/10.1787/c74f03de-en>
- OECD. (2023b). *Is education losing the race with technology?: AI's progress in maths and reading, educational research and innovation*. <https://doi.org/10.1787/73105f99-en>
- OECD-Education International. (2023). *Opportunities, guidelines and guardrails on effective and equitable use of AI in education*. <https://www.oecd.org/education/cei/Opportunities,%20guidelines%20and%20guardrails%20for%20effective%20and%20equitable%20use%20of%20AI%20in%20education.pdf>
- Perrotta, C. (2023). Advancing data justice in education: Some suggestions towards a deontological framework. *Learning, Media and Technology, 48*(2), 187–199. <https://doi.org/10.1080/17439884.2022.2156536>
- Popenici, S. (2023a). *Artificial intelligence and learning futures: Critical narratives of technology and imagination in higher education*. Routledge.
- Popenici, S. (2023b). The critique of AI as a foundation for judicious use in higher education. *Journal of Applied Learning and Teaching, 6*(2), 378–384. <https://doi.org/10.37074/jalt.2023.6.2.4>
- Popenici, S., Rudolph, J., Tan, S., & Tan, S. (2023). A critical perspective on generative AI and learning futures. An interview with Stefan Popenici. *Journal of Applied Learning and Teaching, 6*(2), 311–331. <https://doi.org/10.37074/jalt.2023.6.2.5>
- Porayska-Pomsta, K. (2023). A manifesto for a pro-actively responsible AI in education. *International Journal of Artificial Intelligence in Education, 34*(1), 73–83. <https://doi.org/10.1007/s40593-023-00346-1>
- Rudolph, J., Tan, S., & Aspland, T. (2023a). Editorial 6(2): Personal digital assistant or job killer? Generative AI and the teaching profession in higher education. *Journal of Applied Learning and Teaching, 6*(2), 7–16. <https://doi.org/10.37074/jalt.2023.6.2.1>
- Rudolph, J., Tan, S., & Tan, S. (2023b). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?. *Journal of Applied Learning and Teaching, 6*(1), 342–363. <https://doi.org/10.37074/jalt.2023.6.1.9>
- Selwyn, N. (2011). Editorial: In praise of pessimism—the need for negativity in educational technology. *British Journal of Educational Technology, 2*(5), 713–718. <https://doi.org/10.1111/j.1467-8535.2011.01215.x>
- Selwyn, N. (2021). Less work for teacher? The ironies of automated decision-making in schools. In S. Pink, M. Berg, D. Lupton & M. Ruckenstein (Eds.), *Everyday automation: Experiencing and anticipating emerging technologies* (pp. 73–86). Routledge.
- Selwyn, N., Hillman, T., Bergviken Rensfeldt, A., & Perrotta, C. (2023). Digital technologies and the automation of education — key questions and concerns. *Postdigital Science and Education, 5*(1), 15–24. <https://doi.org/10.1007/s42438-021-00263-3>

- Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner–instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, 18(1). <https://doi.org/10.1186/s41239-021-00292-9>
- Srivastava, A., & Thomson, S. B. (2009). Framework analysis: A qualitative methodology for applied policy research. *Journal of Administration and Governance (JOAAG)*, 4(2), 72–79. [https://www.researchgate.net/publication/267678963\\_Framework\\_Analysis\\_A\\_Qualitative\\_Methodology\\_for\\_Applied\\_Policy\\_Research](https://www.researchgate.net/publication/267678963_Framework_Analysis_A_Qualitative_Methodology_for_Applied_Policy_Research)
- Teräs, M., Suoranta, J., Teräs, H., & Curcher, M. (2020). Post-Covid-19 education and education technology 'solutionism': A seller's market. *Postdigital Science and Education*, 2(3), 863–878. <https://doi.org/10.1007/s42438-020-00164-x>
- Teräs, M., Teräs, H., & Suoranta, J. (2023). From official document utopias to a collective utopian imagination. In A. Weich & F. Macgilchrist (Eds.), *Postdigital participation in education: How contemporary media constellations shape participation* (pp. 177–198). Palgrave Macmillan.
- UCLACommStudies. (2014, March 18). *Angela Davis speaking at UCLA 10/8/1969* [Video]. YouTube. <https://www.youtube.com/watch?v=AxCqTEMgZUc>
- Uleanya, C., & Prinsloo, P. (2024). Mapping the imaginary of information communication technologies (ICTs) in education: The case of Botswana. *Learning, Media and Technology*, 1–19. <https://doi.org/10.1080/17439884.2024.2306553>
- UNESCO. (2019a). *Beijing consensus on artificial intelligence and education*. <https://unesdoc.unesco.org/ark:/48223/pf0000368303>
- UNESCO. (2019b). *Artificial intelligence for sustainable development: Synthesis report*. <https://unesdoc.unesco.org/ark:/48223/pf0000370308>
- UNESCO. (2019c). *Artificial Intelligence in education: Challenges and opportunities for sustainable development*. <https://unesdoc.unesco.org/ark:/48223/pf0000366994>
- UNESCO. (2019d). *International conference on artificial intelligence and education, planning education in the AI era: Lead the leap: Final report*. <https://unesdoc.unesco.org/ark:/48223/pf0000370967>
- UNESCO. (2019e). *Preliminary study on the ethics of artificial intelligence*. <https://unesdoc.unesco.org/ark:/48223/pf0000367823?posInSet=1&queryId=e3db03b9-50ce-4ab1-a4d6-718cb92179c1>
- UNESCO. (2019f). *Artificial intelligence in education, compendium of promising initiatives: Mobile learning week 2019*. <https://unesdoc.unesco.org/ark:/48223/pf0000370307>
- UNESCO. (2020). *Artificial intelligence and inclusion, compendium of promising initiatives: Mobile learning week 2020*. <https://unesdoc.unesco.org/ark:/48223/pf0000374644>
- UNESCO. (2022a). *K-12 AI curricula: A mapping of government-endorsed AI curricula*. <https://unesdoc.unesco.org/ark:/48223/pf0000380602>
- UNESCO. (2022b). *International forum on AI and education: Ensuring AI as a common good to transform education*. <https://unesdoc.unesco.org/ark:/48223/pf0000381226>
- UNESCO. (2022c). *Minding the data - Protecting learners' privacy and security*. <https://unesdoc.unesco.org/ark:/48223/pf0000381494?posInSet=1&queryId=ee54b78d-f6f5-4e8d-93fd-3bc6155583cb>
- UNESCO. (2022d). *Re-imagining the future of education management information systems: Ways forward to transform education data systems to support inclusive, quality learning for all*. <https://unesdoc.unesco.org/ark:/48223/pf0000381618?posInSet=1&queryId=39d23da7-c6b8-49dd-b9ad-c24d3c7caefb>
- UNESCO. (2023). *Guidance for generative AI in education and research*. <https://unesdoc.unesco.org/ark:/48223/pf0000386693>
- UNESCO. (2024). *The education sector at a glance*. <https://www.unesco.org/en/education/about?hub=343>
- UNESCO IITE & SOU. (2022). *Analytical report on the use of advanced ICT/AI for digital transformation of education*. [https://iite.unesco.org/wp-content/uploads/2022/07/Analytical-Report\\_Ed\\_AI.pdf](https://iite.unesco.org/wp-content/uploads/2022/07/Analytical-Report_Ed_AI.pdf)
- U.S. Department of Education, Office of Educational Technology. (2024). *National educational technology plan*. Washington, DC.
- Wagener-Böck, N., Macgilchrist, F., Rabenstein, K., & Bock, A. (2023). From automation to symmation: Ethnographic perspectives on what happens in front of the screen. *Postdigital Science and Education*, 5(1), 136–151. <https://doi.org/10.1007/s42438-022-00350-z>
- Watters, A. (2021). *Teaching machines: The history of personalized learning*. The MIT Press.
- Williamson, B. (2024, February 22). *AI in education is a public problem*. <https://codeactsineducation.wordpress.com/2024/02/22/ai-in-education-is-a-public-problem/>
- Williamson, B., Eynon, R., Knox, J., & Davies, H. (2023). Chapter 25: Critical perspectives on AI in education: Political economy, discrimination, commercialization, governance and ethics. In B. du Boulay, A. Mitrovic, & K. Yace (Eds.), *Handbook of Artificial Intelligence in education* (pp. 553–570). Edward Elgar.
- Williamson, B., Molnar, A., & Boninger, F. (2024). *Time for a pause: Without effective public oversight, AI in schools will do more harm than good*. National Education Policy Center. <http://nepc.colorado.edu/publication/ai>

Xiao, J. (2023). Critiquing sustainable openness in technology-based education from the perspective of cost-effectiveness and accessibility. *Open Praxis*, 15(3), 244–254. <https://doi.org/10.55982/openpraxis.15.3.569>

Xiao, J. (2024). Will artificial intelligence enable open universities to regain their past glory in the 21st century? *Open Praxis*, 16(1), 11–23. <https://doi.org/10.55982/openpraxis.16.1.618>

Yan, L., Sha, L., Zhao, L., Li, Y., Martinez-Maldonado, R., Chen, G., Li, X., Jin, Y., & Gašević, D. (2024). Practical and ethical challenges of large language models in education: A systematic literature review. *British Journal of Educational Technology*, 55(1), 90–112. <https://doi.org/10.1111/bjet.13370>

Zawacki-Richter, O., Bai, J. Y. H., Lee, K., Slagter van Tryon, P. J., & Prinsloo, P. (2024). New advances in artificial intelligence applications in higher education?. *International Journal of Educational Technology in Higher Education*, 21, 32. <https://doi.org/10.1186/s41239-024-00464-3>

Copyright: © 2025. Junhong Xiao and Aras Bozkurt. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.





Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Appraising higher education assessment validity: Development of the PANDORA GenAI Susceptibility Rubric

---

Peter Bannister <sup>A</sup>	A	<i>Researcher, Universidad Internacional de La Rioja, Spain</i>
Alexandra Santamaría Urbietta <sup>B</sup>	B	<i>Professor, Universidad Internacional de La Rioja, Spain</i>
Nuria Brufau Alvira <sup>C</sup>	C	<i>Lecturer, Universidad Internacional de La Rioja, Spain</i>

---

### Keywords

---

Academic integrity;  
assessment design;  
generative ai;  
higher education;  
susceptibility rubric.

---

### Abstract

---

This paper presents the development and application of the PANDORA GenAI Susceptibility Rubric, a novel tool designed to assess the susceptibility of higher education assessments to the undeclared use of generative artificial intelligence (GenAI) tools. In response to growing concerns about academic integrity and the rising sophistication of GenAI technologies, the rubric provides educators with a structured framework to critically evaluate the validity of their assessments across key criteria, including collaborative authorship, intellectual task complexity, and the opportunity for creativity. Through a mixed-methods design, the rubric was refined to include expert-informed modifications and validated through end-user application across various arts and humanities courses. Results highlight how assessment design can either mitigate or exacerbate GenAI susceptibility, revealing that tasks requiring genuine collaboration, creative thinking, and process-oriented evaluation offer greater resistance to AI manipulation. The rubric also emphasises balancing detailed guidance with student autonomy to avoid facilitating GenAI prompt formulation. This study contributes to the field by offering a practical instrument that promotes more robust, ethically sound, and future-proofed assessment practices. It serves as a critical response to the pressing challenges posed by GenAI in higher education and informs ongoing discourse on academic integrity.

### Correspondence

---

[peter.bannister@unir.net](mailto:peter.bannister@unir.net) <sup>A</sup>

---

### Article Info

Received 16 October 2024  
Received in revised form 15 January 2025  
Accepted 17 January 2025  
Available online 23 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.20>

[PDF Link to Rubrics](#)

## Introduction

The discourse surrounding the disruptive impacts of human interaction with progressively capable Generative Artificial Intelligence (GenAI) technologies in higher education (HE) has broadly centred around the challenges these pose to academic integrity and, to a lesser extent, affordances for teaching and learning (Bond et al.; 2024; Bozkurt; 2023; Law, 2024). Initial muted framings of the duality of GenAI as a “bullshit spewer” and harbinger of traditional assessment approach demise (Rudolph et al., 2023, p. 342) have gained traction. Nonetheless, other analogous comparisons to former technological innovations, such as the calculator, seem to have come up short regarding the overarching complexity which these technologies introduce (Lodge et al., 2023) in the little over two years since the release of OpenAI’s ChatGPT 3.5 in November 2022. Their subsequent, more capable iterations have produced additional waves of impact. These have cemented GenAI globally as a highly complex matter which continues to defy initial reductionist underestimations of the technology’s potential (Möck, 2022).

In parallel, scholars have come together to document differing perspectives on the perils and promises. A swift Google Scholar search reveals almost 6000 publications address GenAI challenges and opportunities, between 2022 and the time of writing. Whilst the remit of the present paper resides in a more specific focus, it is worthy to note that much of this work still refers to this particular phenomenon as ‘the impact of GenAI in HE’ in the singular, as if each discipline of the academy were a singular, homogenous, monolithic entity. Here, the authors prefer to refer to ‘the *impacts* of GenAI’ in *plural*. This is so, not solely as a testament to the rich diverse plurality of the sector itself but also considering that each novel germination of GenAI tools fundamentally changes the rules of the game and will continue to do so time and time again going forward (Bannister & Carver., 2024). The very nature of this multifaceted disruption to HE is pervasive not only to shining a light on longstanding inefficiencies in established assessment practice but also invites us to reconsider more profound epistemological, ontological, and axiological assumptions, and ultimately, the very purpose of HE itself (Kramm & McKenna, 2023).

As these complexities emerge, it becomes clear, however, that abstract considerations cannot overshadow the immediate practical challenges faced by educators on the ground, for instance, the practicalities of adapting assessment design. Further work needs to be undertaken to collate and critically examine domain-specific examples of good practice (e.g., Bannister et al., 2023). These ought to be robust enough to traverse the tensions of the quest for authenticity in assessments whilst deliberating on the “hauntological turn”, referring to the ways in which AI can act as “ghostly forces shaping knowledge in unseen ways, paradoxically omnipresent and absent” (Vallis, 2024, p. 4-5), in the operationalisation of synthetic simulations of student output produced by GenAI tools. Considering these multifaceted challenges, there is a pressing need for structured frameworks to guide educators through this complex terrain.

Perkins et al.’s (2024) Artificial Intelligence Assessment Scale (AIAS) offers an excellent starting point to this end which has been positively received in differing spheres of education globally. In contrast to many techno-teratological punitive approaches found elsewhere, in their constructive and ethical reframing of GenAI tool usage, the authors strive to strike a balance between pedagogical benefits and ethical concerns. The AIAS serves as a structured mechanism which supports educators in this novel and, at times, pernicious terrain that advocated for greater transparency and responsibility through the articulation of clear guidance for all key stakeholders, often found to be lacking in the assessment process (Bearman & Luckin, 2020; Nguyen et al., 2024). The gradual incrementation across the instrument is a poignant reminder that while GenAI can enhance certain aspects of assessment, its inclusion is not necessarily inevitable or compulsory. Ultimately, educators are encouragingly framed as agentive architects in the assessment design process, as opposed to reactive subjects of impervious technological change.

Further complexity can be found in praxis. Mounting empirical validation gives credence to nascent media speculation with even ChatGPT 3.5 having been found to have produced satisfactory performance in varying assessments across subject domains (Lo, 2023). More recent research consolidates this with a confirmation of a continued positive incremental trend following more potent iterations of these technologies which achieve parity with their human-equivalent test-takers across a broad spectrum of disciplines at differing educational levels (e.g., Newton & Xiromeriti, 2024). As GenAI demonstrates increasing proficiency in producing passable academic assessment outputs (Smolansky et al., 2023), the question of how to detect its undeclared use adds another layer of complexity to the assessment landscape. Be that as it may, calls for substantive assessment design reform and innovation are longstanding fixtures of extant literature, albeit thus far with highly limited permeation in praxis and policy (Boud & Falchikov, 2007; Morris et al., 2021; Sadler et al., 2022, amongst many others), even after the upheavals of the disruptive COVID-19 pandemic (Kaqinari, 2023). The essay, for instance, is the mainstay of many domains (Meylani, 2024). It is the traditional assessment genre par excellence, particularly in disciplines such as the Arts and Humanities (Zemits, 2017), the context in which this study is grounded. For some, an essay can be pedagogically beneficial as a focused act of intellectual exploration in which theoretical matters addressed in the learning process may be practically applied through the prism of critical thinking (West et al., 2019). Scholarly consensus, however, converges with dissentious standpoints which criticise surface learning strategies and formulaic responses employed (McGraw & Mason, 2021). Further criticisms encompass the passive reproduction of the ideas of others with no authentic critical discernment (Mirador, 2018), the potential for a lack of alignment with intended learning outcomes, future professional realities (Lalor et al., 2015), extraneous cognitive load and assessment anxiety (Teixeira et al., 2022), grading subjectivity (Bloxham et al., 2011), inconsistency (Lipnevich et al., 2020) and, bias and cultural disparities amongst increasingly international student cohorts (Melekhina & Levitan, 2015).

This genre is particularly susceptible to the undeclared use of GenAI tools for unfair advantage. This is so, as the tools are adept at generating content, written at a standard higher than that of some human learner-produced work (Herbold et al., 2023) in the form of coherent long-form text that fulfils surface-level requirements of often vague essay questions (Waltzer et al., 2024), notwithstanding exceptions of hallucination (Alkaissi & McFarlane, 2023). Egloff (2024) frames this as a tempting shortcut as opposed to the more cognitively demanding task of meaningfully engaging with the material. Furthermore, as Sharples (2022) remarks, if these technologies are mindlessly applied for the creation of the entire piece and lecturers subsequently use the same or similar tools for review, "nobody learns, nobody gains" (p. 1124). This admittedly dystopian vision would render the HE experiences as little more than a mechanically transactional exercise of credentialing devoid of meaningful intellectual growth. As such, students-as-consumers go through the motions and yet do not experience the personally transformative potential of a tertiary education first-hand (Ashwin, 2020). Ashwin et al. (2023), in their timely return to this matter, advocate for a vision of HE in which students engage in a dynamic relationship with knowledge framed as playing a crucial role in their future career prospects. On balance, owing to the imminent need to furnish students with future skills and graduate attributes for a professional world in which GenAI will progressively become more enmeshed (Ehlers & Eigbrecht, 2024; Pratschke, 2024), attempts to eradicate or implement punitive detection in assessment (Blackie, 2024) in the interim are a counterintuitive act of folly.

The thorny issue of detection in practice thus far, in both its human and technologically led facets, stands out as both ineffective and inadequate. Perhaps owing to the continued absence of an effective established protocol for educator AI-generated text decipherment (Kirmani, 2023), multiple studies attest to rates of limited educator success in weeding out authentic assessment artefacts of sole human authorship (Fleckenstein et al., 2024; Matthews & Volpe, 2023; Liu et al., 2023; amongst others). Despite cumulative scholarly evidence to the contrary, commercial enterprises persist in their claims regarding AI-generated text detection efficacy with limited scholarship diverging (Walters, 2023) from the consensus to the contrary (Baron, 2024; Chaka, 2024; Kumar & Mindzak, 2024; Weber-Wulff et al., 2023). Perkins et al. (2024) illustrate a compendium of adversarial techniques which users can use to manipulate GenAI outputs tending the probability of going under the radar of text classifiers is increased. The sensitivities of authorial linguistic traits under the text classifier microscope were also examined by Liang et al. (2023) who notably sounded the alarm regarding the inequitable susceptibility to false positives of work produced by authors who use English as an additional language. Deepening concerns here, existing GenAI academic integrity policies often fail to address the specific needs of this demographic, despite their substantial academic, cultural, and lucrative financial contributions in neoliberal HE models (Bannister et al., 2024b). These highly problematic issues in Higher Education Institution (HEI) response are illustrative of additional complexity at play, which thus far in practice seems to have largely failed to consider the wide diversity of students on campus and their bespoke characteristics and

needs, not all of which can be blamed on the technology itself. Rather, these matters expose the inadequacies of institutional responses that overlook the intricate interplay of human, cultural, and systemic factors in the engagement with GenAI.

Beyond the technical challenges of detection lies a more insidious issue: the uncritical acceptance and propagation of certain narratives surrounding GenAI in education. In line with Monett and Grigorescu (2024), the 'GenAI in education mythogenesis' in popular discourse and in scholarship speaks to an undiscerning acquiescence that ought to be challenged. For instance, the personalisation of learning and democratisation of access to knowledge are AI-generated tropes which, with their notably American English spelling, often adorn GenAI written academic discourse with little scrutiny, albeit with some exceptions (e.g., Tafazoli, 2024). And yet, they inadvertently mask the deeper inequalities they perpetuate, raising questions about whose knowledge is being privileged, whose learning paths are being pre-determined, and the new digital divide with the most potent technologies only accessible in exchange for payment which not all can afford. Further concern in scholarship also pertains to eyebrow-raising instances of publications which contain evidently apparent passages of text of GenAI chatbot responses as highlighted by Giray (2024). The issue here is not at all to do with the use of GenAI tools as a dialogic idea generator, text perfecter, or even research companion and/or co-creator (Tang et al., 2024). It is rather the unsettling dereliction of duty and undermining lack of rigour not only of the authors but of all those involved which make a mockery of the publication process. This sheds light on longstanding systemic issues that still need to be addressed in the publication process even today, in the so-called age of AI. These musings aim to broaden the scope of GenAI-empowered academic misconduct discourse to encompass a more comprehensive understanding of this complex phenomenon, which serves as a reminder to avoid the reductive fallacy of attributing the entirety of the issue solely to student behaviour.

In this spirit, amidst this maelstrom of challenges, in their seminal conceptual work, Dawson et al. (2024) address these emerging complexities through the proposal of a transformative paradigm shift in our approach to academic integrity concerns, which directly resonates with the broader issues articulated thus far. Rather than maintaining a narrow focus on cheating as a moralistic deviation, the authors argue for reframing the issue through the lens of assessment validity. They posit that the latter offers a more constructive and inclusive framework for understanding the educational consequences of GenAI usage. In linking validity to the fundamental purpose of HE, this reframing also aligns with the broader proposition that GenAI's impact on HE is not a monolithic phenomenon, but one that evolves with each technological iteration, thereby continually reshaping the parameters of academic integrity and assessment practices. Thus, the authors' call for a shift from moralisation to validity invites a critical reconsideration of both assessment design and implementation, and the very assumptions upon which our educational frameworks rest.

This bold proposition is a formidable undertaking, and it is precisely this call to action that has catalysed the development of this paper. It has come to fruition within the framework of *The PANDORA Project* spearheaded by the authors together with a team of scholars across Spain and the UK from 2023-2025 funded by Universidad Internacional de La Rioja (UNIR), Spain. This grassroots project has been conceptualised to analyse current assessment validity through the prism of AI-enabled academic misconduct in the Faculty of Arts and Humanities. Furthermore, it seeks to subsequently forge novel assessment innovations with and without AI integration and inform institutional guidelines which regulate the use of GenAI tools. While the authors do not purport to provide exhaustive solutions to either this or all the concerns detailed thus far, an initial step is taken here in this paper. Stemming from the first stage of the project, this paper documents the development of a novel evaluative tool for HEIs, grounded in the context of arts and humanities tertiary education, that seeks to measure the validity of assessments in the context of increasingly sophisticated GenAI tools.

## Literature

### **Ambiguity and institutional inertia in a global regulatory vacuum**

The HEI response to the complexities outlined has yielded limited and problematic guidance marked by critical silences (Luo, 2024), which fail to recognise the full repertoire of complexities of human-AI interaction in HE, as detailed previously, with many institutions internationally still struggling to establish definitive regulations (Dai et al., 2024; De Maio, 2024; McDonald et al., 2024; Sok & Heng, 2024). This enduring global regulatory vacuum, a concurrent sociotechnological phenomenon remains a point of contention, despite scholarly green shoots aimed at shaping effective and socially just policy development (e.g., Bannister et al., 2024a). Even UNESCO (2023), long regarded as a beacon for global educational policy and thought leadership, has been found to fall short with their *Guide to Generative AI in Education and Research* penned by Maio and Holmes in 2023. Whilst initially well-received, it has subsequently been criticised for vague recommendations that overlook the complex realities of diverse educational contexts and not providing detailed, actionable frameworks for implementation in different regions (Knight et al., 2023; Taylor, 2024). In this light, increased levels of educator technostress (Kohnke et al., 2024) are evidently comprehensible, although talk of a GenAI-fuelled crisis in HE (Song, 2024) might seemingly be dismissed as little more than a hyperbolic hissy fit prima facie (Leaver & Srdarov, 2023). However, on closer inspection, regulatory ambiguity and institutional inertia combined with GenAI-induced assessment validity erosion may indeed be indictive of a perfect storm in which the sector finds itself embroiled.

## HE quality assurance and GenAI

In this landscape, quality assurance reiterates itself as a fundamental component of HE. Back in her now somewhat dated literature review, Ryan (2015) highlighted the importance of encouraging the implementation of global initiatives in the future trends section. Now over a decade later, on the issue of GenAI, these have been deemed to be highly necessary (Rawas, 2023) but are often found somewhat lacking by educators (Bannister, 2024). Furthermore, there are two key ideas of relevance to the genesis of the present study. On the one hand, that quality as a concept may be framed in differing ways each with multifaceted interpretations and, on the other, one such framing may be the pursuit of quality as an agent for transformative continuous improvement. Although the notion of accountability, i.e. the goal of quality assurance, and continuous improvement, i.e. the aim of quality enhancement, are often conceived as two incongruous forces, they can also be viewed as complementary that together create a balanced approach to educational development (Condette, 2024). Moreover, as Asiyai (2020) highlights, innovation plays a pivotal role to this end, and perhaps now more than ever if the assessment validity challenges are to be addressed and may act as a catalyst which unlocks this aforementioned transformative power. The operationalisation of this premise can be achieved through the forward-thinking creation of dynamic new tools and frameworks which are both able to assess the status quo and inform future directions (Kaiser et al., 2022). Despite ongoing efforts, existing frameworks lack the structural depth necessary to address the associated complexities. For instance, Zaphir et al.'s (2024) MAGE Framework addresses GenAI vulnerability of assessments. However, the study's focus primarily resides on the correlation between the quality of GenAI responses and engineered prompts and does not fully address academic misconduct concerns or assessment redesign approaches based on comprehensive vulnerability criteria. That's where this study endeavours to offer a more robust, actionable instrument for assessment GenAI susceptibility diagnosis as a basis to inform educators on GenAI-aware assessment design going forward.

Conceptualising assessment validity and GenAI susceptibility Returning to assessment validity, this is a cornerstone concept in educational measurement which extends far beyond the rudimentary notion of an assessment measuring what it purports to measure (Dawson et al., 2024). In the context of HE, it encompasses the intricate interplay between the assessment design, its implementation, and its ability to authentically capture and evaluate the intended learning outcomes (Ajjawi et al., 2019). As articulated by Chappelle and Lee (2021), validity is not merely a property of the assessment itself, but rather an evaluative judgement of the degree to which empirical evidence and theoretical rationales support the adequacy and appropriateness of interpretations and actions based on test scores. It is crucial to also acknowledge that the challenges posed by GenAI to assessment validity are not unprecedented but rather represent an intensification of longstanding concerns (Farrelly & Baker, 2023). Previous threats to assessment validity, while perhaps less technologically sophisticated, have been and continue to be equally pressing. For instance,

plagiarism, in its many forms (Eaton, 2017), is an issue which persists with unwavering resilience despite diverse comprehensive efforts globally to tackle this (Tight, 2024). Moreover, the proliferation of contract cheating services and essay mills has long cast doubt on the integrity of traditional assessment methods (Ahsan et al., 2021), with quite frankly tragic consequences for those who fall victim (Pitt et al., 2020).

These issues, while mediated to a certain extent, failed to catalyse comprehensive reform in HE (Sweeny, 2023). However, it is only now, in the face of GenAI's unprecedented capabilities, that we observe a growing consensus across academic, administrative, and even corporate sectors on the urgent need to address these long-standing issues comprehensively (Perkins et al., 2024). This shift in perspective underscores the transformative potential of the current moment, where the challenges posed by GenAI may serve as the tipping point for a fundamental reassessment of how we conceptualise and implement valid assessments in HE (Dawson et al., 2024). Moreover, given the extensive discourse on GenAI-assisted academic misconduct, it is imperative to provide a more precise articulation of its implications for assessment validity, addressing both apparent and underlying issues. Building on the literature discussed, we propose a novel conceptual definition of 'GenAI susceptibility' that moves beyond moralistic notions of misconduct:

The undeclared use of GenAI to spectrally engineer a quasi- or fully synthetic AI-human hybrid output by any member of the academic community contrived to catalyse an erosion of ontological authenticity for epistemic refraction. In assessment validity, this unfair advantage renders such a submission a distorted reflection of knowledge acquisition, notwithstanding pre-existing assessment design flaws, which may inadvertently achieve comparable misrepresentations, ultimately corrupting the very *raison d'être* of the assessment itself. However, this issue transcends the confines of student-directed educational assessments, as the implications extend to broader academic spheres such as scientific writing authorship and scholarly publication, peer review, and intellectual integrity more broadly.

This is a working definition in need of further refinement. We encourage scholars to critically examine and expand upon this definition as GenAI technologies continue to evolve and HEIs adjust their responses accordingly.

**Operationalising GenAI susceptibility for assessment validity**  
Given these concerns about validity and academic integrity, rubrics offer a potential solution for mitigating GenAI susceptibility in assessments. These instruments are traditionally framed within education as student-facing instruments that enhance the assessment process's transparency (Panadero et al., 2023). However, their potential extends beyond mere criteria clarification; they serve as mechanisms to enhance accuracy and reduce cognitive load (Krebs et al., 2022). They also foster self-regulated learning (Fraile et al., 2023) and critical engagement with evaluative standards (Francis, 2018), thus giving rise to the creation of pedagogical bridges, which can align learning objectives with assessment criteria and instructional strategies (Ragupathi

& Lee, 2020). A further affordance resides in the linguistic commonality which can scaffold discussions around academic expectations and performance enhancements between stakeholders (Morton et al., 2021).

Nevertheless, there are documented associated risks in their use, such as the potential reductionist constraint of the creativity and higher-order thinking they aim to assess, particularly when applied mechanistically (Panadero & Jonsson, 2020). The prescriptive nature of rubrics in assessment may also reinforce power imbalances within educational settings according to Tan (2020). According to the author, this is so given that as artefacts of educational measurement, they embody particular ontological and axiological assumptions about what constitutes valuable learning and how it should be evidenced. This delimitation can risk privileging certain forms of knowledge expression over others and potentially marginalising diverse ways of knowing and demonstrating understanding.

Conversely, in the context of the PANDORA Project and the broader challenges posed by GenAI, the rubric developed here is conceived to assume a more nuanced and multifaceted role. The application of the traditional diagnostic function in the present context is repurposed to evaluate not the submitted assessment artefacts by test-takers, but rather to appraise the assessment design itself and its susceptibility to undeclared GenAI tool usage. In accordance with Bearman and Ajjawi (2019), the instrument is intended to embody a non-static role of enactment in which it is also conceived as a dialogical conduit which invites focused critical reflection which encourages consideration of aspects such as assessment alignment with intended learning outcomes, technological susceptibility, and the authenticity of tasks in relation to higher-order thinking skills. Ultimately, the impetus of the tool is to enable an informed decision to be taken by educators based on a structured analysis as to whether assessments truly capture the essence of student learning or inadvertently create loopholes susceptible to undeclared GenAI tool usage. This metamorphosis is intended to endow the rubric, whose development is reported here, with the capacity to serve as a reflective tool that acts as a dialogic catalyst for pedagogical introspection and innovation.

Although much of the literature on rubric construction is grounded in student-facing contexts, there are, however, a series of constructive insights in such studies as to key design principles and pitfalls to avoid, which are of relevance here. For instance, efficacious rubrics frequently incorporate unambiguous and specific criteria that align closely with the construct under evaluation (Boyd & Hill, 2024), whilst simultaneously providing descriptive levels that facilitate nuanced evaluation (Brookhart, 2018). Moreover, well-constructed rubrics engender consistency in evaluation (Bennett, 2016) and can be used as an impetus for substantive feedback to guide iterative improvement (Wilkerson, 2020). Conversely, prevalent pitfalls in rubric design encompass excessively vague or subjective language, potentially leading to inconsistent interpretations among evaluators (Kenworthy & Hrivnak, 2014). Furthermore, rubrics characterised by excessive complexity or granularity may prove unwieldy in practice, potentially diminishing their

pragmatic utility in the evaluation process (Perris & Mohee, 2020).

Drawing on this, the following section details the specific methodological approach taken for the development of the novel PANDORA GenAI Susceptibility Rubric.

## Rubric development process

The mixed-methods developmental design architecture for the rubric took place across three interconnected collaborative phases: preliminary exploratory inductive analysis, expert review and iterative refinement, and end-user validation (Allen & Knight, 2009). In the interests of concision, information pertaining to the practical application of this procedure is detailed alongside the methodological particulars to dedicate the preponderance of the final sections of the paper to the resulting instrument and its potential implications for theory and practice.

## Context and participants

This study was conducted internally at Universidad Internacional de La Rioja, Spain. It was specifically grounded in the context of Arts and Humanities, owing to the prevalence of traditional assessment methods in this discipline, such as the essay. It has been conceptualised as a pilot project with potential replicable scalability to the wider institution and cognate settings nationally and internationally. After launching a faculty-wide call for participants with the support of academic senior managers, 12 lecturers who taught one or more modules pertaining to the programmes of study highlighted below, were recruited:

- BA Translation and Interpretation Studies
- BA Art History
- MA Theatre Studies
- MA Cultural Management
- MA Teaching English as a Second Language
- MA Secondary Education Teacher Training

This range of programmes provided a representation of Arts and Humanities disciplines, which allowed for a nuanced exploration of GenAI susceptibility across different subject areas within the broader field. The inclusion of both undergraduate and postgraduate programmes enabled the researchers to examine potential variations in assessment practices and GenAI susceptibility at different levels of HE. The participation of educators from these varied programmes ensured a rich dataset, encompassing a wide array of assessment types, subject-specific considerations, and pedagogical approaches. This diversity was crucial in developing a robust and versatile rubric capable of addressing the multifaceted nature of GenAI susceptibility across the Arts and Humanities.

In the first instance, voluntary response sampling was used, however, owing to the highly limited responses to the open call sent by email to all Arts and Humanities faculty members, we turned to the snowball sampling technique (Cash et al., 2022) by asking initial participants to recommend further potential participants who were contacted directly. While not statistically representative of the entire faculty, the resulting sample provided a diverse range of perspectives from experienced educators across various arts and humanities disciplines. Participants were qualified to PhD level and had at least three years' university teaching experience. Most of the respondents were of Spanish nationality with two participants hailing from Venezuela and the United Kingdom. There was a female-to-male gender balance of ten to two.

## Phase 1- Preliminary exploratory inductive analysis

Despite an unexpectedly somewhat muted response, which itself became a point of analysis potentially indicating a lack of awareness or engagement with AI-related issues in assessment practices, the research team proceeded with an exploratory inductive analysis. This entailed two stages which comprised semi-structured interviews with participants and qualitative content analysis of assessment task briefs, rubrics and artefacts of the modules they teach.

The semi-structured interviews were devised to serve a dual purpose: to gather preliminary reflections on the types of assessments employed in arts and humanities courses and to gauge educators' initial perceptions of their assessments' potential susceptibility to GenAI-assisted completion. A bespoke standardised interview protocol was developed by the research team, which comprised open-ended questions to ensure consistency across interviews while allowing for flexible exploration of emerging themes. The protocol included the following key areas of inquiry: current assessment practices, perceived challenges in design, and perceptions and experiences of GenAI's impact on HE assessments. Data was then coded systematically using thematic analysis (Braun et al., 2025) to identify recurring patterns and prevalent themes, such as 'confidence in assessment validity' and 'limited practical engagement with GenAI tools', resulting in 'limited informed awareness, related to the interaction between GenAI tool potentialities and academic assessment practices', as is illustrated from the translated participant quotes below:

I'm confident that my assessments are still valid. I think I could spot anything that wasn't written by a human being anyway. After all, they require critical thinking and analysis, which AI can't replicate... can it? [CB57.09.G]

To be honest, I haven't really engaged with these AI tools myself. I've heard a lot about ChatGPT, but I'm not sure how they could impact my assessments. [TH08.17.B]

From what I've heard they haven't updated it with more recent information so my assessments on the new education law are safe. I can come back to this

again in future. [HB59.21.T]

Following the interviews, participating educators were invited to submit a range of materials, including assessment instructions, marking rubrics (where available), and anonymised samples of graded student work. The full repertoire of the 34 assessments collected is detailed in Table 1 below:

Table 1. Compendium of assessments analysed.

Level of Study	Degree Programme	Module	Language	Assessment Type	
Undergraduate	BA Translation and Interpretation	Introduction to Translation	Spanish	Critical commentary	
		History, Politics and Culture in Anglophone Countries	English	Essay	
	BA Art History	Archaeology		Spanish	Essay
					Harris matrix
		Baroque Art	Spanish	Written justified identification of archaeological remains	
				Post-museum visit critical commentary	
		Art from Neoclassicism to Avant-Garde	Spanish	Forum post	
				Baroque painting analytical written commentary	
	Early Medieval and Romantic Art	Spanish	Spanish	Neoclassical painting analytical written commentary	
				Group oral presentation	
		Spanish	Spanish	Avant-garde painting analytical commentary oral recording	
				Painting analytical commentary oral recording	
Spanish		Spanish	Written historical contextualisation of works of art		
			Forum post		
Postgraduate	MA Cultural Management	Publishing Management	Spanish	Painting analytical commentary	
				Group scientific article text commentary	
	MA Theatre Studies	Theatrical Pedagogy	Spanish	Essay	
				Research proposal	
	MA Teaching English as a Second Language	Language Systems	English	Lesson Plan	
				Tutorial Roleplay Video	
MA Secondary Education Teacher Training	Curricular Design in Physics and Chemistry	Spanish	Lesson Plan		
			Disciplinary Training in Physics and Chemistry		
				Infographic shared on social networks	

These materials formed the corpus for subsequent qualitative content analysis. Two research team members conducted this analytical process through joint coding procedures and subsequent discussions to resolve discrepancies.

To further evaluate the susceptibility of these assessments to undeclared GenAI-assisted completion, the two researchers input the assessment task briefs into two prominent GenAI tools, Open AI's ChatGPT-3.5 and Anthropic's Claude 3 Haiku. The aim was to determine whether responses generated would achieve a passable grade according to the provided assessment rubrics, to determine the degree of GenAI susceptibility of each assessment task. As a means of quantifying this, a 5-point Likert-type scale (1-5) was implemented, chosen for its balance of reliability, validity, and practical utility in educational technology assessment (DeVellis & Thorpe, 2021). Table 2 below illustrates how the construct was operationalised:

The third member of the research team subsequently carried out the same analyses independently, and outcomes from both were ratified with the following outcome as per Table 3 below:

Table 2. Initial GenAI susceptibility scale for assessment tasks.

Scale Point	Susceptibility Level	Description
1	Very Low	AI-generated response fails to meet basic task requirements
2	Low	AI-generated response partially fails to meet requirements but would fall short of a passing grade
3	Moderate	AI-generated response meets minimum requirements for a pass
4	High	AI-generated response would achieve a good grade
5	High	AI-generated response would achieve an excellent grade

Table 3. Preliminary assessment validity GenAI susceptibility findings.

Scale Point	Number of Assessments	% of Corpus
1. Very Low Susceptibility	0	0%
2. Low Susceptibility	1	2.94%
3. Moderate Susceptibility	5	14.71%
4. High Susceptibility	5	14.71%
5. Very High Susceptibility	23	67.63%

The complementary qualitative findings revealed that assignments with lower GenAI susceptibility shared several key attributes. Predominantly, these tasks required direct student engagement or physical presence, such as museum visits or video creation, and often involved practical applications or hands-on tasks rather than purely theoretical or text-based work. For instance, tasks rated at GenAI Susceptibility Level 2 (low susceptibility) required the creation of videos, a format that presents significant challenges for GenAI to replicate at the time of writing. Similarly, these tasks involved commenting on specific, non-named images, reducing the ease with which AI could complete the assignment.

In assignments rated at GenAI Susceptibility Level 3 (moderate susceptibility), mitigating factors such as basing work on provided images or texts, creating infographics with hashtags, or proposing learning designs based on explanatory videos made it possible for AI to achieve satisfactory results but with more effort. These assignments often incorporated more challenging elements for GenAI, like personal reflections, audio recordings, or custom infographics. Tasks that required the integration of multiple media types or formats also made it more difficult for GenAI tools to generate a complete and coherent response.

In contrast, assignments rated at GenAI Susceptibility Level 4 (high susceptibility) were easier for GenAI tools to handle, though they showed some mitigating factors. For example, assignments often required Word or PowerPoint formats, but incorporated elements like selecting specific works, requiring museum visits, or including images, all of which made them slightly less susceptible. Collaborative and interactive tasks were also present, though not all had robust evaluation criteria to ensure meaningful participation.

Tasks, rated at Level 5 (very high susceptibility), were predominantly in Word format or forum posts and were mostly individual in nature, with only a few interactive or collaborative assignments amongst them. These

tasks required comments, essays, creative proposals, presentations, or analyses, all highly susceptible to AI-generated responses, as they primarily demanded structured, predictable outputs. However, assignments that necessitated creativity, original thought, or specific contextual knowledge, such as discussing works studied in class, consistently showed lower susceptibility. Collaborative or interactive assignments, especially those with clear evaluation criteria for participation, were generally more resistant to GenAI-assisted completion, demonstrating the potential for reducing GenAI susceptibility through thoughtful assessment design.

## Phase 2- Expert review and iterative refinement

Drawing on preliminary results, and in consultation with two external GenAI and HE assessment experts, the following criteria were consensually established to be indicative of the operationalisation of the conceptual construct of GenAI susceptibility posed earlier in this paper, as is detailed in Table 4 below:

Table 4. Preliminary criteria and definitions.

Criterion	Definition
Input and Output Format Susceptibility	The ease of transferring assignment instructions and required submission formats to and from GenAI tools.
Intellectual Task Complexity	The degree to which the required cognitive processes align with GenAI capabilities, considering both objective and subjective tasks.
Collaborative Authorship	The extent of genuine collaboration required, beyond mere task division, and its assessment.
Topic Selection	The level of critical thinking required in choosing and justifying the topic.
Opportunity for Creativity	The space provided for original thought that surpasses GenAI-generated patterns.
Instruction Specificity	The level of detail in instructions and its impact on GenAI prompt formulation with greater specificity in instruction leading to greater GenAI susceptibility.
Process-Oriented Assessment	The degree to which the evaluation focuses on the learning process rather than just the final assessment product.
Topic Information Accessibility	The availability of topic-related information to GenAI tools, with more canonical subjects being more susceptible.
Authorship Evidence	The requirement for demonstrable human involvement in the assignment completion.

Consensus diverged around the need to envisage assessment validity and GenAI susceptibility beyond the narrow prism of grading which solely links the issue to student's undeclared GenAI usage, as discussed earlier in the Literature section. Thereby, a streamlined three-point tiered iteration replaced the five-point scale used initially and is to be used in accordance with each of the criteria mentioned in Table 4 previously. Furthermore, a tricolour coding system was also introduced to enhance the visual representation of this division. In an effort to reiterate the designed dialogic and action-oriented nature of the tool, traffic light colours were selected for their connotations with decision-making and intervention. The iterative modifications are summarised in Table 5 below.

## Phase 3- End-user validation

Having implemented the expert-informed modifications in Phase 2, this final component sought a return to the practical domain for end-user validation. Short online meetings were held with participants from Phase 1 to present the refined rubric. These sessions guided participants through the application of the new rubric to the assignments submitted

Table 5. Summary of post-expert review modifications.

Level	Description	Overall Average	Colour Coding
1- Minimum Susceptibility	GenAI It is very or somewhat difficult to use GenAI tools with satisfactory results.	0-1.5	Green
2- Partial Susceptibility	GenAI It is possible to use GenAI tools with satisfactory results.	1.6-2.5	Amber
3- Total Susceptibility	GenAI It is easy or very easy to use GenAI tools with satisfactory results.	2.6-3	Red

previously in Phase 1 and were designed to serve as a forum for garnering feedback on the usability, clarity, and perceived efficacy of the instrument.

At this stage, of the 34 assessments analysed, a total of 28 assessments were determined to have total GenAI susceptibility, 5 to have partial GenAI susceptibility, and 1 to have minimal GenAI susceptibility overall. Although the same assessments were analysed, on this occasion, the total number of highly susceptible cases rose to 82.35% compared to 67.65% of the total corpus previously with the former iteration. This seems to suggest that the iterative development process has led to a more sensitive instrument for detecting GenAI susceptibilities. Table 6, below, illustrates the cumulative criteria-specific breakdown of the analysis:

Table 6. Criteria-specific breakdown of end-user assessment validity analysis.

Criterion	Level 1	Level 2	Level 3
Input and Output Format	1	5	28
Intellectual Task Complexity	1	4	29
Collaborative Authorship	1	3	30
Topic Selection	1	16	17
Creativity Scope	0	19	15
Instruction Specificity	1	3	30
Process-Oriented Assessment	0	8	26
Topic Information Accessibility	0	4	30
Authorship Evidence	0	4	30

The qualitative suggestions for improvement and usability enhancement were pertaining to minor changes in wording. The resulting definitive iteration of the rubric is presented in the following section.

## The PANDORA GenAI Susceptibility Rubric

Having concluded the multistage development process, the novel tool is offered here to spark dialogic deliberation and critical reflection in assessment praxis and policy:

	Level 1 Minimum GenAI Susceptibility <i>Difficult or very difficult AI use with satisfactory results</i>	Level 2 Moderate GenAI Susceptibility <i>Possible AI use with satisfactory results</i>	Level 3 High GenAI Susceptibility <i>Easy AI use with satisfactory results</i>
<b>Input and Output Format</b>	Input/output formats resistant to free GenAI tools: complex multimedia, specialised file types, or formats requiring paid AI services or significant human processing.	Input/output formats with partial GenAI resistance: require human processing of non-text elements; AI output needs conversion to required format.	Input/output formats highly susceptible to GenAI: easily 'pasteable' instructions; submission format directly producible by free AI tools.
<b>Intellectual Task Complexity</b>	Task requires subjective opinion, justification, or complex metacognitive/emotional processes beyond AI capabilities.	Task partially achievable by AI tools but requires some human input.	Task fully achievable by AI tools (e.g., describe, explain, argue, create, or compare within given parameters).
<b>Collaborative Authorship</b>	Genuinely interdependent collaboration required; collaboration explicitly assessed.	Partial collaboration or genuine collaboration not explicitly assessed.	Individual task or easily divisible group work without true collaboration.
<b>Topic Selection</b>	Justified topic choice.	Topic choice without justification.	Topic imposed or limited options without justification.
<b>Creativity Scope</b>	Ample scope for creativity.	Moderate scope for creativity.	Highly limited scope for creativity.



<b>Instruction Specificity</b>	General guidelines only; students must determine specific parameters and justify choices, requiring significant human input for GenAI prompts.	Mix of general and specific instructions; some parameter choices allowed but not justified; minimal student input needed for GenAI prompts.	Highly detailed instructions (e.g., templates, checklists) directly usable as GenAI prompts.
<b>Process-Oriented Assessment</b>	Assessment covers output and developmental process; all steps must be demonstrated	Primary focus on output; some demonstration of developmental process steps required.	Focus solely on output; no developmental process demonstration required.
<b>Topic Information Accessibility</b>	Topic information not readily available online; inaccessible to GenAI tools.	Topic information available online but difficult to find; partial GenAI access.	Topic information easily accessible online; full GenAI access.
<b>Authorship Evidence</b>	Robust authorship evidence required (e.g., shared online document, explanatory video appearance).	Authorship evidence required but easily manipulated (e.g., editable images).	No authorship evidence required.

The development of the PANDORA GenAI Susceptibility Rubric has brought deeper and more structured insights into assessment design that extend beyond superficial adjustments, revealing deeper complexities in how educational tasks can be manipulated by or remain resilient to generative AI (GenAI) intervention. Initially, group activities were thought to provide a buffer against GenAI misuse under the assumption that collaboration would naturally deter its application. However, further analysis demonstrated that dividing tasks among students did little to reduce susceptibility to GenAI-generated responses. Instead, the extent of genuine collaboration emerged as a pivotal factor. This led to establishing “Collaborative Authorship” as a central criterion within the rubric, rather than relying on mechanical task division, collaborative authorship calls for interactive human engagement, ensuring that the co-construction of knowledge involves critical discussion and shared intellectual responsibility. This key distinction reinforces the need for assessments that reflect collective intellectual rigour rather than piecemeal contributions, where GenAI could easily fill the gaps without meaningful student input.

Additionally, the rubric’s development underscored the significance of process-oriented assessment, which evaluates the final product and the steps leading up to it. In doing so, the rubric creates a framework that captures the quality of student collaboration and generates a structured learning pathway that is inherently less vulnerable to GenAI infiltration. This approach ensures that the integrity of the learning process is maintained, as the evaluation hinges on both the process and product, making it increasingly difficult for GenAI to replicate the human-centred aspects of authentic academic work.

In refining the rubric, further attention was given to the intricate relationships between topic selection, creativity, and instruction specificity related to GenAI susceptibility. It became evident that assignments which offered predetermined topics without requiring justification inadvertently opened the door for GenAI misuse. When students are free to select and rationalise their topics, they must engage in critical thinking, directly reducing the rubric’s susceptibility criteria. This shift from passive to active intellectual engagement marks a critical pivot in how we conceptualise student assessment in the era of AI.

Moreover, the rubric elevates the importance of creativity and originality in assessments, as these factors challenge the algorithmic and patterned nature of GenAI outputs. Encouraging originality creates a barrier that GenAI, often reliant on formulaic outputs, struggles to overcome. Yet,

the rubric also recognises a paradox: overly prescriptive instructions can simplify the process of GenAI prompt formulation, thereby increasing susceptibility. This insight led to the inclusion of the criterion “Instruction Specificity”, reminding educators of the delicate balance between clear guidance and fostering student-driven exploration. By offering a more open-ended structure, the rubric promotes student autonomy and ensures that the intellectual demands of the task cannot be easily outsourced to GenAI tools.

Finally, the rubric integrates considerations of topic canonicity and authorship evidence, acknowledging that less conventional subjects and the need for demonstrable human involvement significantly reduce the potential for GenAI manipulation. The ability to differentiate between AI-generated and human-generated work is crucial in maintaining academic integrity, and this rubric provides a structured, methodical approach to achieving that differentiation. In doing so, it serves as a practical tool for educators and an instrument for advancing academic discourse on the evolving challenges that GenAI presents to higher education assessment.

In essence, the PANDORA GenAI Susceptibility Rubric positions itself as a critical tool for the academic community, offering a robust framework that moves beyond reactive measures. It invites educators to engage with the complexities of GenAI in assessment actively, fostering a culture of reflection, innovation, and future-proofed assessment design. Through its multifaceted criteria, the rubric safeguards against GenAI misuse and is a catalyst for more profound, more meaningful learning experiences, thereby reinforcing the educational value of assessments in an AI-driven world. Its importance to the academic world cannot be overstated, as it addresses the urgent need for structured, ethical, and pedagogically sound responses to the disruptive capabilities of GenAI technologies.

### Implications for HE praxis and policy

The findings of this study, particularly the development and application of the PANDORA GenAI Susceptibility Rubric, have far-reaching implications for HE policy and practice in the context of increasingly sophisticated GenAI technologies. Firstly, in practice, the novel conceptual definition and the tool offer a structured framework for educators to evaluate and refine their assessment designs. These move beyond traditional moralistic notions of academic integrity towards a more nuanced understanding of assessment validity. Ultimately, this tool may serve to address the issues highlighted in Phase 1 when participants were interviewed. It may thus raise critical awareness amongst educators globally on the realities of progressively capable GenAI tools beyond the GenAI susceptibilities of their present assessments and the possibilities to enhance assessment procedures with and without GenAI tools. Practical implications might also include using the tool to spark institutional dialogue around the need for professional development programmes that equip educators with the skills to design GenAI-resistant and -integrated assessments, fostering collaboration between academic staff, learning designers, and AI specialists to create innovative assessment strategies. Moreover, it is

apparent that making progress on ensuring assessment validity is a complex task. To that end, the authors foresee the practical utility of this tool used as a precursor to build on parallel frameworks such as that crafted by Zaphir et al. (2024). It could furthermore be used to define assessment validity and GenAI susceptibility. Thereafter, frameworks such as Perkins et al.'s (2024) AI Assessment Scale could be used to support the subsequent development process of new assessment offerings based on the findings of the PANDORA GenAI Susceptibility Rubric.

Secondly, at the policy level, our research underscores the urgent need for institutions to move beyond piecemeal approaches and critical silences (Luo, 2024) towards comprehensive, forward-thinking policies that address the multifaceted impacts of GenAI on academic integrity, assessment design, and pedagogical practices. Drawing on the transformative paradigm shift proposed by Dawson et al. (2024), we argue that policy frameworks should prioritise assessment validity over punitive measures, fostering a culture of ethical AI use whilst simultaneously reimagining the purpose and design of assessments in HE. This approach necessitates a reconceptualisation of quality assurance mechanisms (Ryan, 2015; Rawas, 2023) to incorporate GenAI considerations, ensuring that institutional policies are not only reactive but proactive in addressing the challenges and opportunities presented by these technologies.

Drawing upon the broad conceptual underpinnings of the PANDORA GenAI Susceptibility Rubric, its applicability across diverse higher education contexts warrants careful consideration through multiple intersecting dimensions. The rubric's foundational architecture, whilst initially validated within Arts and Humanities, potentially offers considerable adaptability across disciplinary boundaries through its core evaluative criteria. For instance, the 'Intellectual Task Complexity' and 'Process-Oriented Assessment' dimensions might readily translate to STEM disciplines where laboratory work and empirical investigation predominate, whilst 'Collaborative Authorship' and 'Topic Information Accessibility' maintain relevance in professional programmes such as medicine, law, and business studies. The rubric's implementation framework can be contextually calibrated to accommodate varying institutional typologies—from research-intensive universities to professionally-oriented colleges—through thoughtful consideration of local assessment policies, quality assurance mechanisms, and pedagogical approaches. Moreover, its adaptability extends to diverse learning modalities, encompassing traditional face-to-face instruction, distance education, and hybrid delivery models, each presenting unique challenges and opportunities for assessment validity. This versatility is particularly salient when considering international and cross-cultural applications, where the rubric's emphasis on authentic assessment and academic integrity can be meaningfully aligned with different national quality frameworks and cultural approaches to knowledge demonstration. The instrument is novel in that it offers a robust yet flexible comprehensive framework that can be systematically implemented across the broader higher education landscape, whilst maintaining sensitivity to discipline-specific requirements, institutional contexts, and diverse student populations.

## Limitations

While the instrument offers a novel approach to assessing GenAI susceptibility in HE assessments, several limitations of this study warrant consideration. Firstly, the sample size of 12 lecturers from a single institution in Spain limits the generalisability of the findings. While providing depth, the focus on Arts and Humanities disciplines may not fully capture the nuances of GenAI susceptibility across other academic fields. Additionally, the rapid evolution of GenAI technologies means that the rubric may require frequent updates to remain relevant. The study's reliance on self-reported data from educators could introduce potential biases, particularly given the varying levels of GenAI familiarity among participants. Furthermore, using only two GenAI tools (ChatGPT-3.5 and Claude 3 Haiku) for testing assessment susceptibility may not comprehensively represent the full spectrum of available GenAI technologies. Lastly, the study's context within a Spanish university system may limit its direct applicability to other cultural and educational contexts. Despite these limitations, the PANDORA GenAI Susceptibility Rubric provides a valuable starting point for addressing the complex challenges of GenAI in HE assessment, and future research can build upon this foundation to address these constraints.

## Future research directions

Owing to the progressively intricate multi-faceted impacts of human interactions with GenAI technologies in HE, to quantify avenues for future scholarly exploration as multiple may be somewhat of an understatement. Nonetheless, the most evident routes to pursue include the empirical validation in practice in domains cognate to the Arts and Humanities pedagogical setting in which the present study is grounded.

Additionally, future research should explore the applicability of the PANDORA GenAI Susceptibility Rubric across diverse disciplinary contexts, investigate its long-term impact on assessment design and academic integrity, and examine how it might be adapted to keep pace with rapidly evolving GenAI capabilities. Furthermore, studies on the integration of this tool into broader institutional policies and its potential to foster a culture of ethical AI use in academia would be valuable. Lastly, comparative analyses of how different global regions and educational systems approach GenAI-related assessment challenges could provide crucial insights for developing more robust and culturally responsive frameworks.

## Conclusion

Amidst the GenAI global regulatory vacuum in HE catalysed through sweeping ambiguities and institutional inertia, this study set out to heed the bold call of Dawson et al. (2024) for a paradigmatic shift in academic integrity that assessment validity matters more than the phenomenon of cheating itself. To that end, the authors sought to conceptually substantiate the deeper epistemological, ontological, and axiological implications of undeclared GenAI use by any

member of the academic community and furthermore produce a novel rubric to facilitate an initial exercise of analysis of current assessment practices. This is by no means a simple task for busy academics in differing pedagogical settings worldwide. To that end, we have been motivated to bridge the oft-muted chasm between research and practice through the development of an interactive digital interface of the rubric, which has been made freely accessible through our dedicated project website. The PANDORA GenAI Susceptibility Rubric is available to interact with here: <https://www.pandoraunir.com/>

The digitalised version of the tool features an intuitive interface where educators can systematically evaluate their assessments across the criteria through a series of targeted prompts and reflective questions. The platform then generates an analysis report highlighting areas of GenAI susceptibility whilst offering concrete suggestions for assessment redesign tailored to the specific discipline and level of study. This practical resource builds upon our empirical findings created to disseminate a dynamic, evidence-based framework for educators that responds to the pressing needs of time-constrained academics across the sector.

The tool is intended to serve as a dialogical conduit which invites focused critical reflection and subsequent enactment of assessment innovation to not only answer the pressing needs of GenAI susceptibility, but also longstanding documented calls to explore more valid alternatives to traditional approaches such as the essay. As we conclude here, we would like to emphasise our belief that the true power of the PANDORA GenAI Susceptibility Rubric lies not just in its immediate application, but in its potential to spark a broader conversation about the nature of knowledge, learning, and assessment in the digital age. As we stand at this critical juncture in the evolution of HE, we challenge the academic community to use this tool as a springboard for radical innovation, reimagining not just how we assess, but how we teach, learn, and create knowledge in a world where human and artificial intelligence increasingly intertwine.

## Acknowledgements

This publication has been funded by the Research Project (PANDORA: Project of Analysis and Development for the Optimisation of Assessment and Regulation of Generative Artificial Intelligence) with reference (PP-2023-02) awarded in the 2023 UNIR Institutional Research Projects call of the Universidad Internacional de La Rioja (UNIR).

## References

Ahsan, K., Akbar, S., & Kam, B. (2021). Contract cheating in higher education: A systematic literature review and future research agenda. *Assessment & Evaluation in Higher Education, 47*(4), 1–17. <https://doi.org/10.1080/02602938.2021.1931660>

Ajjawi, R., Tai, J., Huu Nghia, T. L., Boud, D., Johnson, L., & Patrick, C.-J. (2019). Aligning assessment with the needs

of work-integrated learning: The challenges of authentic assessment in a complex context. *Assessment & Evaluation in Higher Education, 45*(2), 1–13. <https://doi.org/10.1080/02602938.2019.1639613>

Alkaissi, H., & McFarlane, S. (2023). Artificial hallucinations in ChatGPT: Implications in scientific writing. *Cureus, 15*(2), e35179. <https://doi.org/10.7759/cureus.35179>

Allen, S., & Knight, J. (2009). A method for collaboratively developing and validating a rubric. *International Journal for the Scholarship of Teaching and Learning, 3*(2), 10. <https://doi.org/10.20429/ijstl.2009.030210>

Ashwin, P. (2020). *Transforming university education: A manifesto*. Bloomsbury Publishing.

Ashwin, P., Goldschneider, B., Agrawal, A., & Smit, R. (2023). Beyond the dichotomy of students-as-consumers and personal transformation: What students want from their degrees and their engagement with knowledge. *Studies in Higher Education, 49*(8), 1439–1450. <https://doi.org/10.1080/03075079.2023.2267589>

Asiyai, R. I. (2020). Best practices for quality assurance in higher education: Implications for educational administration. *International Journal of Leadership in Education, 25*(5), 843–854. <https://doi.org/10.1080/13603124.2019.1710569>

Bannister, P. (2024). English medium instruction educator language assessment literacy and the test of generative AI in online higher education. *Journal of Research in Applied Linguistics, 15*(2), 55–72. <https://doi.org/10.22055/rals.2024.45862.3214>

Bannister, P., Alcalde Peñalver, E., & Santamaría Urbieta, A. (2024a). Transnational higher education cultures and generative AI: A nominal group study for policy development in English medium instruction. *Journal for Multicultural Education, 18*(1/2), 173–191. <https://doi.org/10.1108/JME-10-2023-0102>

Bannister, P., Alcalde Peñalver, E., & Santamaría Urbieta, A. (2024b). International students and generative artificial intelligence. A cross-cultural exploration of HE academic integrity policy. *Journal of International Students, 14*(3), 149–170. <https://doi.org/10.32674/jis.v14i3.6277>

Bannister, P., & Carver, M. (2024). 'I don't need professional development; I want institutional development': Legitimising marginalised epistemic capital that disrupts generative AI discourse. *Professional Development in Education, 1*–19. <https://doi.org/10.1080/19415257.2024.2427873>

Bannister, P., Santamaría Urbieta, A., & Alcalde Peñalver, E. (2023). A Delphi study on generative artificial intelligence and English medium instruction assessment: Implications for social justice. *Iranian Journal of Language Teaching Research, 11*(3), 53–80. <https://doi.org/10.30466/ijltr.2023.121406>

Baron, P. (2024). Are AI detection and plagiarism similarity scores worthwhile in the age of ChatGPT and other generative AI? *Scholarship of Teaching and Learning in the*

- South, 8(2), 151-179. <https://doi.org/10.36615/sotls.v8i2.411>
- Bearman, M., & Ajjawi, R. (2019). Can a rubric do more than be transparent? Invitation as a new metaphor for assessment criteria. *Studies in Higher Education, 46*(2), 1–10. <https://doi.org/10.1080/03075079.2019.1637842>
- Bearman, M., & Luckin, R. (2020). Preparing university assessment for a world with AI: Tasks for human intelligence. In M. Bearman, P. Dawson, R. Ajjawi, J. Tai, & D. Boud (Eds.), *Re-imagining university assessment in a digital world* (pp. 49-63). Springer.
- Bennett, C. (2016). Assessment rubrics: Thinking inside the boxes. *Learning and Teaching, 9*(1), 50-72. <https://doi.org/10.3167/latiss.2016.090104>
- Blackie, M. A. (2024). ChatGPT is a game changer: Detection and eradication is not the way forward. *Teaching in Higher Education, 29*(4), 1109-1116. <https://doi.org/10.1080/13562517.2023.2300951>
- Bloxham, S., Boyd, P., & Orr, S. (2011). Mark my words: The role of assessment criteria in UK higher education grading practices. *Studies in Higher Education, 36*(6), 655–670. <https://doi.org/10.1080/03075071003777716>
- Bond, M., Khosravi, H., De Laat, M., Bergdahl, N., Negrea, V., Oxley, E., Pham, P., Chong, S. W., & Siemens, G. (2024). A meta systematic review of artificial intelligence in higher education: A call for increased ethics, collaboration, and rigour. *International Journal of Educational Technology in Higher Education, 21*(1). <https://doi.org/10.1186/s41239-023-00436-z>
- Boud, D., & Falchikov, N. (2007). *Rethinking assessment in higher education: Learning for the longer term*. Routledge.
- Boyd, P., & Hill, J. (2024). Working with rubrics. In N. Reiman, I. Sadler, & J. Hill (Eds.), *Academic standards in higher education. Critical perspectives and practical strategies* (pp. 157-170). Routledge.
- Bozkurt, A. (2023). Unleashing the potential of generative AI, conversational agents and chatbots in educational praxis: A systematic review and bibliometric analysis of GenAI in education. *Open Praxis, 15*(4), 261-270. <https://doi.org/10.55982/openpraxis.15.4.609>
- Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2025). Thematic analysis. In P. Brough (Ed.), *Advanced research methods for Applied psychology: Design, analysis and reporting* (pp. 238-248). Routledge.
- Brookhart, S. M. (2018). Appropriate criteria: Key to effective rubrics. *Frontiers in Education, 3*(22). <https://doi.org/10.3389/educ.2018.00022>
- Cash, P., Isaksson, O., Maier, A., & Summers, J. (2022). Sampling in design research: Eight key considerations. *Design Studies, 78*(1), 101077. <https://doi.org/10.1016/j.destud.2021.101077>
- Chaka, C. (2024). Accuracy pecking order – how 30 AI detectors stack up in detecting generative artificial intelligence content in university English L1 and English L2 student essays. *Journal of Applied Learning & Teaching, 7*(1), 127-139. <https://doi.org/10.37074/jalt.2024.7.1.33>
- Chappelle, C. A., & Lee, H. (2021). Conceptions of validity. In G. Fulcher, & L. Harding (Eds.), *The Routledge handbook of language testing* (pp. 21-34). Routledge.
- Condette, M. (2024). 'It's paradoxical, but it works' – towards ambidexterity in external quality assurance: The case of Roman Catholic ecclesiastical higher education. *Studies in Higher Education, 1*-13. <https://doi.org/10.1080/03075079.2024.2407516>
- Dai, Y., Lai, S., Lim, C. P., & Liu, A. (2024). University policies on generative AI in Asia: Promising practices, gaps, and future directions. *Journal of Asian Public Policy, 1*-22. <https://doi.org/10.1080/17516234.2024.2379070>
- Dawson, P., Bearman, M., Dollinger, M., & Boud, D. (2024). Validity matters more than cheating. *Assessment & Evaluation in Higher Education, 1*-12. <https://doi.org/10.1080/02602938.2024.2386662>
- De Maio, C. (2024). Institutional responses to ChatGPT: Analysing the academic integrity policies of four public and private institutions of higher education in Australia. *Journal of Academic Language and Learning, 18*(1), T1-T8. <https://journal.aall.org.au/index.php/jall/article/view/917>
- DeVellis, R. F., & Thorpe, C. T. (2021). *Scale development: Theory and applications* (5th ed.). SAGE Publications.
- Eaton, S. E. (2017). Comparative analysis of institutional policy definitions of plagiarism: A pan-Canadian university study. *Interchange, 48*(3), 271–281. <https://doi.org/10.1007/s10780-017-9300-7>
- Egloff, J. (2024). The college essay is not dead: Using scaffolding and presentations to create ChatGPT-resistant research projects. *Proceedings of the H-Net Teaching Conference, 2*(1), 72–100. <https://doi.org/10.33823/phtc.v2i1.225>
- Ehlers, U. D., & Eigbrecht, L. (2024). *Creating the university of the future. A global view on future skills and future higher education*. Springer.
- Farrelly, T., & Baker, N. (2023). Generative artificial intelligence: Implications and considerations for higher education practice. *Education Sciences, 13*(11), 1109. <https://doi.org/10.3390/educsci13111109>
- Fleckenstein, J., Meyer, J., Jansen, T., Keller, S. D., Köller, O., & Möller, J. (2024). Do teachers spot AI? Evaluating the detectability of AI-generated texts among student essays. *Computers and Education: Artificial Intelligence, 6*, 100209. <https://doi.org/10.1016/j.caeai.2024.100209>
- Fraile, J., Gil-Izquierdo, M., & Medina-Moral, E. (2023). The impact of rubrics and scripts on self-regulation, self-efficacy

- and performance in collaborative problem-solving tasks. *Assessment & Evaluation in Higher Education*, 48(8), 1223–1239. <https://doi.org/10.1080/02602938.2023.2236335>
- Francis, J. E. (2018). Linking rubrics and academic performance: An engagement theory perspective. *Journal of University Teaching & Learning Practice*, 15(1), 1-20. <https://doi.org/10.53761/1.15.1.3>
- Giray, L. (2024). Negative effects of generative AI on researchers: Publishing addiction, Dunning-Kruger effect and skill erosion. *Journal of Applied Learning & Teaching*, 7(2), 398-405. <https://doi.org/10.37074/jalt.2024.7.2.38>
- Herbold, S., Hautli-Janisz, A., Heuer, U., Kikteva, Z., & Trautsch, A. (2023). *AI, write an essay for me: A large-scale comparison of human-written versus ChatGPT-generated essays*. arXiv. <https://doi.org/10.48550/arxiv.2304.14276>
- Kaiser, F., Melo, A. I., & Hou, A. Y. (2022). Are quality assurance and rankings useful tools to measure 'new' policy issues in higher education? The practices in Europe and Asia. *European Journal of Higher Education*, 12(1), 391-415. <https://doi.org/10.1080/21568235.2022.2094816>
- Kaçinari, T. (2023). Facilitators and barriers to online teaching and educational technology use by university lecturers during COVID-19: A systematic review of qualitative evidence. *Trends in Higher Education*, 2(4), 636–666. <https://doi.org/10.3390/higheredu2040038>
- Kenworthy, A. L., & Hrivnak, G. A. (2014). To rubric or not to rubric. *Journal of Management Education*, 38(3), 345–351. <https://doi.org/10.1177/1052562914530103>
- Kirmani, A. R. (2023). Fantastic (AI) bots and how to catch them. *MRS Bulletin*, 48(4), 314-318. <https://doi.org/10.1557/s43577-023-00516-5>
- Knight, S., Dickson-Deane, C., Heggart, K., Kitto, K., Çetindamar Kozanoğlu, D., Maher, D., Narayan, B., & Zarrabi, F. (2023). Generative AI in the Australian education system: An open data set of stakeholder recommendations and emerging analysis from a public inquiry. *Australasian Journal of Educational Technology*, 39(5), 101-124. <https://doi.org/10.14742/ajet.8922>
- Kohnke, L., Zou, D., & Moorehouse, B. L. (2024). Technostress and English language teaching in the age of generative AI. *Educational Technology & Society*, 27(2), 306-320. [https://doi.org/10.30191/ETS.202404\\_27\(2\).TP02](https://doi.org/10.30191/ETS.202404_27(2).TP02)
- Kramm, N., & McKenna, S. (2023). AI amplifies the tough question: What is higher education really for? *Teaching in Higher Education*, 28(8), 2173-2178. <https://doi.org/10.1080/13562517.2023.2263839>
- Krebs, R., Rothstein, B., & Roelle, J. (2022). Rubrics enhance accuracy and reduce cognitive load in self-assessment. *Metacognition and Learning*, 17(2), 627-650. <https://doi.org/10.1007/s11409-022-09302-1>
- Kumar, R., & Mindzak, M. (2024). Who wrote this? *Canadian Perspectives on Academic Integrity*, 7(1), 1-9. <https://doi.org/10.55016/ojs/cpai.v7i1.77675>
- Lalor, J., Lorenzi, F., & Rami, J. (2015). Developing professional competence through assessment: Constructivist and reflective practice in teacher-training. *Eurasian Journal of Educational Research*, 15(58), 45-66. <https://dx.doi.org/10.14689/ejer.2015.58.6>
- Law, L. (2024). Application of generative artificial intelligence (GenAI) in language teaching and learning: A scoping literature review. *Computers and Education Open*, 6, 100174. <https://doi.org/10.1016/j.caeo.2024.100174>
- Leaver, T., & Srdarov, S. (2023). ChatGPT isn't magic: The hype and hypocrisy of generative artificial intelligence (AI) rhetoric. *M/C Journal*, 26(5). <https://doi.org/10.5204/mcj.3004>
- Liang, W., Yuksekgonul, M., Mao, Y., Wu, E., & Zou, J. (2023). GPT detectors are biased against non-native English writers. *Patterns*, 4(7), 100779. <https://doi.org/10.1016/j.patter.2023.100779>
- Lipnevich, A. A., Guskey, T. R., Murano, D. M., & Smith, J. K. (2020). What do grades mean? Variation in grading criteria in American college and university courses. *Assessment in Education: Principles, Policy & Practice*, 27(5), 480–500. <https://doi.org/10.1080/0969594x.2020.1799190>
- Liu, Y., Zhang, Z., Zhang, W., Yue, S., Zhao, X., Cheng, X., Zhang, Y., & Hu, H. (2023). *ArguGPT: Evaluating, understanding and identifying argumentative essays generated by GPT models*. arXiv. <https://doi.org/10.48550/arXiv.2304.07666>
- Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, 13(4), 410. <https://doi.org/10.3390/educsci13040410>
- Lodge, J. M., Yang, S., Furze, L., & Dawson, P. (2023). It's not like a calculator, so what is the relationship between learners and generative artificial intelligence? *Learning: Research and Practice*, 9(2), 117-124. <https://doi.org/10.1080/23735082.2023.2261106>
- Luo, J. (2024). A critical review of GenAI policies in higher education assessment: A call to reconsider the "originality" of students' work. *Assessment & Evaluation in Higher Education*, 1–14. <https://doi.org/10.1080/02602938.2024.2309963>
- Matthews, J. A., & Volpe, C. R. (2023). Academics' perceptions of ChatGPT-generated written outputs: A practical application of Turing's imitation game. *Australasian Journal of Educational Technology*, 39(5), 82-100. <https://doi.org/10.14742/ajet.8896>
- McDonald, N., Johri, A., Ali, A., & Hingle, A. (2024). *Generative artificial intelligence in higher education: Evidence from an analysis of institutional policies and guidelines*. arXiv. <https://doi.org/10.48550/arXiv.2402.01659>
- McGraw, A., & Mason, M. (2021). The formulaic essay and

- its power to de-fuse reading responses. *Literacy Learning: The Middle Years*, 29(3), 8-15. <https://search.informit.org/doi/10.3316/informit.069867974654568>
- Melekhina, E. A., & Levitan, K. M. (2015). Assessment system in writing essays by graduate students. *Procedia - Social and Behavioral Sciences*, 200, 482–489. <https://doi.org/10.1016/j.sbspro.2015.08.099>
- Meylani, R. (2024). A comparative analysis of traditional and modern approaches to assessment and evaluation in education. *The Western Anatolian Journal of Educational Sciences*, 15(1), 520–555. <https://doi.org/10.51460/baebd.1386737>
- Mirador, J. (2018). "You need to criticize, not just summarize!" Investigating "criticality" in written assignments of postgraduate students. *Writing & Pedagogy*, 10(1-2), 61–92. <https://doi.org/10.1558/wap.33366>
- Möck, L. A. (2022). Prediction promises: Towards a metaphorology of artificial intelligence. *Journal of Aesthetics and Phenomenology*, 9(2), 119-139. <https://doi.org/10.1080/20539320.2022.2143654>
- Monett, D., & Grigorescu, B. (2024). *Deconstructing the AI myth: Fallacies and harms of algorithmification*. ResearchGate. <https://www.researchgate.net/publication/382802495>
- Morris, R., Perry, T., & Wardle, L. (2021). Formative assessment and feedback for learning in higher education: A systematic review. *Review of Education*, 9(3), e3292. <https://doi.org/10.1002/rev.3.3292>
- Morton, J. K., Northcote, M., Kilgour, P., & Jackson, W. A. (2021). Sharing the construction of assessment rubrics with students: A model for collaborative rubric construction. *Journal of University Teaching & Learning Practice*, 18(4), 1-17. <https://doi.org/10.53761/1.18.4.9>
- Newton, P., & Xiromeriti, M. (2024). ChatGPT performance on multiple choice question examinations in higher education. A pragmatic scoping review. *Assessment & Evaluation in Higher Education*, 49(6), 781-798. <https://doi.org/10.1080/2602938.2023.2299059>
- Nguyen, A., Hong, Y., Dang, B., & Huang, X. (2024). Human-AI collaboration patterns in AI-assisted academic writing. *Studies in Higher Education*, 49(5), 847-864. <https://doi.org/10.1080/03075079.2024.2323593>
- Panadero, E., & Jonsson, A. (2020). A critical review of the arguments against the use of rubrics. *Educational Research Review*, 30, 100329. <https://doi.org/10.1016/j.edurev.2020.100329>
- Panadero, E., Jönsson, A., Pinedo, L., & Fernández-Castilla, B. (2023). Effects of rubrics on academic performance, self-regulated learning, and self-efficacy: A meta-analytic review. *Educational Psychology Review*, 35(4), 113. <https://doi.org/10.1007/s10648-023-09823-4>
- Perkins, M., Furze, L., Roe, J., & MacVaugh, J. (2024). The artificial intelligence assessment scale (AIAS): A framework for ethical integration of generative AI in educational assessment. *Journal of University Teaching and Learning Practice*, 21(6), 1-18. <https://doi.org/10.53761/q3azde36>
- Perkins, M., Roe, J., Vu, B. H., Postma, D., Hickerson, D., McGaughan, J., & Khuat, H. Q. (2024). Simple techniques to bypass GenAI text detectors: Implications for inclusive education. *International Journal of Educational Technology in Higher Education*, 21(1), 1-25. <https://doi.org/10.1186/s41239-024-00487-w>
- Perris, K., & Mohee, R. (2020). *Quality assurance rubric for blended learning*. Commonwealth of Learning. <https://oasis.col.org/items/2d37644b-4134-4f91-807d-e48ab8d26557>
- Pitt, P., Dullaghan, K., & Sutherland-Smith, W. (2020). "Mess, stress and trauma": Students' experiences of formal contract cheating processes. *Assessment & Evaluation in Higher Education*, 46(4), 1–14. <https://doi.org/10.1080/02602938.2020.1787332>
- Pratschke, B. M. (2024). *Generative AI and education: Digital pedagogies, teaching innovation and learning design*. Springer.
- Ragupathi, K., & Lee, A. (2020). Beyond fairness and consistency in grading: The role of rubrics in higher education. In C. S. Sanger, & N. W. Gleason (Eds.), *Diversity and inclusion in global higher education. Lessons learnt from Asia* (pp. 73-96). Palgrave Macmillan.
- Rawas, S. (2023). ChatGPT: Empowering lifelong learning in the digital age of higher education. *Education and Information Technologies*, 29(6), 6895-6908. <https://doi.org/10.1007/s10639-023-12114-8>
- Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning and Teaching*, 6, 342-363. <https://doi.org/10.37074/jalt.2023.6.1.9>
- Ryan, T. (2015). Quality assurance in higher education: A review of literature. *Higher Learning Research Communications*, 5(4), 1-12. <https://doi.org/10.18870/hlrc.v5i4.257>
- Sadler, I., Reimann, N., & Sambell, K. (2022). Feedforward practices: A systematic review of the literature. *Assessment & Evaluation in Higher Education*, 48(3), 1–16. <https://doi.org/10.1080/02602938.2022.2073434>
- Sharples, M. (2022). Automated essay writing: An AIED opinion. *International Journal of Artificial Intelligence in Education*, 32(4), 1119-1126. <https://doi.org/10.1007/s40593-022-00300-7>
- Smolansky, A., Cram, A., Radulescu, C., Zeivots, S., Huber, E., & Kizilcec, R. F. (2023). Educator and student perspectives on the impact of generative AI on assessments in higher education. *Proceedings of the Tenth ACM Conference on Learning @ Scale*. <https://doi.org/10.1145/3573051.3596191>
- Sok, S., & Heng, K. (2024). *Generative AI in higher education:*

- The need to develop or revise academic integrity policies to ensure the ethical use of AI. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4806030>
- Song, N. (2024). Higher education crisis: Academic misconduct with generative AI. *Journal of Contingencies and Crisis Management*, 32(1), e12532. <https://doi.org/10.1111/1468-5973.12532>
- Sweeney, S. (2023). Who wrote this? Essay mills and assessment – considerations regarding contract cheating and AI in higher education. *The International Journal of Management Education*, 21(2), 100818. <https://doi.org/10.1016/j.ijme.2023.100818>
- Tafazoli, D. (2024). Exploring the potential of generative AI in democratizing English language education. *Computers and Education: Artificial Intelligence*, 7, 100275. <https://doi.org/10.1016/j.caeai.2024.100275>
- Tan, K. H. K. (2020). Rubrics, power and conduct. In K. H. K. Tan (Ed.), *Assessment rubrics decoded* (pp. 79-91). Routledge.
- Tang, K., Cooper, G., Rappa, N., Cooper, M., Sims, C., & Nonis, K. (2024). A dialogic approach to transform teaching, learning & assessment with generative AI in secondary education: A proof of concept. *Pedagogies: An International Journal*, 19(3), 493-503. <https://doi.org/10.1080/1554480x.2024.2379774>
- Taylor, S. (2024). *Is UNESCO's guidance for Generative AI (GenAI) in education & research "the solution" to the problem of GenAI adaptation in international schools? A critical analysis of policy recommendations through Carol Bacchi's What's The Problem Represented to Be? (WPR) Framework. Wayfinder Learning Lab*. [https://sjtylr.net/wp-content/uploads/2024/09/taylors\\_edd\\_policy\\_unescogenai.pdf](https://sjtylr.net/wp-content/uploads/2024/09/taylors_edd_policy_unescogenai.pdf)
- Teixeira, R. J., Brandão, T., & Dores, A. R. (2022). Academic stress, coping, emotion regulation, affect and psychosomatic symptoms in higher education. *Current Psychology*, 41, 7618–7627. <https://doi.org/10.1007/s12144-020-01304-z>
- Tight, M. (2024). Challenging cheating in higher education: A review of research and practice. *Assessment & Evaluation in Higher Education*, 1–13. <https://doi.org/10.1080/02602938.2023.2300104>
- UNESCO. (2023). *Guidance for generative AI in education and research*. <https://unesdoc.unesco.org/ark:/48223/pf0000386693>
- Vallis, C. (2024). Authentic assessment in higher education: The spectre of lost futures. *Teaching in Higher Education*, 1-8. <https://doi.org/10.1080/13562517.2024.2362217>
- Walters, W. H. (2023). The effectiveness of software designed to detect AI-generated writing: A comparison of 16 AI text detectors. *Open Information Science*, 7(1), 20220158. <https://doi.org/10.1515/opis-2022-0158>
- Waltzer, T., Pilegard, C., & Heyman, G. D. (2024). Can you spot the bot? Identifying AI-generated writing in college essays. *International Journal for Educational Integrity*, 20(1), 11. <https://doi.org/10.1007/s40979-024-00158-3>
- Weber-Wulff, D., Anohina-Naumeca, A., Bjelobaba, S., Foltýnek, T., Guerrero-Dib, J., Popoola, O., Šigut, P., & Waddington, L. (2023). Testing of detection tools for AI-generated text. *International Journal for Educational Integrity*, 19(1), 26. <https://doi.org/10.1007/s40979-023-00146-z>
- West, H., Malcolm, G., Keywood, S., & Hill, J. (2019). Writing a successful essay. *Journal of Geography in Higher Education*, 43(4), 609–617. <https://doi.org/10.1080/03098265.2019.1655720>
- Wilkerson, J. R. (2020). Rubrics meeting quality assurance and improvement needs in the accreditation context. *Quality Assurance in Education*, 28(1), 19–32. <https://doi.org/10.1108/QAE-04-2019-0045>
- Zaphir, L., Lodge, J. M., Lisec, J., McGrath, D., & Khosravi, H. (2024). *How critically can an AI think? A framework for evaluating the quality of thinking of generative artificial intelligence*. arXiv. <https://doi.org/10.48550/arXiv.2406.14769>
- Zemits, B. I. (2017). Representing knowledge: Assessment of creativity in humanities. *Arts and Humanities in Higher Education*, 16(2), 173–187. <https://doi.org/10.1177/1474022215601862>



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Integration of GenAI tools by academics to humanise pedagogical spaces: An AI humanising pedagogical perspective

---

Micheal van Wyk<sup>A</sup>

A

*Professor, Department of Curriculum and Instructional Studies, School for Teacher Education, College of Education*

---

### Keywords

AI-humanising pedagogical framework;  
AI-technologies;  
Artificial Intelligence;  
ChatGPT;  
ethical considerations;  
Generative Artificial Intelligence;  
multiple case study design;  
narrative-based research;  
personalised learning.

---

### Correspondence

[vwykmm@unisa.ac.za](mailto:vwykmm@unisa.ac.za)<sup>A</sup>

---

### Article Info

Received 21 November 2024

Received in revised form 4 February 2025

Accepted 6 February 2025

Available online 13 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.24>

### Abstract

Globally, generated AI tools have significantly changed the operations of higher education. This paper contests the claim that academics in the context of this study were exposed to and capacitated with AI literacy, tools and technological skills. The assumption is that they will successfully integrate AI technologies in humanising pedagogy for online learning spaces. This narrative-based research argues, from an AI-humanising pedagogical framework (AIHP), to explore multiple cases of academics integrating AI technologies in humanising pedagogical spaces. Findings reported that AI-generated tools promoted personalised learning, fostering empathy through realistic simulations, generating specific learning content to meet students' needs, and facilitating collaborative learning. Thus, the proposed AI-humanising pedagogical framework provided an alignment in support of dimensions from the narrative-based inquiry depicted in three cases in the study. Higher education institutions must develop institutional AI policies and guidelines for ethical practices, transparency, accountability, and inclusivity in developing and deploying AI.



## Introduction

Since the “release” of the large language model (LLM), ChatGPT3.5 and similar AI technologies have emerged, exponentially influencing various sectors, from creative industries to customer service. Scholars emphasise that these AI technologies are programmed to act as “chatbots” to produce human-like text, images, and even music based on instructions (Onesi-Ozigagun et al., 2024; Sedkaoui & Benaichouba, 2024; Takale et al., 2024). These AI-generated tools have significantly changed the operations of higher education. Literature shows a relationship of mutualism between AI and humanity, such that AI technologies can enrich the human experience. In addition, recent developments in AI-generated tools reported impacted personalised learning, ethical and privacy concerns, administrative efficiency, accessibility and inclusion significantly (Amato et al., 2023; Eaton, 2023; Thurston, 2024; Uzumcu & Acilmis, 2024; Zheng et al., 2024). Moreover, an editorial by Rudolph et al. (2023, p.9) posits that AI technologies could be a teacher’s assistant because teachers can benefit from technology for “brainstorming, creating new subject content, drafting text-based notes and help for dialogically thinking”.

The positive impacts of AI technologies could arguably revolutionise the operations of HEIs globally. Studies reported the benefits of individualised personalised learning and incorporating new technologies in transforming teaching and learning (van den Berg & du Plessis, 2023). Despite being excited, the authors also noted concerns from respondents (Chisom et al., 2023; Falebita & Kok, 2024; Hlongwane et al., 2024; Tarisayi, 2024) about academic integrity and ethics as well as privacy and bias involved with new technologies. Sanders and Mukhari (2024) provide South African lecturers’ perspectives on the management support they perceive is essential for integrating AI-generated tools in a blended teaching and learning approach.

Despite positive reports about AI technologies, scholarly publications from the Global South raised concerns about academic dishonesty, ethics, plagiarism, copyright infringements, information privacy and intellectual property rights (Sevnarayan & Maphoto, 2024; Singh, 2023; Verhoef et al., 2022). Moreover, Sevnarayan and Potter (2024, p.2) investigated the impact of ChatGPT on student academic integrity, revealing that the “potential for blurred lines between collaboration and unauthorised assistance looms large and raises concerns about plagiarism and academic dishonesty.” To address these concerns, the South African government, as co-signatories to the UNESCO Recommendation to the Ethics of Artificial Intelligence (UNESCO, 2021), gazetted the National Artificial Intelligence (AI) Policy Framework (Department of Communications and Digital Technologies, 2024) as a contingency strategy. This framework provides a strategic framework to enable and accelerate South Africa’s leveraging of AI for national development and innovation. One of the vital mandates of this framework is to encourage cyber security, ethical conduct, transparency, accountability and inclusion in the furthering and use of AI (Dai et al., 2024; Eaton, 2023; Popenici, 2023). The framework guides what higher education can do to reap benefits from it while preventing issues that may cause harm (Department of Communications and Digital

Technologies, 2024). Therefore, HEIs have the opportunity to leverage this framework as well as use AI technologies as potential drivers to be every bit as important for addressing how institutions work with, rather than against, the nature of being human; hence, it is an absolute prerequisite for best-practice institutional AI policies and guidelines/approaches by institutions everywhere (Cacho, 2024; Lund & Naheem, 2024).

Research reported positive outcomes of harnessing technologies in humanising pedagogy for diverse teaching and learning spaces (Fataar, 2016; Kajee, 2021; Keet et al., 2009; Zinn et al., 2016). In addition, Pika (2024) modelling a professional development framework, a Humanising Digital Pedagogy (HDP) for futuristic empowering teachers. This HDPF integrates AI technologies into education practices to address the needs and experiences of students. This HDP provided the basis for including dimensions not part of the original framework as an opportunity to apply them online. Although some research has reported on the benefits and concerns of AI technologies, there have been few empirical investigations into humanising pedagogy and harnessing AI technologies. Apart from Pika’s (2024) HDP model, there is a need to contribute to theory and practice to conceptualise an AI humanising pedagogical model applied in a narrative-based inquiry. Second, despite empirical investigations using multiple-case study design (Yin, 2014), little narrative-based research has been applied in a multiple-case study design exploring academics’ views of harnessing AI technologies in humanising pedagogical spaces.

This paper contests the claims that “successful integration of AI in higher education must be grounded in the principles of ethics, equity, and the prioritisation of educational aims and human values” (Rudolph et al., 2024). Moreover, academics in the context of this study were exposed to and capacitated with AI literacy, tools, and technological skills. The assumption is that they will successfully integrate AI technologies in humanising pedagogy for online learning spaces. To attest to these claims, an investigation is prompted into academics harnessing AI technologies into humanising pedagogical online environments. The participants were requested to script narratives based on the following questions:

- What are participants’ views of harnessing generated AI technologies in humanising pedagogy for an online learning space?
- How are they selecting AI technologies for the course to apply a humanising pedagogical approach to an online space?
- Based on existing literature and the empirical findings, what dimensions emerged to be included in a proposed AI-humanising pedagogical framework?

Therefore, this paper focuses on defining humanising pedagogy and makes a theoretical argument for constructing an AI-humanising pedagogical framework based on the principles, practices and dimensions applied in multiple cases of either engendered humanised or dehumanised online learning spaces. This argument is based on the

support of a narrative-based inquiry depicted in three case studies. Inclusion, methodological considerations, findings, discussions, and specific suggestions are provided for further investigations.

## Context of the study

This multiple case study is located in a College of Education and engaged with one of the catalytic niche areas, Fourth Industrial Revolution (4IR) and digitalisation, at the university where the research is based. Before launching the National Artificial Intelligence (AI) Policy Framework, the college organised several webinars, online discussion sessions and off-campus training to increase awareness of AI literacy and training of academics in AI-generated tools for online pedagogy. Awareness of the ethical use of AI-generated tools for online pedagogy and development of the AI policy and guidelines were held under the selected catalytic niche, followed by several sessions with staff in each of the ten departments. As a college flagship project, the Digitalisation Project was registered to identify specific modules to be part of the catalytic niche area. Based on the university and college strategic objectives and operational plan (2023-2030), academics were instructed to apply the approved AI-generated tools such as Grammarly (paraphrasing), Turnitin (detecting plagiarism) and CoPilot (generated text/context) for online pedagogy. The college management mandated that the author of this paper conduct oversight visits to verify whether academics applied what they learned about AI literacy, ethics, and tools in their courses. The latter resulted in an investigation of academics using AI-generated tools online (van Wyk, 2024).

## Literature review

This narrative-based research provides a theoretical argument defining humanising pedagogy and contextualising within an AI-humanising pedagogical framework (AIHP). Thereafter, I briefly explained the model's dimensions in the context of the multiple-case design. In these cases, the consented academics harness AI-generated tools to enhance a humanising pedagogy environment.

## Theorising humanising pedagogy

Paulo Freire's seminal text, *Pedagogy of Freedom* (Freire, 1998), impacted the theorisation of humanising pedagogy, and several scholars have extended this phenomenon. Humanising pedagogy enhances a student's dignity, respect, empathy and holistic development (Alm & Watanabe, 2023; Zuin & de Mello, 2024). Therefore, humanising pedagogy is an educational approach that focuses on the holistic development of students by acknowledging and valuing their humanity (Bartolome, 1994). Moreover, Vokwana and Baleni (2023) describe humanising pedagogy as a "decolonial social transformative theory that focuses on the creative utilisation of digital resources to improve the quality of teaching and learning". According to Pika (2024, p. 125), "humanising pedagogy includes building relationships, recognising individual differences, inclusive practices,

authentic communication, empathy and understanding, flexibility and personalisation, student-centred learning and promoting well-being". I argue that AI technologies can be the "catalyst" in humanising pedagogical spaces to inculcate respect, human values, emotions, and experiences of students. In addition, Fataar (2016, p. 76) opines that in practising a humanised pedagogical approach, students need to be "engaging within the social-subjective in educational spaces, encourages pedagogies that support how young people mobilise their educational resources and networks across different spaces to facilitate their learning". Therefore, when lecturers apply the humanised pedagogical approach, the existence and expansion of students' humanity are at the heart of humanising pedagogy. Furthermore, Salazar (2013, p. 129) points out that this phenomenon "is guided by principles and practices that may assist teachers and students to develop consciousness of their freedom to access or produce knowledge and to take constructive action".

## Studies on humanising pedagogy using AI-powered tools

AI-generated studies indicated ways it could help improve humanisation, such as by creating unique and customised experiences for individual users, creating realistic simulations to help develop a greater sense of empathy and making creative tools more accessible (Kaldaras et al., 2024; Uzumcu & Acilmis, 2024; Zheng et al., 2024). The research proves how AI-enabled chatbots can personalise student support and feedback, allowing personalised interaction between students and learning spaces (AI-Mughairi & Bhaskar, 2024). Additionally, artificial intelligence can replicate human emotions and environments, which can be very helpful in therapeutic situations as a tool for exploring complicated emotions and memories. Moreover, Rudolph et al. (2024, p. 20) argue that the successful integration of AI in higher education must be grounded in the "overall aims of education and bedrock principles of ethics, equity, and the prioritisation of educational aims and human values."

Chan and Tsi (2024, p. 10) confirmed that AI had brought new dynamics, but "the importance of social-emotional competencies can only be developed through human interactions, something which generative AI technologies cannot currently replicate." Crawford et al. (2024, p. 894) concluded that using AI-generated tools in the form of "social support from peers and other people plays a significant role for university students in their sense of belonging," Additionally, AI can create tailored learning materials to cater to students' requirements (Rashid et al., 2024). Studies reported that AI-powered tools adapted learning materials by setting the difficulty level of assessments and offered specific feedback to help enhance interactive and personalised learning experiences by analysing student performance and learning styles (Amato et al., 2023; Kaldaras et al., 2024; Uzumcu & Acilmis, 2024; Zheng et al., 2024).

Scholars supported integrating AI technologies, which offered students personalised and adaptive learning experiences (AI-Mughairi & Bhaskar, 2024; Neupane et al., 2024). Thurston (2024) reported on a comprehensive

strategy with AI-generated tools for humanising learning and AI literacy and engaging on the #DigitalPowerups platform for rigorous student engagement. Apart from this, AI can promote student collaborative learning by arranging team-based learning where community and think-pair-share ideas can be implemented (Ouyang & Zhang, 2024). This view is supported by Nguyen et al. (2024), who reported that ChatGPT significantly influenced student learning behaviours and increased performance. Furthermore, studies reported prevention strategies to combat cheating, academic dishonesty and plagiarism (Rane et al., 2024; Tripathi & Thakar, 2024). Last but not least, the integration of AI should be goal-oriented — an ethical and responsible use of AI (Adillón et al., 2024; Lepri et al., 2021; Popenici et al., 2023).

## Methodological considerations

Ethical clearance was approved for this preliminary inquiry under the college's digitalisation project. Hence, an exploratory narrative-based research study was chosen for its qualitative approach. Inquiry-based narratives move from focusing on generalisations to examining the experience of specific cases of academics exploring AI-generated tools in online courses. Connelly and Clandinin (1990, p. 375) defined narrative-based research "as an inquiry methodology which adopts a particular view of experience as a phenomenon under study. People shape their daily lives with stories of who they and others are, and they interpret their past in terms of these stories."

Data were extracted from narratives of participants' views, which provided a rich and valuable way to understand human experiences and the meanings people assign to them. I purposefully selected the narrative-based research and aligned it with the multiple-case study design (Yin, 2014). The selection of the multiple case study design offered a rich and comprehensive understanding of participants' actions in harnessing AI technologies in humanising pedagogy. The selection justified is based on increasing the validity and reliability of three cases to verify findings. The findings of the multiple case studies provided various perspectives on harnessing AI technologies in different courses. In each of these cases, specific trends and patterns emerged, such as AI tools (ChatGPT, CoPilot, Grammarly), grading of assessment tasks, feedback, ethics, and privacy. The findings derived from the multiple cases were more robust.

I analysed academic narratives that exemplify AI-generated tools to humanise students through capacitation with AI literacy skills, awareness, ethics, and privacy within online pedagogical spaces (Kajee, 2021). Purposive sampling was used to select participants who consented to participate in the research. After obtaining consent, participants were informed that their participation was voluntary and that they could withdraw at any time if they felt uncomfortable during the study. The three cases are:

- Case Study 1: Humanising Pedagogy with AI-assisted learning resources. Ruth (female, Senior Lecturer) teaches online under one of the course learning units, Humanising Pedagogy with AI-

generated tools.

- Case Study 2: Mpho (male, Associate Professor) co-teaches a Bachelor of Education Honours (Bed Hons) course, Research Design and Methodology, in the postgraduate course using AI-generated tools.
- Case Study 3: Kolabo (female, Full Professor) teaches inclusive education at the undergraduate level. She revised one of the learning units in her module, Using AI for Gender-based Equality and Ubuntu.

Meanwhile, participants used AI-generated tools as phenomena in ways that compared those first with both similar issues and contexts (teaching online teacher education programs) and subsequently contrasted them to others through their narratives (personal experiences) and views as differences in online courses in humanising or dehumanising these tools applied in humanised online pedagogy. The three participants have received training on AI-generated tools as part of the Digitalisation Project. Participants received the two specific questions two days before the online interviews, which gave them time to reflect on them. After the interview sessions, participants had written narratives of each question, which were then emailed to the researcher. The narratives (data sets) were uploaded into the NVivo 14 computerised qualitative software to build themes associated with the narrative excerpts of each of the three cases (<https://lumivero.com/products/nvivo/>). The following procedures were based on qualitative computerised software: (1) created a project theme according to the research question intended for the procedures; (2) coded data sets of each case (narratives); (3) running the qualitative software, generating and analysis of generated themes; (4) interpreting its results with reference; and (5) compared to original narratives. The verification process was undertaken with participants who received the original narratives (narratives of the three cases) and the themes generated by NVivo's qualitative computerised software. Each participant verified the original transcripts and compared them with the generated themes. After acceptance of the data sets, participants signed to validate the transcribed data and themes generated by NVivo (participant validation). Finally, the generated themes and original transcripts (narratives) were sent to one of the senior professors who specialises in qualitative research and frequently used the NVivo software program to compare, validate and confirm that generating themes are a true reflection.

## Findings

The multiple case studies showed that participants' narrated extracts captured the thematic dimensions of AI-generated tools used in their courses to enhance humanising and dehumanising pedagogy in online learning spaces.

## **Case Study 1: Humanising Pedagogy with AI-generated tools**

Ruth (pseudonym) is a female senior lecturer teaching an online undergraduate module within the Bachelor of Education program. Since her appointment eight years ago, she alluded that she experienced a shift in curriculum delivery from blended learning to a fully online teaching mode. Ruth teaches an online module and has revised one of her learning units based on Humanising Pedagogy with AI-generated tools. She was empowered to teach with AI tools. Ruth also attended the college digitalisation project activities to revise her module. The COVID-19 pandemic and AI-generated tools, CoPilot and Grammarly, had affected her online teaching significantly. These two factors created an opportunity to modify the learning unit, Humanising Pedagogy. She had noticed an opportunity to include AI-generated tools.

### ***AI is the “teacher’s assistant” in support of humanising pedagogy***

The “hype” about ChatGPT and other AI-generated tools created a chance to integrate AI-generated tools in her online module. In the module, she made learning spaces for personalised learning, created an online presence for accessibility, and engaged spaces that fostered a humanising pedagogical approach. Ruth echoed sentiments about how AI-generated tools can support personalised learning:

“I intentionally use AI-generated tools in my module. I noticed that some of my students had grammatical issues in assessments. Most of the students are African language speakers but are taught in English. As stated, you must be deliberate in overcoming some students’ challenges. To remedy this challenge, I created an awareness of the benefits of Grammarly as a paraphrasing tool.”

Students used Moodle as a learning management system (LMS) to access the online module. Ruth said:

“My students received monthly data freely from the university. Therefore, they can access the module site anytime, everywhere, at any location; accessibility is not an issue. As soon as I posted announcements, uploaded learning resources, graded assessments and conducted online discussions, students received a notification.

### ***Creating interactive and engaged humanised spaces for the course***

The AI-generated tools created engagement in the module site. Ruth said AI is an active partner in creating interactive and engaging learning spaces. She alluded to the benefits of using these AI technologies. Ruth is serious about active participation and engagement in the module, but these AI-generated tools could reduce student-lecturer interaction. She highlighted that she practices what she teaches in the learning unit, Humanising Pedagogy with AI-generated tools. She spoke about the virtues of caring and Ubuntu.

She alluded...

“Caring for my students is a vital virtue in my teaching identity...I am aware of the profile of my students; some are from rural towns. I do my best to inculcate a sense of Ubuntu and act on the pedagogy of care, particularly in the online presence. I believed in an open-door policy and expected students to consult me if they needed support.”

### ***Empowering students with ethical skills in humanising learning***

As revealed by Ruth, AI-generated tools must be employed to create personalised learning spaces and engage and assess as a crucial dimension for deep learning and retention of knowledge and skills. Ruth and the students were aware of the ethical conditions, risks, and challenges posed by using the tools. Her concern is that:

“AI tools are available, so students have access to these tools... having said that... we need to help them not to compromise critical thinking, creative thinking, and independent problem-solving skills”.

### ***Inculcate academic integrity as a humanised pedagogical dimension***

Ruth is very serious about academic integrity and will not compromise any dishonesty, which remains a humanising issue for her students. Some students were awarded honesty in preparing tasks. Constantly, Ruth had warned students about the consequences of academic dishonesty. She wrote:

“I created and taught in my teaching that integrity, morality, and ethical practices need to be acted. In the Introduction of the module, moral issues are highlighted and must be adhered to... there is no place for academic dishonesty in my module. Before each learning unit, I made students aware of plagiarism, cheating, and academic dishonesty...I provided a link to the university policy on AI, Assessment, and Academic Integrity on the module site.”

### ***Socially and caring is at the heart of humanising pedagogy***

Ruth acknowledged that AI-generated tools can facilitate learning but cannot replace the human-nuanced caring and empathetic interactions between students and lecturers. Ruth stated in one of her narratives an issue of isolation. Ruth likes contact sessions and remembered how the pandemic had isolated them. She narrates.

“The reliance on AI-generated tools and online platforms reduced opportunities for face-to-face interaction, leading to isolation and disconnection among my students.”

Ruth believes that human interaction is a critical component of socialisation during the teaching experience, and its absence can negatively impact student well-being.

## Case Study 2: AI-generated tools in the postgraduate course

Mpho (pseudonym) was appointed in 2011 and promoted to associate professor. Currently teaches a compulsory module in the Bachelor of Education Honours (Bed Hons), Research Design and Methodology. He also supervises master's and doctoral students as part of his job description. He has experimented with and integrated new digital technologies into student-centred teaching approaches, qualitative research methods, and academic writing. The new Bed Hons program was approved; he had also revised his module by integrating AI-generated tools into the postgraduate course. Since the launch of ChatGPT3.5 and other similar AI-generated tools, Mpho became interested in exploring these digital technologies.

### *Equipped with AI literacy skills and use of AI technologies*

Mpho is experienced in using AI technologies in his teaching. He said:

"I started with the free version of ChatGPT3.5, and I noticed the tool's benefits. Why are people scared to use it? AI is only a tool; you need to stay in control; it is all about the purpose of using the tool."

Furthermore, he alluded to his exposure to using specific AI-generated tools as part of college catalytic niche areas. He spoke passionately:

"The training exposed us to AI-generated tools. How to implement it in our modules as part of the selected catalytic niches, the Fourth Industrial Revolution (4IR) and digitalisation. I am confident that Grammarly is a fantastic paraphrasing tool. This tool is a game-changer for my struggling students in academic writing."

### *Empowering postgraduate students with AI literacy skills*

Since then, my students have been empowered and actively used Grammarly. This tool changed their challenges into positives. He said:

"I exposed and created awareness of the different AI technologies. I was so excited to train my postgraduate students... but believed that AI has been increasingly integrated into teaching, research and community engagement."

### *AI technologies provide instant feedback and free up time*

Concerning integrating humanising aspects, like support for postgraduate students, AI tools can handle administrative tasks such as grading and attendance tracking, freeing up teachers to focus more on direct student interaction and personalised instruction. Mpho speaks confidently about how assessment practices have changed in the past decade. He spoke briefly about the transition:

"from paper-based to online assessments, but the COVID-19 pandemic has accelerated this process. Before the pandemic, we were exposed to online module platforms and were trained in J-Router as an AI-generated tool for grading students' assessments. The university's information technology unit developed the J-Router tool before the launch of ChatGPT3.5". The J-Router was a great tool to provide timely feedback to students."

Mpho's student profile showed that some completed their undergraduate studies several years ago. Based on the student profile, he said..." *I used the AI-generated assessment performance tool, Power BI, a plug-in in the Moodle LMS, to track students-at-risk and profiling interventions.* According to Mpho, this shift allows academics to spend more time understanding and addressing individual postgraduate student needs.

### *Use AI technologies to track students-at-risks for early interventions*

His Bed Hons students are mostly in-service teachers. He said... *I implemented practical strategies and integrated AI-generated tools for Grammarly and CoPilot, empowering them to create confidence and adapt to new learning experiences in the course.* The adaptability of AI-driven platforms can be used to create and adapt to each student's learning progress, which can increase adaptive learning, providing customised exercises and feedback. Mpho expressed his delight in the progress tracking software..." *I used Power BI to track student-at-risk and create learning interventions".* Another humanising strategy is early interventions based on the performance in the course. Mpho agreed that academics are using AI technologies like Power BI (plug-in Microsoft 365) to support lecturers in analysing students' performances in the course. Lecturers used the data (information) to identify at-risk or struggling students and alert lecturers to intervene early. This proactive approach helps prevent students from falling behind and ensures timely support.

## Case Study 3: Harnessing AI to promote gender equality

Kolabo is a female professor in inclusive education. She revised her modules three years ago and experimented with and integrated new digital technologies. She intentionally integrated digital technologies, like ChatGPT3.5, and, until recently, explored other AI-generated tools, such as Grammarly, CoPilot, and Gamma.ai. Why did she harness these tools in her modules? Kolabo mentioned in her narratives that she made a paradigm shift in the learning unit, Gender-based Equity and Equality, by harnessing the AI-generated tools to promote gender equality, equity, fairness and non-discrimination. Since the launch of ChatGPT3.5 and other similar AI-generated tools, Kolabo has become interested in exploring these digital technologies in her courses.

## ***Torch-bearer for engendering gender equality***

Her narratives revealed that

“Gender-based violence is a pandemic worse than COVID-19... eish... every hour, a woman and girl child is either raped or murdered. I sensitised my students about this pandemic that the country is facing. By the way, they will soon become teachers to take the message into their classrooms.”

She said the pandemic did not severely impact how she teaches, but the personal touch got a knock...” COVID-19 was disruptive and caused “loss of teaching time. Still, we are teaching online, no time was precisely lost. Still, the personal touch we had missed”. As a torch-bearer of gender equality, Kolabo highlights the importance of gender-based issues in harnessing AI in the course. She said:

“AI could be used as a transformational tool to create gender-based content to humanise gender-based stereotypes and enhance gender equity in the workplace.”

She deliberately revised one of the learning units in the course. The purpose is to create student-diverse views on AI-generated content to improve inclusivity and fairness. Since the revised learning unit, she noticed that students know gender-based equity and equality content and practices. Through online discussions, critical reflections emerged related to awareness among her students.

### ***Harnessing AI technologies to generate content-specific case studies***

Kolabo used AI-generated tools to generate specific case studies on stereotypes and gender equality in the workplace. After studying the case studies, some students raised concerns about the disparities of women in senior leadership positions because of discriminatory HR policies, practices and gender stereotyping within the teaching profession. Finally, she talked about how AI generates specific content related to the principles of Ubuntu. Her narrative extracts captured some principles of Ubuntu. She narrated:

“sense of community, inclusivity, and diversity” ... inculcating a sense of feeling valued, belonging and supported throughout the course.”

## **Discussion**

Literature does not provide a convincing definition for AI, which is evolving and problematic (Fetzer, 1990). Moreover, Sivasubramanian (2021) provides a guiding definition for AI that can be used intelligently and cognitively in support of humans to generate specific content to enhance humanising pedagogy. Based on this guiding definition and aligned to the HDP model of Pika (2024), the proposed AIHP model foregrounded the principles and dimensions of humanising pedagogy, namely ethical, social, and psychological, to support and align to the qualitative, narrative-based research approach.

First, participants’ views of harnessing generated AI technologies in humanising pedagogy for an online learning space are provided. Each case study provided specific dimensions for successful application in a humanised pedagogical space. Participants harnessing AI-generated tools for undergraduate and postgraduate studies. Based on Paulo Freire’s seminal text, *Pedagogy of Freedom* (Freire, 1998), scholars concurred that humanising pedagogy emphasises the importance of a student’s dignity, respect, empathy, and holistic development (Alm & Watanabe, 2023; Rudolph et al., 2024; Zuin & de Mello, 2024). The three cases (Ruth, Mpho and Kalobo as participants) revealed they harness AI-generated tools in humanised pedagogy. This view is supported by Salazar (2013, p. 129), who argues that humanising pedagogy “is guided by principles and practices that may assist teachers and students to develop consciousness of their freedom to access or produce knowledge and to take constructive action”.

Findings showed that Ruth and Mpho applied specific AI-generated tools to support students in enhancing personalised learning in the course. Ruth narrated, “*I used Copilot to help tailor educational content to individual student needs, promoting a more personalised learning experience.*” Al-Mughairi and Bhaskar (2024) concurred that AI-enabled chatbots can personalise student support and feedback, allowing personalised interaction between students and lecturers. Furthermore, participants expressed gratitude for how AI-generated tools supported grading assessment tasks and tracking student attendance, freeing them to focus more on direct student interaction and personalised instruction (Kim et al., 2022). A study by Nguyen et al. (2024) confirmed that AI-generated tools like ChatGPT significantly impacted student learning. Studies have reported on supporting postgraduate students and how assessment practices have changed in the past decade (Gray & Dunn, 2024; Kiaer & Jeon, 2024).

The second question focuses on successfully implementing AI technologies for course delivery based on ethics and equality in an online space. Studies reported that AI technologies could create unique, customised content for personalised learning and help develop a greater sense of empathy for AI technologies (Kaldaras et al., 2024; Neupane et al., 2024; Uzumcu & Acilmis, 2024; Zheng et al., 2024). In each case study, participants purposely selected and harnessed AI technologies to create awareness among students, promote gender equality in the course, identify students, and capacitate postgraduate students with research and AI literacy skills. Participant (Mpho) spoke briefly about the support of harnessing AI technologies in her course: “*I used the AI-generated assessment performance tool, Power BI, a plug-in in the Moodle LMS, to track students-at-risk and profiling interventions.*” Similarly, Kaldaras et al. (2024) argue that when using AI to develop AI-generated assessments, the purpose must be aligned with the performance expectations of the learning program. Abdaoui and El Aggoune (2023) found that students often face issues related to accessibility to online courses through Moodle LMS. Ruth said: “*Accessibility ensures all students have equal opportunities to learn and succeed regardless of their circumstances.*” If students access the course, student engagement will optimally increase their online presence. Ruth said AI is an active partner in creating

interactive and engaging learning spaces. She alluded to the benefits of using these tools in her module; *I am creative and innovative in using prompting as an AI literacy technique to be prompting*. However, the participant (Kolabo) narrated that harnessing AI-generated tools to promote gender equality, equity, fairness, and non-discrimination is crucial for humanising the learning space (Joseph et al., 2024; Rudolph et al., 2024). Participant (Kolabo) harnessed AI-generated tools to develop gender-based content to humanise stereotypes and gender equity in the course. In addition, scholars reported on the AI-biases typologies and suggested mitigation strategies to overcome AI-generated content biases (Shuford, 2024; van Wyk, 2024). Participants have warned students about the consequences of academic dishonesty, which contradicts humanising pedagogy. AI-generated tools posed challenges and dehumanising risks for participants and the students, such as overreliance on AI-generated tools, isolation, reduced interaction and created academic dishonesty among students (Eaton, 2023; Sedkaoui, & Benaichouba, 2024).

### **Theorising a proposed AI-humanising pedagogical frame (AIHP)**

Based on existing literature and the empirical findings, dimensions were identified to be included for a proposed AI-humanising pedagogical frame foregrounded in Pika's (2024) Humanising Digital Pedagogy (HDP) for the futuristic empowerment of schoolteachers. This model forms the basis of the proposed AI-humanising pedagogical model on the premise of integrating the principles of humanising pedagogy into the development and use of artificial intelligence in teaching and learning. It focuses on creating more empathetic, ethical, and user-centred AI systems. The AI-humanising pedagogical model (AIHP) is centred around three key dimensions, namely social, ethical and psychological, as opposed to the technical aspects of AI. This perspective accounts for the impact of AI on human experience. Various moral/ethical implications of AI qualifying as a decision-making authority create social reactions to deploying an automated system and psychological effects. Intelligent-like behaviour responses are created as humans interact through prompts with AI technologies.

First, the *social dimension* of the AIHP model emphasises transparency, fairness, and accountability in AI-generated tools and usage in each of the cases (courses) applied to ensure that these technologies support human (students) flourishing and reflect societal norms. The social specificity and interactivity of the AIHP model correspond to the collective knowledge base on human engagement with automation, moral discourse relevant to ethics concerns, and the positive psychological valency in manipulating human relations by machines. I argued that three distinctive dimensions underscore the AIHP model based on the social dimension related to societal norms, values, and structures that focus on privacy, bias and equity. Moreover, Devis-Rozental and Clarke (2020) opine that students and academic's "well-being and other associated positive psychology constructs are needed to humanise higher education.". Through AI's application in the three study cases, these dimensions influence social interactions and

decision-making, shaping individual and group behaviour.

Second, the *ethical dimension* of the AIHP model is based on integrity, ownership, privacy, bias and human interaction with AI and machine learning (Salle & Rini, 2024). For example, the participants applied the AI-generated tools in a humanised manner, as shown in teaching in an online space. These participants are compelled to act with integrity and ethics when using AI technologies responsibly to protect the image and information of the university. According to Dabis and Csáki (2024), moral and legal responsibilities are vested in lecturers who are information custodians. Therefore, academics must, at all costs, control quality-assured AI-generated content for specific learning units. They are the specialist [experts] to ensure the correctness of such AI-generated content. If neglected, this responsibility could challenge the intellectual property rights, authorship and ethical issues of this generated content. Ethically, suppose the content was AI-generated and appropriate for the course. In that case, academics need to acknowledge the AI-generated software to protect the integrity of the university or could be exposed to serious infringement of intellectual property rights issues.

Finally, the *psychological dimension* in the AIHP model is based on student and lecturers' wellness, empathy, cohesion and group interaction. The psychological dimension in AI integrates psychological principles and human behaviour understanding into developing and applying AI tools in an online space. This dimension focuses on how AI can better interact with humans by recognising and responding to the students' and lecturers' emotions, thoughts, and behaviours. The psychological dimension reflected student and lecturer engagement in course content, some partially AI-generated to achieve module outcomes. In addition, in this study, three lecturers implemented humanising pedagogical practices in online spaces through awareness and preventive strategies of optimal use of AI tools during course delivery.

### **Conclusion and future research**

Based on Paulo Freire's seminal text, *Pedagogy of Freedom* (Freire, 1998), scholars concurred that humanising pedagogy emphasises the importance of a student's dignity, respect, empathy and holistic development. Findings reported that AI-generated tools promoted personalised learning, fostering empathy through realistic simulations, generating specific learning content to meet students' needs, and facilitating collaborative learning. Furthermore, each case study provided specific dimensions for successful application in a humanised pedagogical space. The participants were upskilled in AI literacy, AI-generated tools, and practice to successfully implement AI technologies for the course delivery based on ethics and equality for humanising pedagogical spaces. Moreover, participants purposely selected and harnessed AI technologies to intentionally create ethical awareness of the benefits and drawbacks of AI technologies among students, promoting gender equality in the course, identifying student-at-risk, and capacitating postgraduate students with research, ethics, academic honesty and AI literacy skills.

Based on the existing literature and empirical findings, an AIHP framework is proposed for future training to ensure that when academics integrate AI technologies, they use it in an accountable, transparent, ethical and socially responsible manner to protect the privacy of students, colleges, and universities' information against incorrect AI-generated content which could have intellectual property rights issues. This study had limitations that are associated with a narrative-type of inquiry. The qualitative research used three cases limited to the findings, but a mixed methods design may yield different results when investigating a larger group of participants. This novel study aimed to use the AIHP framework within teacher education for future professional development training. It is recommended that higher education institutions develop institutional AI policies and guidelines for ethical practices, transparency, accountability, inclusivity and protection of intellectual property rights.

## References

Abdaoui, M., & El Aggoune, A. (2023). *Online learning through Google Meet™ for Moodle: The need to maintain accessibility and visibility of Algerian universities' websites in the post-COVID era*. [https://www.researchgate.net/publication/380712029\\_Online\\_Learning\\_through\\_Google\\_Meet\\_for\\_Moodle\\_The\\_Need\\_to\\_Maintain\\_Accessibility\\_and\\_Visibility\\_of\\_Algerian\\_Universities'\\_Websites\\_in\\_the\\_Post-COVID\\_Era](https://www.researchgate.net/publication/380712029_Online_Learning_through_Google_Meet_for_Moodle_The_Need_to_Maintain_Accessibility_and_Visibility_of_Algerian_Universities'_Websites_in_the_Post-COVID_Era)

Adillón, M. V., Bellón, E. M. E., Cantero, J. M. M., & Forgas, R. C. (2024). Academic integrity in pre-service teacher education: a review of the literature. *Práxis Educativa*, 19. Academic integrity in pre-service teacher education: A review of the literature

Alm, A., & Watanabe, Y. (2023). Integrating ChatGPT in language education: A Freirean perspective. *Iranian Journal of Language Teaching Research*, 11(3), Special Issue, 19-30. <https://doi.org/10.30466/ijltr.2023.121404>

Al-Mughairi, H., & Bhaskar, P. (2024). Exploring the factors affecting adopting AI techniques in higher education: Insights from teachers' perspectives on ChatGPT. *Journal of Research in Innovative Teaching & Learning*. <https://doi.org/10.1108/JRIT-09-2023-0129>

Amato, F., Galli, A., Gravina, M., Marassi, L., Marrone, S., & Sansone, C. (2023). AI-powered learning: Personalizing education for each student. In *Ital-IA* (pp. 478-483).

Bartolome, L. (1994). Beyond the methods fetish: Toward a humanising pedagogy. *Harvard Educational Review*, 64(2), 173-195. <https://doi.org/10.17763/haer.64.2.58q5m5744t325730>

Cacho, R. M. (2024). Integrating Generative AI in university teaching and learning: A model for balanced guidelines. *Online Learning*, 28(3). <https://doi.org/10.24059/olj.v28i3.4508>

Chan, S. K. Y., & Tsi, L. H. Y. (2024). Will generative AI replace teachers in higher education? A study of teacher and student

perceptions. *Studies in Educational Evaluation*, 83, 101395. <https://doi.org/10.1016/j.stueduc.2024.101395>.

Chisom, O. N., Unachukwu, C. C., & Osawaru, B. (2023). Review of AI in education: Transforming learning environments in Africa. *International Journal of Applied Research in Social Sciences*, 5(10), 637-654. <https://doi.org/10.51594/ijarss.v5i10.725>

Connelly, F. M., & Clandinin, D. J. (1990). Stories of experience and narrative inquiry. *Educational Researcher*, 19(5), 2-14. <https://doi.org/10.3102/0013189X019005002>

Crawford, J., Allen, K. A., Pani, B., & Cowling, M. (2024). When artificial intelligence substitutes humans in higher education: The cost of loneliness, student success, and retention. *Studies in Higher Education*, 49(5), 883-897. <https://doi.org/10.1080/03075079.2024.2326956>

Dabis, A., & Csáki, C. (2024). AI and ethics: Investigating the first policy responses of higher education institutions to the challenge of generative AI. *Humanities and Social Sciences Communications*, 11, 1006. <https://doi.org/10.1057/s41599-024-03526-z>

Dai, Y., Lai, S., Lim, C. P., & Liu, A. (2024). University policies on generative AI in Asia: Promising practices, gaps, and future directions. *Journal of Asian Public Policy*, 1-22. <https://doi.org/10.1080/17516234.2024.2379070>

Department of Communications and Digital Technologies. (2024). *National Artificial Intelligence policy framework. government press, Pretoria*. <https://www.dcdt.gov.za/sa-national-ai-policy-framework/file/338-sa-national-ai-policy-framework.html>

Devis-Rozental, C., & Clarke, S. (2020). *Humanising higher education: A positive approach to enhancing wellbeing*. Palgrave MacMillan.

Eaton, S. E. (2023). Postplagiarism: Transdisciplinary ethics and integrity in the age of artificial intelligence and neurotechnology. *International Journal of Education Integration*, 19, 23. <https://doi.org/10.1007/s40979-023-00144-1>

Falebita, O. S., & Kok, P. J. (2024). Strategic goals for artificial intelligence integration among STEM academics and undergraduates in African higher education: A systematic review. *Discovery Education*, 3(1), 1-22. <https://doi.org/10.1007/s44217-024-00252-1>

Fataar, A. (2016). Towards a humanising pedagogy through an engagement with the social-subjective in educational theorising in South Africa. *Educational Research for Social Change*, 5(1), 10-21. <https://doi.org/10.17159/2221-4070/2016/v5i1a1>

Fetzer, J. H. (1990). *Artificial intelligence: Its scope and limits, Volume 4*. Springer.

Freire, P. (1998). *Pedagogy of freedom: Ethics, democracy, and civic courage*. Rowman & Littlefield Publishers.



- Gray, L. E., & Dunn, S. D. (Eds.). (2024). *Humanizing online teaching and learning in higher education*. IGI Global.
- Hlongwane, J., Shava, G. N., Mangena, A., & Muzari, T. (2024). Towards the integration of artificial intelligence in higher education, challenges and opportunities: The African context, a case of Zimbabwe. *International Journal of Research and Innovation Social Science*, 8(3S), 417-435. <https://dx.doi.org/10.47772/IJRISS.2024.803028S>
- Joseph, O. U., Arikpo, I. M., Victor, O. S., Chidirim, N., Mbua, A. P., Ify, U. M., & Diwa, O. B. (2024). Artificial Intelligence (AI) in academic research. A multi-group analysis of students' awareness and perceptions using gender and programme type. *Journal of Applied Learning and Teaching*, 7(1), 1-17. <https://doi.org/10.37074/jalt.2024.7.1.9>
- Kajee, L. (2021). Teacher narratives and understandings of (de) humanising pedagogy. *South African Journal of Higher Education*, 35(6), 138-150. [https://hdl.handle.net/10520/ejc-high\\_v35\\_n6\\_a9](https://hdl.handle.net/10520/ejc-high_v35_n6_a9)
- Kaldaras, L., Akaeze, H. O., & Reckase, M. D. (2024). Developing valid assessments in the era of generative artificial intelligence. In *Frontiers in education* (Vol. 9, p. 1399377). Frontiers.
- Keet, A., Zinn, D., & Porteus, K. (2009). Mutual vulnerability: A key principle in a humanising pedagogy in post-conflict societies. *Perspectives in Education*, 27, 109-119. <https://eric.ed.gov/?redir=http%3a%2f%2fjournals.sabinet.co.za%2fpie%2findex.html>
- Kiaer, J., & Jeon, Y. J. (2024). Humanizing AI education: The MERGE framework for supporting teachers in AI-enhanced classrooms. *International Journal of Contents*, 20(3). <http://doi.org/10.5392/IJoC.2024.20.3.001>
- Kim, J., Lee, H., & Cho, Y. H. (2022). Learning design to support student-AI collaboration: Perspectives of leading teachers for AI in education. *Education and Information Technologies*, 27(5), 6069-6104. <https://doi.org/10.1007/s10639-021-10831-6>
- Lepri, B., Oliver, N., & Pentland, A. (2021). Ethical machines: The human-centric use of artificial intelligence. *IScience*, 24(3). <https://doi.org/10.1016/j.isci.2021.102249>
- Lund, B. D., & Naheem, K. T. (2024). Can ChatGPT be an author? A study of artificial intelligence authorship policies in top academic journals. *Learned Publishing*, 37(1), 13-21. <https://doi.org/10.1002/leap.1582>
- Neupane, A., Shahi, T., Cowling, M., & Tanna, D. (2024). Threading the GenAI needle: Unpacking the ups and downs of GenAI for higher education stakeholders. *Journal of Applied Learning & Teaching*, 7(2), 1-9. <https://doi.org/10.37074/jalt.2024.7.2.4>
- Nguyen, T. N. T., Lai, N. V., & Nguyen, Q. T. (2024). Artificial Intelligence (AI) in education: A case study on ChatGPT's influence on student learning behaviors. *Educational Process: International Journal*, 13(2), 105-121. <https://doi.org/10.22521/edupij.2024.132.7>
- Onesi-Ozigagun, O., Olofade, Y. J., Eyo-Udo, N. L., & Ogundipe, D. O. (2024). Revolutionising education through AI: A comprehensive review of enhancing learning experiences. *International Journal of Applied Research in Social Sciences*, 6(4), 589-607. <http://dx.doi.org/10.51594/ijarss.v6i4.1011>
- Ouyang, F., & Zhang, L. (2024). AI-driven learning analytics applications and tools in computer-supported collaborative learning: A systematic review. *Educational Research Review*, 44, 100616. <https://doi.org/10.1016/j.edurev.2024.100616>
- Pika, S. T. (2024). *Humanising digital pedagogy for equitable learning in South African rural universities*. SD and ES [Edited Book] Prof. Badar Iqbal 2024 for Walter Sisulu University, South Africa.
- Popenici, S. (2023). The critique of AI as a foundation for judicious use in higher education. *Journal of Applied Learning & Teaching*, 6(2), 378-384. <https://doi.org/10.37074/jalt.2023.6.2.4>
- Popenici, S., Rudolph, J., Tan, S., & Tan, S. (2023). A critical perspective on generative AI and learning futures.: An interview with Stefan Popenici. *Journal of Applied Learning and Teaching*, 6(2), 311-331. <https://doi.org/10.37074/jalt.2023.6.2.5>
- Rane, N. L., Paramesha, M., & Desai, P. (2024). Artificial intelligence, ChatGPT, and the new cheating dilemma: Strategies for academic integrity. *Artificial Intelligence and Industry in Society*, 5, 2-2. [https://doi.org/10.70593/978-81981271-1-2\\_1](https://doi.org/10.70593/978-81981271-1-2_1)
- Rashid, M. M., Atilgan, N., Dobres, J., Day, S., Penkova, V., Küçük, M., ... & Sawyer, B. D. (2024). Humanizing AI in education: A readability comparison of LLM and human-created educational content. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting* (p. 10711813241261689). Sage CA: Los Angeles, CA: SAGE Publications. <https://doi.org/10.1177/10711813241261689>
- Rudolph, J., Ismail, F., & Popenici, S. (2024). Higher education's generative artificial intelligence paradox: The meaning of chatbot mania. *Journal of University Teaching and Learning Practice*, 21(6), 1-35. <https://doi.org/10.53761/54fs5e77>
- Rudolph, J., Tan, S., & Aspland, T. (2023). JALT Editorial 6(1): Fully automated luxury communism or Turing trap? Graduate employability in the generative AI age. *Journal of Applied Learning and Teaching*, 6(1), 7-15. <https://doi.org/10.37074/jalt.2023.6.1.35>
- Salazar, M. (2013). A humanising pedagogy: Reinventing the principles and practice of education as a journey toward liberation. *Review of Research in Education*, 37(1), 121-48. <https://www.jstor.org/stable/24641959>
- Salle, S., & Rini, W. S. D. (2024). Development of artificial intelligence regulations and implications for intellectual property rights protection. *Artes Libres Law and Social*

Sanders, D. A., & Mukhari, S. S. (2024). Lecturers' perceptions of the influence of AI on a blended learning approach in a South African higher education institution. *Discover Education, 3*(1), 135. <https://doi.org/10.1007/s44217-024-00235-2>

Sedkaoui, S., & Benaichouba, R. (2024). Generative AI as a transformative force for innovation: A review of opportunities, applications and challenges. *European Journal of Innovation Management. http://dx.doi.org/10.1108/EJIM-02-2024-0129*

Sevnarayan, K., & Maphoto, K. B. (2024). Exploring the dark side of online distance learning: Cheating behaviours, contributing factors, and strategies to enhance the integrity of the online assessment. *Journal of Academic Ethics, 22*(1), 51–70. <https://doi.org/10.1007/s10805-023-09501-8>

Sevnarayan, K., & Potter, M.A. (2024). Generative artificial intelligence in distance education: Transformations, challenges, and impact on academic integrity and student voice. *Journal of Applied Learning and Teaching, 7*(1), 104-114. <https://doi.org/10.37074/jalt.2024.7.1.41>

Shuford, J. (2024). Examining ethical aspects of AI: Addressing bias and equity in the discipline. *Journal of Artificial Intelligence General Science (JAIGS), 3*(1), 262-280. <https://doi.org/10.60087/jaigs.v3i1.119>

Singh, M. (2023). Maintaining the integrity of the South African University: The impact of ChatGPT on plagiarism and scholarly writing. *South African Journal of Higher Education, 37*(5), 203–220. [https://hdl.handle.net/10520/ejc-high\\_v37\\_n5\\_a15](https://hdl.handle.net/10520/ejc-high_v37_n5_a15)

Sivasubramanian, S. (2021). *Keynote speech. Invent 2021 database, analytics, and machine learning.*

Takale, D. G., Mahalle, P. N., & Sule, B. (2024). Advancements and applications of generative artificial intelligence. *Journal of Information Technology and Sciences, 10*(1), 20-27. [https://www.researchgate.net/publication/378942763\\_Advancements\\_and\\_Applications\\_of\\_Generative\\_Artificial\\_Intelligence](https://www.researchgate.net/publication/378942763_Advancements_and_Applications_of_Generative_Artificial_Intelligence)

Tarisayi, K. S. (2024). ChatGPT is used in universities in South Africa through a socio-technical lens. *Cogent Education, 11*(1), 2295654. <https://doi.org/10.1080/2331186X.2023.2295654>

Thurston, T. (2024). Humanising online discussions by remixing AI and# DigitalPowerups. *Journal of Educational Impact, 1*(1), 3-12. <https://doi.org/10.70617/pjesgb87>

Tripathi, A., & Thakar, S. V. (2024). Ethical use of AI for academic integrity: Preventing plagiarism and cheating. *Ethical Frameworks in Special Education: A Guide for*

*Researchers, 91.*

UNESCO. (2021). *Recommendation on the ethics of artificial intelligence.* <https://unesdoc.unesco.org/ark:/48223/pf0000381137>

Uzumcu, O., & Acilmis, H. (2024). Do innovative teachers use AI-powered tools more interactively? A study in the context of diffusion of innovation theory. *Technology, Knowledge and Learning, 29*(2), 1109-1128. <https://doi.org/10.1007/s10758-023-09687-1>

van den Berg, G., & du Plessis, E. (2023). ChatGPT and generative AI: Possibilities for contributing to lesson planning, critical thinking and openness in teacher education. *Education Sciences, 13*(10), 998. <https://doi.org/10.3390/educsci13100998>

Van Wyk, M. M. (2024). Is ChatGPT an opportunity or a threat? Preventive strategies employed by academics related to a GenAI-based LLM at a faculty of education. *Journal of Applied Learning and Teaching, 7*(1), 35-45. <https://doi.org/10.37074/jalt.2024.7.1.15>

Verhoef, A. H., Fourie, M., Janse van Rensburg, Z., Louw, H., & Erasmus, M. (2022). The enhancement of academic integrity through a community of practice at the North-West University, South Africa. *International Journal for Educational Integrity, 18*(1), 18. <https://doi.org/10.1007/s40979-022-00115-y>

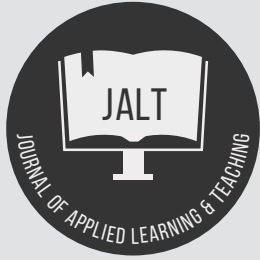
Vokwana, N., & Baleni, L. 2023. The application of a humanistic pedagogy-based evaluation tool to capture educators' perceptions of the value of digital technologies to enhance teaching and learning in higher education. *Proceedings of The Focus Conference (TFC 2022)*, pp. 134-148, Atlantis Press SARL, Paris. [http://dx.doi.org/10.2991/978-2-38476-006-0\\_12](http://dx.doi.org/10.2991/978-2-38476-006-0_12)

Yin, R. K., (2014). *Case study research: Design and methods.* California: SAGE Publications

Zheng, L., Fan, Y., Chen, B., Huang, Z., Gao, L., & Long, M. (2024). An AI-enabled feedback-feed-forward approach to promoting online collaborative learning. *Education and Information Technologies, 29*(9), 11385–11406. <https://doi.org/10.1007/s10639-023-12292-5>

Zinn, D., Adam, K., Kurup, R., & du Plessis, A. (2016). Returning to the source: Reflexivity and transformation in understanding a humanising pedagogy. *Educational Research for Social Change, 5*(1), 70-93. <https://doi.org/10.17159/2221-4070/2016/v5i1a5>

Zuin, A., & de Mello, R. R. (2024). Educating with Paulo Freire: Teaching and learning on the digital culture. *Educational Philosophy and Theory, 1-11.* <https://doi.org/10.1080/00131857.2024.2336025>



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Educational justice. Reliability and consistency of large language models for automated essay scoring and its implications

---

Siti Bealinda Qinthara Rony<sup>A</sup>      *Research Assistant, Faculty of AI and Robotics, Raffles University, Malaysia*

Tan Xin Fei<sup>B</sup>      *Undergraduate Student, Faculty of AI and Robotics, Raffles University, Malaysia*

Sasa Arsovski<sup>C</sup>      *Professor, Dean of Faculty of AI and Robotics, Raffles University, Malaysia*

---

### Keywords

---

AES;  
AI;  
analysis;  
artificial intelligence;  
automated essay scoring;  
analysis;  
consistency;  
generative artificial intelligence;  
LLMs;  
reliability.

### Abstract

---

Maintaining consistency in automated essay scoring is essential to guarantee fair and dependable assessments. This study investigates consistency and provides a comparative analysis of open-source and proprietary large language models (LLMs) for automated essay scoring (AES). The study utilized student essays, each assessed five times to measure both intrarater (using intraclass coefficient and repeatability coefficient) and interrater (concordance correlation coefficient) reliability across several models: GPT-4, GPT-4o, GPT-4o mini, GPT-3.5 Turbo, Gemini 1.5 Flash, and LLaMa 3.1 70B. Essays and marking criteria are used for prompt construction and sent to each large language model to obtain score outputs. Results indicate that the scores generated by GPT-4o closely align with human assessments, demonstrating fair agreement across repeated measures. Specifically, GPT-4o exhibits slightly higher concordance correlation coefficients (CCC) than GPT-4o mini, indicating superior agreement with human scores. However, qualitatively, it can be observed that all LLM models are not as consistent in terms of their scoring rationale/evaluation. Our study results indicate that the challenges currently faced in automated essay scoring with large language models need to be analyzed not only from a quantitative perspective but also qualitatively. Additionally, we utilize more sophisticated prompting methods and address the inconsistencies observed in the initial measurements. Despite the purported reliability of some models within our study, the selection of LLMs should be considered thoroughly during practical implementations for an AES.

### Correspondence

---

bealindaqinthara@gmail.com<sup>A</sup>

---

### Article Info

Received 29 November 2024  
Received in revised form 17 January 2025  
Accepted 17 January 2025  
Available online 21 January 2025

DOI: <https://doi.org/10.37074/jalt.2025.8.1.21>

## Introduction

In the education sector, new technologies are used to further engage and create more cohesive learning and teaching experiences. Ghosh (2024) investigates the usage of student portals and implementation of online quizzes in classrooms as a part of a competitive game between students. Nevertheless, teachers play a crucial role in the delivery of curriculum and are also the greatest contributor to what a student manages to learn in an educational setting.

Good education should be a necessity, yet with that thought, often there is a great disparity between the ratio of students to teachers, especially in larger institutions. Despite being a necessity, the question of the quality of education and the focus on students' learning experience can often be compromised by the amount of workload a teacher has (Anglia, 2020; Kanwal et al., 2023). Part of what contributes to this overwhelming workload is essay marking (Warschauer & Grimes, 2008).

Automated essay scoring (AES) refers to the usage of machine systems to mark educational assessments and is a possible solution to alleviate the said burden. Such a solution will allow teachers to allocate more time towards teaching, overall maintaining the quality of education to not fall below acceptable standards, and possibly even elevating the quality to higher standards (Hénard & Roseveare, 2012). AES systems are not a new concept, with widely known systems dating back to the 1960s. In recent years, however, techniques such as machine learning and natural language processing algorithms have often been utilized (Wilks, 2005; Ramesh & Sanampudi, 2021).

Our study focuses on the usage of artificial intelligence (AI) powered AES systems, primarily reviewing the performance and consistency of open source and proprietary large language models (Barry, 2023) for the grading/scoring of essays. We compare the consistency across models and analyze consistency criteria for each model's repeated grading runs.

## Literature review

AES systems like the Project Essay Grader (PEG), e-rater, and Intelligent Essay Assessor (IEA) were implemented in the 1990s to address the time-intensive nature of essay evaluation. Initial resistance in the 1960s arose from early AES prototypes relying on surface features (e.g., number of propositions, commas, and uncommon words), which overlooked important aspects like content (Hearst, 2000). Although these systems showed high interrater correlation, they failed to assess critical writing skills.

Over the years, the pursuit of better AES systems has put an emphasis on the system's ability to extract and evaluate direct features of an essay. Now, as LLMs' capabilities to process multi-modal inputs (images, text, videos) progress, the possibility that an essay's context and direct linguistic features i.e., semantic features, structural features, etc. can be understood also further expands. Where systematic differences between any system regarding essay assessment

often study intrarater and interrater reliability (Kayapinar, 2014), this evaluation method still applies to recent AI-based AES systems. The literature review is further divided into two sections, in which the first section will highlight the challenges and concerns involved in AI-based AES, and the second section talks about recent usage of AI for AES systems, where various works focused on the purported feasibility of such methods.

## Challenges in AI-based AES

There are several challenges associated with the creation and feasibility of any AES (Automated Evaluation System) model (Hussein et al., 2019). When analyzing large language models (LLMs) and AI systems that operate as prompt-and-response mechanisms, we must consider not only the robustness of the models but also the inputs they receive, such as the prompts. These challenges are interrelated; one challenge can directly or indirectly impact another.

**Marking consistency** is a critical limitation in AI grading systems, as similar essays can receive different marks, undermining trust among educators and students (Attali, 2013; Balfour, 2013). Inconsistencies can arise when slight variations in context, sentence structure, or phrasing lead to different scores for identical essays. AI systems also struggle with discrepancies in scoring compared to human experts, even when adhering to predefined rubrics (Perelman, 2014). Furthermore, inconsistencies may occur when grading large volumes of essays simultaneously.

**Internal understanding** refers to the model's ability to understand grading criteria and generalize. The AI model's inability to grasp nuances, especially in unconventional writing styles, can lead to inaccurate marks, either undervaluing creative work or inflating scores due to its limited context (Li et al., 2021; Awidi, 2024). AI may focus on rubric fulfilment rather than content quality, potentially inflating scores for essays lacking depth (Zhu, 2019).

## Recent research in AES

Recent AES research explores deep learning and generative AI models, which don't require traditional feature extraction (Attali & Burstein, 2006; Uto, 2021). Deep learning models, however, show promise when combined with feature-engineered inputs for a hybrid AES system to enhance contextual understanding (Kurniawan et al., 2024; Ortiz-Zambrano et al., 2024; Faseeh et al., 2024). Despite the rise of deep learning, traditional systems still offer value, as evidenced by a model that achieved a high Pearson's correlation using NLP techniques (Adeyanju et al., 2024).

LLMs, such as GPT, have shown promise in AES due to their linguistic capabilities and reasoning (Mansour et al., 2024; Ouyang et al., 2022). For example, Mizumoto and Eguchi (2023) tested GPT-3 for scoring non-native English essays, finding that GPT marked scores with acceptable adjacent agreement to human raters. They also showed that combining GPT scores with linguistic features improved AES performance. Inspired by Mizumoto and Eguchi's approach,

Li and Liu (2024) used the approach of utilizing different prompting techniques (Maclaren, 2024) and demonstrated GPT-4's superiority in scoring non-native Japanese essays compared to several other models when including all linguistic measures in their scoring criteria with multi-shot prompting.

Recent work by Pack et al. (2024) had also expanded the viability testing of essays concerning language proficiency to other mainstream LLMs aside from OpenAI (n.d.)'s, focusing on Google's PaLM 2 (through chatbot Bard), Anthropic's Claude 2, and OpenAI's GPT-3.5 and GPT-4. Using the intraclass correlation coefficient (ICC) reliability score, the researchers were able to analyze the interrater reliability between model scores to humans and intrarater reliability of each model based on measures between two different time gaps. With the exception of GPT-3.5, the other LLMs improved in terms of intrarater reliability over time, in which GPT-4 was the most reliable given repeated measures in separate instances. However, interrater reliability (or the validity of the models' scoring to human scores) decreased for GPT-3.5 and GPT-4 over time.

A notable way to further enforce standardization and increase intrarater abilities of LLMs for AES can be seen in works by Ishida et al. (2024) or Kim and Jo (2024), where they utilize pairwise evaluation or comparative judgement (Pollitt, 2011) with LLMs instead of a rubric-based approach (Ishida et al., 2024; Kim & Jo, 2024). The method generally involves giving a positive point to the essay that scores higher, and giving zero or negative points to the essay that loses in score - repeated in a round-robin fashion. In the study by Kim and Jo (2024), it showed that this approach improved the performance of both GPT-4 and GPT-3, and was statistically significant.

This pairwise comparison approach is likened to the use of Latent Semantic Analysis (Deerwester et al., 1990; Foltz, 1996) for the IEA (Foltz & Landauer, 1999). The IEA, however, would focus on a more semantic comparison where the meaning of a student's essay is extracted and then compared with similar texts of known quality. By looking at the essays within an interconnected setting semantic-wise or rubrics, such approaches may also alleviate the inherent randomness/non-deterministic nature of an LLM (Lee et al., 2022), as proprietary models often get updated - altering its underlying parameters. The problem is that when dealing with a large number of essays, the number of pairwise comparisons that can be made increases exponentially, raising concerns about computational viability.

Despite promising results, challenges thus remain, particularly with the non-deterministic nature of LLMs and potential issues with interrater reliability (Pack et al., 2024). Nevertheless, LLMs' potential as AES tools also extends beyond grading, as they can provide valuable feedback to both students and raters, improving efficiency and consistency (Xiao et al., 2024; Gombert et al., 2024). Despite challenges such as the lack of personalized feedback, it can still serve as a basis or a foundation for students' self-review/study (Meyer et al., 2024). And so, the ability of LLMs to enhance grading consistency positions them as an increasingly viable AES solution.

## Dataset and essay marking pipeline

Our dataset consists of 126 essays. We used 26 essays from Diploma in Business students for the "Learning Skills" module for our statistical analysis and 100 essays with additional prompting to confirm study results. The dataset for statistical analysis includes the marked essays with grades (human scores), the original ungraded submissions, and marking criteria (Appendix B). These are processed through a general essay marking pipeline, as shown in Figure 1, where each essay is paired with the marking criteria for zero-shot prompting. The resulting scores are compiled into a table (Appendix A), and sample outputs are presented in Appendices C and D.

The study uses six models: five proprietary models (GPT-3.5 Turbo, GPT-4, GPT-4o, GPT-4o mini, and Gemini 1.5 Flash) and Meta (n. d.)'s LLaMa 3.1 70B, which is a more democratized LLM (in freely providing access to trained weights for implementation, and the general architecture). A brief overview of the models is provided below:

- **GPT-3.5 Turbo** (OpenAI): A fast and efficient version of GPT-3.5, ideal for time-sensitive tasks and general-purpose text generation.
- **GPT-4o** (OpenAI): A versatile version of GPT-4 designed for various applications, offering improved efficiency and adaptability.
- **GPT-4o mini** (OpenAI): A lightweight variant of GPT-4, optimized for small-scale applications requiring efficiency and compact form.
- **GPT-4** (OpenAI): A multimodal model with advanced reasoning and higher accuracy, capable of processing both text and images.
- **Gemini 1.5 Flash** (DeepMind): A fast and contextually accurate model, excelling in multi-modal processing and natural language understanding.
- **LLaMa 3.1 70B** (Meta): A powerful language model with 70 billion parameters, offering advanced text generation, complex reasoning, and translation capabilities.

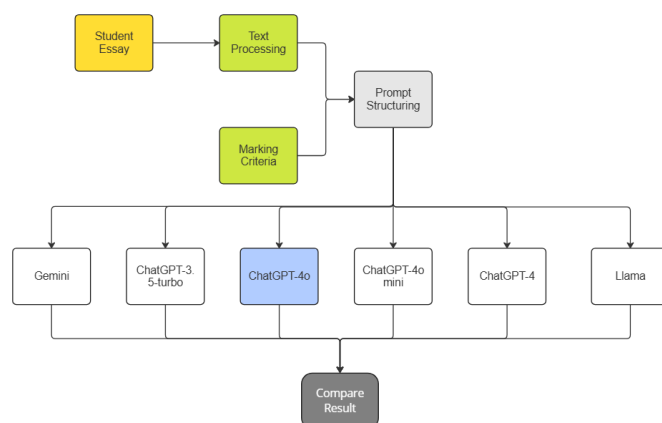


Figure 1. Essay marking pipeline.

## Analysis of results

This section presents the results of five repeated measures of each student's essay for each model, focusing on consistency. The analysis includes both score marks and qualitative assessments of the text outputs. Reliability refers to the consistency and reproducibility of measurements, with two types (Baumgartner, 1989): relative reliability, which evaluates consistency across repeated trials (Bruton et al., 2000), and absolute reliability, which assesses measurement error, such as the Standard Error of the Mean (Stratford & Goldsmith, 1997).

To compare the marks given by LLMs and humans, we analyze both intrarater (the model's internal consistency) and interrater reliability (comparison between the model and human raters). Subjectively, we examine how well the model adheres to the baseline rubric across repeated measurements and students. The focus is on consistency, with a brief discussion of the reasonableness of generated feedback. Statistical methods used do not account for subjective score variations based on the extracted criteria.

### Intrarater reliability

Intrarater reliability can be considered a type of relative reliability study that refers to how reliable *one* instrument/rater is across repeated measures (Gwet, 2008). Our study examines the consistency of a single model's scoring across repeated measures for multiple essays. We use the ICC to assess 'relative' reliability and measure internal scoring consistency. The ICC allows for the estimation of two types of consistency: absolute agreement and consistency (Nichols, 1998).

The ICC measure for absolute agreement assesses whether a model assigns identical scores to essays across repeated measurements. The ICC for consistency evaluates whether a model maintains the same relative ranking of students across measurements, regardless of score values. For example, if Student 1 ranks highest in the first measurement, consistency checks if they retain the top rank in subsequent measurements. Note that this ICC measure focuses on relative ranking, not absolute score consistency.

Based on a comprehensive research article on ICC by Liljequist et al. (2019), in our intrarater reliability study, we opted to analyze both ICC measures. The ICC measure of consistency excludes variance caused by bias in repeated measurements, unlike the absolute agreement measure, which accounts for it. While the choice of model (one-way random, two-way random, or two-way mixed) defines the scope and assumptions about bias, the calculation for consistency and absolute agreement remains the same for two-way random and mixed effects models. Hence, looking from an abstract level, the difference between the formula used between the two ICC measures for both two-way random and two-way mixed effect models can be said to lie in the inclusion of  $\sigma_c^2$  (bias variance) for each repeated measurement with the same rater.

However, for our study, we will frame the ICC measures to use the two-way fixed effects model for a single measurement type, as declared below:

- A two-way mixed effects model: Our results only represent the specific reliability of each LLMs involved, where the LLMs determined as raters are not considered as a sample of a bigger population (Shrout & Fleiss, 1979). In practice, it means that the same rater is utilized for subsequent measurements considering a fixed bias (Koo & Li, 2016; Liljequist et al., 2019), such that the calculation of ICC cannot be generalized to other LLMs with similar characteristics;
- Single measurement type: In our study, we are not interested in the k average of raters, and are calculating ICC based only on a singular rater (model) for repeated measurements.

We use both ICC measures of consistency and absolute agreement to assess each model's internal consistency. ICC (A, 1) represents an absolute agreement, while ICC (C, 1) reflects consistency in our analysis. The primary objective of this study is to evaluate consistency across repeated measures for each model, with repeatability also considered.

Repeatability refers to the variation between two measurements observed under identical conditions (Bartlett & Frost, 2008). To better understand how consistent a model scores the same essay across repeated measurements, we are also thus concerned with the difference in values in successive measurements, where less variation should indicate better repeatability and better internal consistency. The repeatability coefficient use will quantify the maximum expected difference and is calculated as seen in Equation (1). The multiplier 2.77 arises from the properties of the normal distribution and accounts for the variability between successive measurements within 95% confidence interval (CI) (Vaz et al., 2013). Our RC calculation utilizes the mean pooled standard deviation to account for within-subject variances and between-subject variances, as seen in Equation (2).

$$RC = 2.77\sigma_w \quad (1)$$

$$\sigma_w = \sqrt{\frac{\sum_{i=1}^5 (n_i - 1) \cdot Var_i}{\sum_{i=1}^5 (n_i - 1)}} \quad (2)$$

All calculations of the ICC and repeatability consistency is calculated for each model, where the "irr" R statistical package, and Python are used for calculations. Intrarater Reliability Statistical Analysis given in Table 1.

We assess the relative reliability of the models using repeated measures under identical conditions, with values < 0.5 indicating poor reliability, 0.5-0.75 moderate, 0.75-0.9 good, and > 0.9 excellent (Koo & Li, 2016). Based on Table 1., GPT-4o mini has the highest ICC values for both absolute agreement and consistency, followed by GPT-4o with ICC (C, 1) values of 0.7819 and 0.7484, and ICC (A, 1) values of 0.787 and 0.749. Only these two models achieved ICC values

Table 1. Intrarater reliability statistical analysis of tested large language models.

	GPT-3.5 Turbo	GPT-4	GPT-4o	GPT-4o mini	Gemini 1.5 Flash	LLaMa 3.1 70B
<b>ICC (C,1)</b>						
Value	0.569*	0.509*	0.748*	0.782*	0.187**	0.285*
CI95%	[0.40,0.74]	[0.33,0.69]	[0.61,0.86]	[0.66,0.88]	[0.041,0.397]	[0.122,0.499]
<b>ICC (A,1)</b>						
Value	0.571*	0.516*	0.749*	0.787*	0.0815***	0.266*
CI95%	[0.4,0.74]	[0.339,0.7]	[0.62,0.86]	[0.67,0.883]	[0.001,0.221]	[0.111,0.475]
<b>RC</b>						
Mean	20.4832	15.1534	12.6063	8.4700	24.2112	24.2988
SD	7.3946	5.4706	4.5510	3.0578	8.7405	8.7721

\* $p < 0.001$ , \*\* $p = 0.004$ , \*\*\* $p = 0.0226$ . *d*1 for each model is 25 and *d*2 is 104.

above 0.7, while older GPT versions (GPT-3.5 Turbo and GPT-4) had ICC values around 0.5.

Non-OpenAI models, Gemini 1.5 Flash and LLaMa 3.1 70B, show the lowest ICC values (<0.5) for both measures, with Gemini 1.5 Flash performing particularly poorly. Its absolute agreement ICC is below 0.1, indicating the model struggles to maintain consistent scores and relative rankings across repeated measures. Notably, GPT-4o and GPT-3.5 Turbo are the only models where the absolute agreement ICC slightly exceeds the consistency ICC, which could reflect data artifacts or bias in score variability.

The repeatability coefficient (RC) generally aligns with ICC values, with GPT-4o mini showing the smallest range of 8.47, indicating the highest consistency for successive measures. GPT-4, while achieving moderate reliability, has a higher RC of 12.61, but still ranks second in reliability. GPT-3.5 Turbo, despite its higher ICC values, has a larger RC, indicating more variability in successive measures.

Our findings suggest that GPT-4o mini and GPT-4o demonstrate the best internal consistency and reliability, particularly in maintaining relative rankings across repeated measures. GPT-4o mini, based on intrarater reliability, emerges as the most consistent model for essay scoring, ensuring reliable scores across repeated and successive measures.

### Interrater reliability

Interrater reliability measures the agreement between raters (Lange, 2011). In our study, we assess the reliability of LLM-generated scores against a human rater. The analysis compares the scores from each model with the human rater using the concordance correlation coefficient (CCC), calculated pairwise for each essay. CCC was chosen over Pearson's *r* to quantify both correlation and agreement (Lin, 1989). The calculation treats the dataset as pairwise data, with repeated measurements forming new data points for each essay.

We interpret CCC values using Landis and Koch's scale: <0 (no agreement), 0–0.20 (slight), 0.21–0.40 (fair), 0.41–0.60 (moderate), 0.61–0.80 (substantial), and 0.81–1 (almost perfect). The table includes the CCC estimate and 95% CI for each model. Unlike intrarater reliability, which measures consistency within a single rater, interrater reliability in our study evaluates the agreement between model outputs and human scores over multiple repetitions. Consistency is

determined by how well the repeated model outputs align with a given human score.

A Bland-Altman analysis (also included in Table 2) was also conducted, though its assumptions - such as equivalent precision and constant bias - may not fully apply here (Taffé, 2021; Silveira et al., 2024). Since tolerance limits for acceptable score differences were not defined, the analysis serves as a general illustration rather than a definitive assessment of agreement (Indrayan, 2022). The calculations for CCC and Bland-Altman bias were performed using the "SimplyAgree" R package.

Table 2. Interrater reliability statistical analysis of tested large language models.

	GPT-3.5 Turbo	GPT-4	GPT-4o	GPT-4o mini	Gemini 1.5 Flash	LLaMa 3.1 70B
<b>CCC</b>						
Estimate	0.2860	0.0158	0.3954	0.3540	0.1716	0.2690
CI95%	[0.14, 0.42]	[-0.05, 0.08]	[0.24, 0.53]	[0.21, 0.48]	[0.01, 0.32]	[0.15, 0.38]
<b>Bland-Altman</b>						
Mean Bias	5.1923	15.2615	2.0846	-1.9923	2.9154	8.7923
Lower LoA	-18.7316	-8.6804	-17.9151	-20.2980	-20.1026	-12.9478
Upper LoA	29.1162	39.2034	22.0844	16.3134	25.9333	30.5324

LoA = Limits of Agreement

Our interrater reliability study (Table 2.) shows that GPT-4o and GPT-4o mini achieve the highest CCC values, indicating fair agreement with human scores across repeated measures. This suggests both models produce consistent and reasonably accurate score outputs. However, GPT-4o demonstrates slightly better agreement than GPT-4o mini. In contrast, GPT-4 has the lowest CCC estimate, with true values close to 0, indicating minimal to no agreement with human scores.

The Bland-Altman analysis reveals that GPT-4o and GPT-4o mini exhibit similar bias (around 2 points), with GPT-4o mini underestimating and GPT-4o overestimating scores. Overall, GPT-4o and GPT-4o mini show the highest interrater reliability and are better suited for tasks requiring alignment with human evaluation.

### Qualitative analysis

A qualitative review of the LLM's text outputs reveals a degree of randomness in their marking criteria. Shown in Appendix C are excerpts of GPT-4o and Gemini 1.5 Flash's first and repeated outputs, which we primarily investigate to give our qualitative analysis. Research data of the full-text outputs for all repeated measurements on each model will be made available upon reasonable request. Yet it is clear that qualitatively, repeated measures show notable differences in rationale which often correlate with variations in numerical scores. Some models also fail to correctly sum scores from subcriteria, leading to inconsistencies.

For instance, the GPT-4o model may change the naming and maximum score of subcriteria across repeated measures, such as changing "Referencing and Citation" from 10 marks to "Use of Sources and Referencing" with 15 marks. Additionally, some models would hallucinate new subcriteria or omit specified ones. Inconsistencies can also occur in how subcriteria are evaluated, such as Gemini 1.5 Flash initially breaking down "Content" into smaller aspects,

but later assessing it based on identified strengths and weaknesses. Hence, while numerical scores may suggest some reliability, the rationale behind these scores reveals that LLMs' consistency in essay marking is less dependable than statistical analyses alone might imply.

## Discussion

A key concern in using AI models as Automated Essay Scoring (AES) systems is whether they produce accurate scores compared to human raters. This issue arises not only from the subjectivity or objectivity of the scoring models but also from the inherent variability of AI generative models. The practical deployment of AI in AES requires trust in its scoring analysis, as the quality of AI models as replacements for human teachers remains uncertain (Barshay, 2024). In our study, we assess the consistency and reliability of selected AI models, helping readers to evaluate their suitability for practical applications.

Our findings suggest that GPT-4o and GPT-4o mini are internally reliable models. However, if both reliability and agreement with human scores are priorities, GPT-4o should be preferred, as it shows slightly higher agreement with human scores (higher CCC value). While GPT-4 demonstrates internal reliability ( $ICC > 0.5$ ), it has the lowest CCC value when compared to human scores, showing minimal agreement and making it less suitable for practical use. Non-OpenAI proprietary models generally exhibit low consistency and agreement with human scores, supporting the preference for OpenAI models in AES applications.

Despite good internal consistency in models like GPT-4o and GPT-4o mini, achieving sufficient human-model agreement remains challenging, even with repeated measures showing fair agreement. Therefore, selecting the appropriate LLM for AES requires careful consideration. Qualitative inconsistencies are also evident across all models, including:

- Hallucination or omission of subcriteria
- Inconsistent definition of maximum marks or awarding of marks across repeated measurements
- Inconsistent evaluation of aspects within similar subcriteria
- Errors in summing total marks from subcriteria

While early research into the reliability of models like the GPT-3.5 (Khademi, 2023) showed low inter-reliability with human scores, more recent research involving GPT-4 (Pack et al., 2024; Tate et al., 2024), has shown it has become the most reliable for essay scoring in comparison to earlier GPT models and other non-Open AI models. Our study now suggests that GPT-4o and GPT-4o mini offer better reliability and human score agreement. This trend likely indicates that future versions of OpenAI's LLMs will become more reliable for AES applications.

Our study acknowledges limitations, such as the evolving nature of proprietary AI models and the impact of prompt engineering (Stahl et al., 2024). Since we used a simple rubric for zero-shot prompting, alternative methods may improve consistency. Nevertheless, our approach is suitable for measuring both internal consistency and human-model agreement for repeated measures. We tested further using additional prompting to mark 100 student essays using the GPT-4o mini. The results of further testing corroborated our study results, where the model achieves similar internal consistency and fair agreement.

The change in interrater reliability or intrarater reliability (if any) in such models is thus assumed to be not just due to an LLM's non-deterministic nature (Lee et al., 2022), but also on how proprietary models are constantly updated, thereby frequently altering its parameters. This, alongside a neural network's black-box nature, is a point to consider when trying to employ an LLM as an AES. Clear instructions through prompts thus cannot be overstated to standardize scoring and avoid cases of hallucination, as LLMs will generate different scoring criteria for each input when no criteria are specified (Ishida et al., 2024; Xiao et al., 2024). Future research thus could explore alternative prompting methods (Li, 2024; Kim & Jo, 2024) to further refine consistency analysis across different AI models, and also as a means to combat hallucinations – leading to more reliable feedback (Rudolph et al., 2024).

Regardless, even in cases with clear scoring outlines, the chances of encountering the models' quirks are never zero. Hence, as of current time, we once again note that both caution and deliberation should always be included in the usage of AI-based AES. Popenici (2022) noted even more reasons why this degree of caution should be exercised. AI is prone to algorithmic bias, and cases where bias stemming from technology affecting people is increasingly real (Popenici et al., 2023; Rudolph, 2023). Education, implemented justly is one of the fields where people of all kinds can truly share their experiences and knowledge, enriching one another through meaningful interaction on an even playing field. So, what happens if AI-based AES systems were implemented on a wide scale while still being riddled with the various concerns of reliability and fairness? The focus on consistency studies, or the pursuit of a more consistent AI model, is thereby highly imperative in education – as it is impossible to completely avoid rapid advancements in technology. Instead, its usages should be as tools by both teachers and students alike to enrich the learning experience, assisting and elevating current educational foundations and not as a means that redefines said foundations.

## Conclusion

This study reinforces the critical role of consistency metrics in assessing LLMs for automated essay scoring, both quantitatively and qualitatively. By focusing on intrarater reliability to measure internal consistency and interrater reliability to see the model's consistency and agreement with human raters, we identified GPT-4o as a strong candidate for practical implementations. However, achieving human-



level alignment without any possible aspect of randomness remains to be a challenge. While our findings provide a foundational approach to reliability testing in AES, future research must adapt to the evolving nature of LLMs, ensuring that the usage of these tools in the field meets the nuanced demands involved in educational assessment. Our study thus lays the groundwork for selecting and deploying more robust and trustworthy AI-based AES systems to further elevate current educational foundations.

## References

Adeyanju, I. A., Rachael, O. K., Titilayo, A. O., Ajoke, G. O., Oyeladun, M. B., & Samuel, F. A. (2024). Artificial intelligence based essay grading system. *Engineering and Technology Journal*, 9(7). <https://doi.org/10.47191/etj/v9i07.06>

Anglia, N. (2020, August 19). *Does class size matter? The educational impact of teacher-student ratios*. Nord Anglia Education. <https://www.nordangliaeducation.com/news/2020/08/19/does-class-size-matter-the-educational-impact-of-teacherstudent-ratios>

Attali, Y. (2013). Validity and reliability of automated essay scoring. In M. D. Shermis & J. Burstein (Eds.), *Handbook of automated essay evaluation: Current applications and new directions* (2nd ed., pp. 181-198). Routledge. [https://www.researchgate.net/profile/Yigal-Attali/publication/292810655\\_Validity\\_and\\_reliability\\_of\\_automated\\_essay\\_scoring/links/5bfbfe31299bf10737f8b7cf/Validity-and-reliability-of-automated-essay-scoring.pdf](https://www.researchgate.net/profile/Yigal-Attali/publication/292810655_Validity_and_reliability_of_automated_essay_scoring/links/5bfbfe31299bf10737f8b7cf/Validity-and-reliability-of-automated-essay-scoring.pdf)

Attali, Y., & Burstein, J. (2006). Automated essay scoring with e-rater® V.2. *The Journal of Technology, Learning, and Assessment*, 4(3). <https://ejournals.bc.edu/index.php/jtla/article/view/1650>

Awidi, I. T. (2024). Comparing expert tutor evaluation of reflective essays with marking by generative artificial intelligence (AI) tool. *Computers and Education: Artificial Intelligence*, 6, 100226. <https://doi.org/10.1016/j.caeai.2024.100226>

Balfour, S. P. (2013). Assessing writing in MOOCs: Automated essay scoring and calibrated peer review. *Research & Practice in Assessment*, 8, 40-48. <https://eric.ed.gov/?id=EJ1062843>.

Barry, D. (2023, September 15). *A look at the large language model landscape*. Reworked. <https://www.reworked.co/information-management/a-look-at-the-large-language-model-landscape/>

Barshay, J. (2024, May 20). *Proof points: AI essay grading is already as 'good as an overburdened' teacher, but researchers say it needs more work*. The Hechinger Report. <https://hechingerreport.org/proof-points-ai-essay-grading/>

Bartlett, J. W., & Frost, C. (2008). Reliability, repeatability and reproducibility: Analysis of measurement errors in continuous variables. *Ultrasound in Obstetrics and Gynecology*, 31(4), 466-475. <https://doi.org/10.1002/uog.5256>

Baumgartner, T. A. (1989). Norm-referenced measurement: Reliability. In M. J. Safrit & T. M. Wood (Eds.), *Measurement concepts in physical education and exercise science* (pp.45-72). Champaign: Human Kinetics Books.

Bruton, A., Conway, J. H., & Holgate, S. T. (2000). Reliability: What is it, and how is it measured? *Physiotherapy*, 86(2), 94-99. [https://doi.org/10.1016/s0031-9406\(05\)61211-4](https://doi.org/10.1016/s0031-9406(05)61211-4)

Deerwester, S., Dumais, S. T., Furnas, G. W., Landauer, T. K., & Harshman, R. (1990). Indexing by latent semantic analysis. *Journal of the American Society for Information Science*, 41(6), 391-407. [https://doi.org/10.1002/\(sici\)1097-4571\(199009\)41\(6\)391-407](https://doi.org/10.1002/(sici)1097-4571(199009)41(6)391::AID-ASIS391>3.0.CO;2-3).

Faseeh, M., Jaleel, A., Iqbal, N., Ghani, A., Abdusalomov, A., Mehmood, A., & Cho, Y. (2024). Hybrid approach to automated essay scoring: Integrating deep learning embeddings with handcrafted linguistic features for improved accuracy. *Mathematics*, 12(21), 3416. <https://doi.org/10.3390/math12213416>

Foltz, P. W. (1996). Latent semantic analysis for text-based research. *Behavior Research Methods Instruments & Computers*, 28(2), 197-202. <https://doi.org/10.3758/bf03204765>

Foltz, P. W., Laham, D., & Landauer, T. K. (1999). The intelligent essay assessor: Applications to educational technology. *Interactive Multimedia Electronic Journal of Computer - Enhanced Learning*, 1(2). [https://www.researchgate.net/publication/243770899\\_The\\_intelligent\\_essay\\_assessor\\_Applications\\_to\\_educational\\_technology](https://www.researchgate.net/publication/243770899_The_intelligent_essay_assessor_Applications_to_educational_technology)

Ghosh, A. (2024, February 27). *Student portals: Fostering connectivity and educational growth*. Buddy4Study. <https://www.buddy4study.com/article/student-portals>

Gombert, S., Fink, A., Giorgashvili, T., Jivet, I., Di Mitri, D., Yau, J., Frey, A., & Drachsler, H. (2024). From the automated assessment of student essay content to highly informative feedback: A case study. *International Journal of Artificial Intelligence in Education*. <https://doi.org/10.1007/s40593-023-00387-6>

Google DeepMind. (n.d.). *Gemini 1.5 Flash*. Google Deep Mind. <https://deepmind.google/technologies/gemini/flash/>

Gwet, K. L. (2008). Intrarater reliability. *Wiley Encyclopedia of Clinical Trials*, 1-13. <https://doi.org/10.1002/9780471462422.eoct631>

Hearst, M. (2000). The debate on automated essay grading. *IEEE Intelligent Systems and Their Applications*, 15(5), 22-37. <https://doi.org/10.1109/5254.889104>

Hénard, F., & Roseveare, D. (2012). Fostering quality teaching in higher education: Policies and practices. *An IMHE Guide for Higher Education Institutions*, 1(1), 7-11. <http://dx.doi.org/10.5901/mjss.2014.v5n25p272>

Hussein, M. A., Hassan, H., & Nassef, M. (2019). Automated language essay scoring systems: A literature review. *PeerJ Computer Science*, 5, Article e208. <https://doi.org/10.7717/peerj.csci.208>

- Indrayan, A. (2022). *Direct use of clinical tolerance limits for assessing agreement: A robust nonparametric approach*. SSRN Electronic Journal. <https://doi.org/10.2139/ssrn.4189799>
- Ishida, T., Liu, T., Wang, H., & Cheung, W. K. (2024, May 28). *Large language models as partners in student essay evaluation*. arXiv.org. <https://arxiv.org/abs/2405.18632>
- Kanwal, A., Rafiq, S., & Afzal, A. (2023). Impact of workload on teachers' efficiency and their students' academic achievement at the university level. *Gomal University Journal of Research*, 39(2), 131–146. <https://doi.org/10.51380/gujr-39-02-02>
- Kayapinar, U. (2014). Measuring essay assessment: Intra-rater and inter-rater reliability. *Eurasian Journal of Educational Research*, 14(57). <https://doi.org/10.14689/ejer.2014.57.2>
- Khademi, A. (2023). Can ChatGPT and Bard generate aligned assessment items? A reliability analysis against human performance. *Journal of Applied Learning & Teaching*, 6(1), 75–80. <https://doi.org/10.37074/jalt.2023.6.1.28>
- Kim, S., & Jo, M. (2024, July 8). *Is GPT-4 alone sufficient for automated essay scoring?: A comparative judgment approach based on rater cognition*. arXiv.org. <https://arxiv.org/html/2407.05733v1>
- Koo, T. K., & Li, M. Y. (2016). A guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, 15(2), 155–163. <https://doi.org/10.1016/j.jcm.2016.02.012>
- Kurniawan, W., Riantoni, C., Lestari, N., & Ropawandi, D. (2024). A hybrid automatic scoring system: Artificial intelligence-based evaluation of physics concept comprehension essay test. *International Journal of Information and Education Technology*, 14(6), 876–882. <https://doi.org/10.18178/ijiet.2024.14.6.2113>
- Lange, R. T. (2011). Inter-rater reliability. In J. S. Kreutzer, J. DeLuca, B. (Eds.), *Encyclopedia of clinical neuropsychology*. Springer. [https://doi.org/10.1007/978-0-387-79948-3\\_1203](https://doi.org/10.1007/978-0-387-79948-3_1203)
- Lee, M., Liang, P., & Yang, Q. (2022). CoAuthor: Designing a human-AI collaborative writing dataset for exploring language model capabilities. *CHI Conference on Human Factors in Computing Systems*, (388), 1–19. <https://doi.org/10.1145/3491102.3502030>
- Li, W., & Liu, H. (2024). Applying large language models for automated essay scoring for non-native Japanese. *Humanities and Social Sciences Communications*, 11(1). <https://doi.org/10.1057/s41599-024-03209-9>
- Li, Z., Zhang, J., Fei, Z., Feng, Y., & Zhou, J. (2021, June 4). *Addressing inquiries about history: An efficient and practical framework for evaluating open-domain chatbot consistency*. arXiv.org. <https://arxiv.org/abs/2106.02228>
- Liljequist, D., Elfving, B., & Roaldsen, K. S. (2019). Intraclass correlation – a discussion and demonstration of basic features. *PLoS ONE*, 14(7), Article e0219854. <https://doi.org/10.1371/journal.pone.0219854>
- Lin, L. I. (1989). A concordance correlation coefficient to evaluate reproducibility. *Biometrics*, 45(1), 255. <https://doi.org/10.2307/2532051>
- Maclaren, U. (2024). *Do you know when to use 0-shot, 1-shot, or multi-shot prompts (e.g. give it 1 or more examples)?* SSW Rules. <https://www.ssw.com.au/rules/shot-prompts/>
- Mansour, W., Albatarni, S., Eltanbouly, S., & Elsayed, T. (2024, April 26). *Can large language models automatically score proficiency of written essays?*. arXiv.org. <https://arxiv.org/pdf/2403.06149>
- Meta. (n. d.). *Llama 3.1 70B*. Hugging face. <https://huggingface.co/meta-llama/Llama-3.1-70B>
- Meyer, J., Jansen, T., Schiller, R., Liebenow, L. W., Steinbach, M., Horbach, A., & Fleckenstein, J. (2024). Using LLMs to bring evidence-based feedback into the classroom: AI-generated feedback increases secondary students' text revision, motivation, and positive emotions. *Computers and Education: Artificial Intelligence*, 6(1), 100199. <http://dx.doi.org/10.1016/j.caeai.2023.100199>
- Mizumoto, A., & Eguchi, M. (2023). Exploring the potential of using an AI language model for automated essay scoring. *Research Methods in Applied Linguistics*, 2(2), 100050. <https://doi.org/10.1016/j.rmal.2023.100050>
- Nichols, D. P. (1998). *SPSS Library: Choosing an intraclass correlation coefficient*. OARC Stats. <https://stats.oarc.ucla.edu/spss/library/spss-library-choosing-an-intraclass-correlation-coefficient/>
- OpenAI. (n. d.). *Models*. OpenAI platform. <https://platform.openai.com/docs/models>
- Ortiz-Zambrano, J. A., Espín-Riofrío, C. H., & Montejo-Ráez, A. (2024). Deep encodings vs. linguistic features in lexical complexity prediction. *Neural Computing and Applications*. <https://doi.org/10.1007/s00521-024-10662-9>
- Ouyang, L., Wu, J., Jiang, X., Almeida, D., L. Wainwright, C., Mishkin, P., Zhang, C., Agarwal, S., Slama, K., Ray, A., Schulman, J., Hilton, J., Kelton, F., Miller, L., Simens, M., Askell, A., Welinder, P., Christiano, P., Leike, J., & Lowe, R. (2022). Training language models to follow instructions with human feedback (36th Conference on Neural Information Processing Systems: Advances in Neural Information Processing Systems, Vol. 35). [https://proceedings.neurips.cc/paper\\_files/paper/2022/file/b1efde53be364a73914f58805a001731-Paper-Conference.pdf](https://proceedings.neurips.cc/paper_files/paper/2022/file/b1efde53be364a73914f58805a001731-Paper-Conference.pdf)
- Pack, A., Barrett, A., & Escalante, J. (2024). Large language models and automated essay scoring of English language learner writing: Insights into validity and reliability. *Computers and Education Artificial Intelligence*, 6, 100234. <https://doi.org/10.1016/j.caeai.2024.100234>

- Perelman, L. (2014). When “the state of the art” is counting words. *Assessing Writing*, 21, 104–111. <https://doi.org/10.1016/j.asw.2014.05.001>
- Pollitt, A. (2011). Comparative judgement for assessment. *International Journal of Technology and Design Education*, 22(2), 157–170. <https://doi.org/10.1007/s10798-011-9189-x>
- Popenici, S. (2022). *Artificial intelligence and learning futures*. <https://doi.org/10.4324/9781003266563>
- Popenici, S., Rudolph, J., Tan, S., & Tan, S. (2023). A critical perspective on generative AI and learning futures. An interview with Stefan Popenici. *Journal of Applied Learning & Teaching*, 6(2), 311–331. <https://doi.org/10.37074/jalt.2023.6.2.5>
- Ramesh, D., & Sanampudi, S. K. (2021). An automated essay scoring systems: A systematic literature review. *Artificial Intelligence Review*, 55(3), 2495–2527. <https://doi.org/10.1007/s10462-021-10068-2>
- Rudolph, J. (2023). Book review. Popenici, Stefan (2023). *Artificial intelligence and learning futures. Critical narratives of technology and imagination in higher education*. Routledge. *Journal of Applied Learning & Teaching*, 6(2), 420–425. <https://doi.org/10.37074/jalt.2023.6.2.27>
- Rudolph, J., Ismail, F., & Popenici, S. (2024). Higher education’s generative artificial intelligence paradox: The meaning of chatbot mania. *Journal of University Teaching and Learning Practice*, 21(6). <https://doi.org/10.53761/54fs5e77>
- Silveira, P. S. P., Vieira, J. E., & De Oliveira Siqueira, J. (2024). Is the Bland-Altman plot method useful without inferences for accuracy, precision, and agreement? *Revista De Saúde Pública*, 58(1). <https://doi.org/10.11606/s1518-8787.2024058005430>
- Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin*, 86(2), 420–428. <https://doi.org/10.1037/0033-2909.86.2.420>
- Stahl, M., Biermann, L., Nehring, A., & Wachsmuth, H. (2024, April 24). *Exploring LLM prompting strategies for joint essay scoring and feedback generation*. arXiv.org. <https://arxiv.org/abs/2404.15845>
- Stratford, P. W., & Goldsmith, C. H. (1997). Use of the standard error as a reliability index of interest: An applied example using elbow flexor strength data. *Physical Therapy*, 77(7), 745–750. <https://doi.org/10.1093/ptj/77.7.745>
- Taffé, P. (2021). When can the Bland & Altman limits of agreement method be used and when it should not be used. *Journal of Clinical Epidemiology*, 137, 176–181. <https://doi.org/10.1016/j.jclinepi.2021.04.004>
- Tate, T. P., Steiss, J., Bailey, D., Graham, S., Moon, Y., Ritchie, D., Tseng, W., & Warschauer, M. (2024). Can AI provide useful holistic essay scoring? *Computers and Education Artificial Intelligence*, 7, 100255. <https://doi.org/10.1016/j.caeai.2024.100255>
- Uto, M. (2021). A review of deep-neural automated essay scoring models. *Behaviormetrika*, 48(2), 459–484. <https://doi.org/10.1007/s41237-021-00142-y>
- Vaz, S., Falkmer, T., Passmore, A. E., Parsons, R., & Andreou, P. (2013). The case for using the repeatability coefficient when calculating test–retest reliability. *PLoS ONE*, 8(9), Article e73990. <https://doi.org/10.1371/journal.pone.0073990>
- Warschauer, M., & Grimes, D. (2008). Automated writing assessment in the classroom. *Pedagogies an International Journal*, 3(1), 22–36. <https://doi.org/10.1080/15544800701771580>
- Wilks, Y. (2005). *The history of natural language processing and machine translation. Encyclopedia of language and linguistics* (Vol. 9).
- Xiao, C., Ma, W., Song, Q., Xu, S. X., Zhang, K., Wang, Y., & Fu, Q. (2024, January 12). *Human-AI collaborative essay scoring: A dual-process framework with LLMs*. arXiv.org. <https://arxiv.org/abs/2401.06431>
- Zhu, W. (2019). A study on the application of automated essay scoring in college English writing based on PigAi. *Proceedings of the 7th International Conference on Social Science and Higher Education (ICSSHE 2021)*. <https://doi.org/10.2991/icsshe-19.2019.188>

## Appendices

### Appendix A: Score output for repeated measurements.

Human Scoring	GPT-3.5 Turbo				
	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5
76	100	94	93	100	83
57	90	90	83	90	92
59	75	81	75	84	89
72	84	71	78	88	85
79	90	93	85	91	83
83	72	100	93	70	72
76	82	77	83	82	90
71	68	68	68	96	69
84	72	76	76	76	75
90	83	83	83	83	92
76	85	87	77	82	82
65	100	87	82	74	81
63	70	70	68	72	72
89	82	77	84	78	80
69	75	77	87	90	76
59	71	60	74	70	42
74	62	67	65	67	52
86	93	69	93	84	92
63	70	74	77	73	85
74	74	86	79	72	68
74	77	77	72	78	77
85	91	100	92	85	83
67	86	59	59	80	81
89	84	90	93	93	86
81	83	90	86	86	80
67	49	57	55	67	49

Human Scoring	GPT-4				
	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5
76	100	92	90	100	100
57	100	100	94	88	100
59	95	87	90	100	85
72	100	95	100	95	100
79	94	94	92	94	100
83	92	100	100	100	92
76	84	75	82	70	80
71	100	87	98	95	100
84	75	90	90	88	95
90	92	94	100	93	96
76	84	84	85	85	89
65	92	90	91	88	92
63	83	80	85	80	84
89	80	80	90	100	91
69	92	95	90	88	90
59	100	90	80	100	100
74	75	81	90	81	75
86	95	100	91	80	80
63	75	100	75	81	80
74	89	92	85	90	86
74	72	85	77	88	77
85	87	94	92	93	96
67	83	90	80	82	90
89	85	75	83	90	83
81	100	95	100	100	95
67	85	83	80	86	86

Human Scoring	LLaMa 3.1 70B				
	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5
76	93	92	86	93	95
57	88	74	70	78	66
59	81	78	92	70	71
72	84	84	92	83	80
79	75	84	91	92	91
83	84	90	94	98	90
76	75	75	77	93	82
71	91	91	92	95	95
84	93	95	97	91	95
90	93	94	94	94	92
76	75	81	79	91	83
65	71	78	84	91	65
63	71	74	79	91	76
89	86	90	92	68	74
69	67	80	64	60	66
59	84	88	84	60	83
74	95	96	81	85	83
86	95	95	84	74	74
63	94	92	82	47	74
74	94	97	76	78	80
74	83	94	73	62	73
85	94	92	83	80	84
67	94	83	81	56	74
89	92	86	86	69	84
81	77	83	93	83	80
67	74	75	93	72	76

Human Scoring	GPT-4o				
	Measure 1	Measure 2	Measure 3	Measure 4	Measure 5
76	78	81	87	84	83
57	76	80	75	75	80
59	75	74	74	73	97
72	72	73	72	73	67
79	86	83	92	92	75
83	83	83	84	83	83
76	64	67	67	67	68
71	85	85	83	85	85
84	74	73	78	81	75
90	85	85	85	90	89
76	73	73	61	61	56
65	80	85	81	81	73
63	74	74	69	69	65
89	86	81	77	77	85
69	66	69	69	69	72
59	78	75	69	81	83
74	63	61	61	61	57
86	84	81	84	84	91
63	65	65	67	71	69
74	74	81	79	75	95
74	75	69	78	67	72
85	83	83	83	81	89
67	68	71	69	71	78
89	80	80	81	88	95
81	82	82	82	82	82
67	61	61	61	56	57

## Appendix B: Scoring criteria.

FINAL ESSAY ASSESSMENT (100 MARKS)					
CLO	CRITERIA	0-4 marks	5-9 marks	10-17 marks	18-20 marks
3	Organisation of ideas (coherence and logical structure)	Poor coherence and/or logical structure.	Average coherence and/or logical structure.	Good coherence and/or logical structure.	Excellent coherence and/or logical structure.
2 & 3	Critical analysis, evaluation of thesis	Poor analysis, evaluation and/or reflection. Mostly own opinion with no evidence presented.	Average analysis, evaluation and/or reflection. Lack of reasonable evidence given.	Good analysis, evaluation and/or reflection. Average evidence presented to support analysis.	Excellent analysis, evaluation and/or reflection. Concrete evidence presented to support critical analysis.
2 & 3	Comprehension of the topic and related issues	Poor understanding of the topic and/or related issues.	Average understanding of the topic and/or related issues.	Good understanding of the topic and/or related issues.	Excellent understanding of the topic and/or related issues.
		1-2 marks	3-5 marks	6-8 marks	9-10 marks
2 & 3	conclusion	Poor evidence of preceding arguments and/or overall conclusion.	Average evidence of preceding arguments and/or overall conclusion.	Good evidence of preceding arguments and/or overall conclusion.	Excellent evidence of preceding arguments and/or overall conclusion.
3	criteria adherence, formatting and use of language	Poor criteria adherence, formatting and/or use of language.	Average criteria adherence, formatting and/or use of language.	Good criteria adherence, formatting and/or use of language.	Excellent criteria adherence, formatting and/or use of language.
3	wide reading (citation and referencing)	Poor use of citation and/or referencing.	Average use of citation and/or referencing.	Good use of citation and/or referencing.	Excellent use of citation and/or referencing.
		1 mark	2 marks	3-4 marks	5 marks
3	Time management (Draft)	Late submission (delay 3 days)	Late submission (delay 2 days)	Late submission (delay 1 day) with incomplete work submitted	Submit work on time and complete (both map & questions)
3	Time management (Final)	Late submission (delay 3 days)	Late submission (delay 2 days)	Late submission (delay 1 day) with incomplete work submitted	Submit work on time and complete (both map & questions)

## Appendix C: Excerpt text outputs.

GPT-4o (prompt and output)

Prompt

You are a business course lecturer. Here are the criteria for marking: *attach pdf file*. Please mark the essay according to the provided criteria, detailing the marking of each part. The total marks should be out of 100. Here is the essay submitted by the student using docs: *attach docs file*.

**Output: first measure**

### Marking Criteria Breakdown

- 1. Introduction and Thesis Statement (10 marks)\*\***  
 - \*\*Marks Awarded: 8/10\*\*  
 - \*\*Comments:\*\* The introduction effectively sets the stage for the essay by highlighting the urgency of climate change and the need for renewable energy. The thesis statement is clear and concise, stating that renewable energy is essential to human life because it affects food, water supply, and health. However, it could be more engaging to capture the reader's attention better.
- 2. Understanding and Use of Sources (20 marks)\*\***  
 - \*\*Marks Awarded: 18/20\*\*  
 - \*\*Comments:\*\* The essay demonstrates a strong understanding of the sources cited. The references are relevant and well-integrated into the argument. The student uses a variety of credible sources, including reports from the National Oceanic and Atmospheric Administration and the Union of Concerned Scientists. However, there is a slight over-reliance on the National Oceanic and Atmospheric Administration, which could have been balanced with more diverse sources.
- 3. Argument Development and Cohesion (20 marks)\*\***  
 - \*\*Marks Awarded: 16/20\*\*  
 - \*\*Comments:\*\* The essay is well-structured, with each paragraph focusing on a specific aspect of the argument. The points are logically developed and supported by evidence. However, some transitions between paragraphs could be smoother to enhance the overall flow of the essay.
- 4. Critical Analysis and Original Thought (20 marks)\*\***  
 - \*\*Marks Awarded: 15/20\*\*  
 - \*\*Comments:\*\* The essay provides a good critical analysis of the impact of climate change on food, water, and health. The student makes a compelling case for the necessity of renewable energy. However, the analysis could be deepened by exploring counterarguments or potential challenges in implementing renewable energy solutions.
- 5. Conclusion (10 marks)\*\***  
 - \*\*Marks Awarded: 8/10\*\*  
 - \*\*Comments:\*\* The conclusion effectively summarizes the main points and reinforces the thesis statement. It also provides a call to action for government initiatives, which adds a practical dimension to the argument. However, it could be more impactful by reiterating the urgency and importance of the issue.
- 6. Grammar, Spelling, and Formatting (10 marks)\*\***  
 - \*\*Marks Awarded: 9/10\*\*  
 - \*\*Comments:\*\* The essay is well-written with minimal grammatical and spelling errors. The formatting is consistent, and the references are correctly cited. There are a few minor errors, such as the lowercase "the" at the beginning of a sentence in the third paragraph.
- 7. Referencing and Citation (10 marks)\*\***  
 - \*\*Marks Awarded: 9/10\*\*  
 - \*\*Comments:\*\* The essay includes a comprehensive list of references, which are correctly formatted according to the required citation style. The in-text citations are appropriately placed. However, the reference list could be more alphabetically organized.

### Total Marks: 83/100

### Summary

The essay is well-researched and effectively argues the importance of renewable energy in mitigating the impacts of climate change on food, water, and health. It demonstrates a good understanding of the topic and uses credible sources to support the argument. The structure is logical, and the writing is clear and concise. However, there is room for improvement in the depth of critical analysis and the smoothness of transitions between paragraphs. Overall, it is a strong essay that meets most of the marking criteria effectively.

**Output: repeated measure**

### Marking Criteria Breakdown

- 1. Introduction and Thesis Statement (10 marks)\*\***
- 2. Argument Development and Evidence (30 marks)\*\***
- 3. Organization and Structure (20 marks)\*\***
- 4. Clarity and Style (15 marks)\*\***
- 5. Use of Sources and Referencing (15 marks)\*\***
- 6. Conclusion (10 marks)\*\***

### Detailed Marking

#### 1. Introduction and Thesis Statement (10 marks)  
 - \*\*Score: 8/10\*\*  
 - \*\*Comments:\*\* The introduction effectively sets the stage for the essay by highlighting the urgency of climate change and the need for renewable energy. The thesis statement is clear and outlines the main points that will be discussed: food and water supply, and health. However, it could be more concise.

#### 2. Argument Development and Evidence (30 marks)  
 - \*\*Score: 25/30\*\*  
 - \*\*Comments:\*\* The essay provides a well-rounded argument supported by credible sources. Each point is backed by evidence, primarily from reputable organizations like the National Oceanic and Atmospheric Administration and the Union of Concerned Scientists. However, some sections are repetitive, and the argument could be more tightly woven.

#### 3. Organization and Structure (20 marks)  
 - \*\*Score: 18/20\*\*

- \*\*Comments:\*\* The essay is well-organized, with each paragraph focusing on a specific aspect of the argument. The transitions between paragraphs are smooth, and the structure is logical. However, the essay could benefit from more subheadings to guide the reader through the different sections.

#### 4. Clarity and Style (15 marks)  
 - \*\*Score: 12/15\*\*  
 - \*\*Comments:\*\* The writing is generally clear and concise, with a formal academic tone. However, there are a few grammatical errors and awkward phrasings that detract from the overall readability. For example, "the farmers and ranchers that provide the food on our tables" could be more succinctly phrased.

#### 5. Use of Sources and Referencing (15 marks)  
 - \*\*Score: 13/15\*\*  
 - \*\*Comments:\*\* The essay makes excellent use of a variety of sources, all of which are properly cited in APA format. The references are relevant and add credibility to the argument. However, the essay could benefit from integrating the sources more seamlessly into the narrative.

#### 6. Conclusion (10 marks)  
 - \*\*Score: 8/10\*\*  
 - \*\*Comments:\*\* The conclusion effectively summarizes the main points and reiterates the importance of renewable energy. It also provides a call to action for government involvement, which adds a persuasive element. However, it could be more concise and impactful.

### Total Score: 84/100

### General Comments

The essay is well-researched and presents a compelling argument for the importance of renewable energy. It is well-organized and makes good use of credible sources. However, there are areas for improvement in terms of clarity, conciseness, and integration of sources. Overall, it is a strong essay that meets the criteria well.

**Gemini 1.5 Flash (prompt and output)**

**Prompt**

You are a business course lecturer. Here are the criteria for marking image: *attach image*. Here is the essay submitted by the student.  
 [Student Essay in plain text format]  
 Please mark the essay according to the provided criteria, detailing the marking of each part. The total marks should be out of 100.

**Output: first measure**

◆ **Essay Marking: Why Renewable Energy is Essential to Human Life**

Total Marks: 85

Content (40 Marks):

- **Relevance to Topic (10 Marks):** The essay directly addresses the importance of renewable energy. (10/10)
- **Depth of Knowledge (15 Marks):** The essay outlines the negative impacts of climate change on food, water, and health, and how renewable energy can help mitigate these issues. However, the discussion on economic and social aspects of renewable energy is missing. (10/15)
- **Accuracy of Information (15 Marks):** The essay uses credible sources to support its claims. Citations are well-formatted. (15/15)

**Output: repeated measure**

◆ **Essay Marking: Why Renewable Energy is Essential to Human Life**

Total Marks: 85

Content (40 marks)

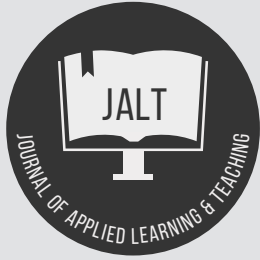
- **Strength:**
  - Clearly establishes the importance of renewable energy by highlighting the detrimental effects of climate change on food, water, and health.
  - Uses credible sources to support arguments.
  - Mentions the advantages of renewable energy (low emissions, sustainability).
- **Weakness:**
  - Lacks a strong focus on the business aspects of renewable energy (e.g.,

I will mark the essay according to the provided criteria.

**CLO 3: Organisation of Ideas (Coherence and Logical Structure): 18/20** The essay has a clear and logical structure, with a well-defined introduction, body, and conclusion. The writer presents a clear thesis statement and supports it with relevant evidence throughout the essay. However, there are some minor issues with transitions between paragraphs, which could be improved to enhance the overall coherence.

**CLOs 2 & 3: Critical Analysis, Evaluation of Thesis: 19/20** The writer demonstrates excellent critical analysis and evaluation skills, presenting a clear and well-supported argument for the importance of renewable energy. The writer provides concrete evidence from credible sources to support their claims, and effectively evaluates the impact of climate change on human life. However, there could be more nuance in the analysis, and some of the points could be more deeply explored.

**CLOs 2 & 3: Comprehension of the Topic and Related Issues: 19/20** The writer demonstrates an excellent understanding of the topic and related issues, including the impact of climate change on human life, the importance of renewable energy, and the role of government initiatives. The writer provides a comprehensive



## Using Generative Artificial Intelligence in learning and teaching: An empirical analysis on academic staff's perspectives

Carolyn Tran <sup>A</sup>	A	<i>University of New England, Business School, The University of Sydney, School of Education and Social Work, Australian Institute of Higher Education</i>
Bryn James <sup>B</sup>	B	<i>Australian Institute of Higher Education</i>
Vivian Allen <sup>C</sup>	C	<i>Australian Institute of Higher Education</i>
Rodrigo Oliveira de Castro <sup>D</sup>	D	<i>Australian Institute of Higher Education</i>
Cesar Sanin <sup>E</sup>	E	<i>Australian Institute of Higher Education</i>

### Keywords

Academic perspectives;  
academic integrity;  
Australia;  
Generative Artificial Intelligence;  
private higher education.

### Abstract

The use of Generative Artificial Intelligence (GAI) in higher education has garnered significant attention from scholars and researchers since the release of ChatGPT, one of the prominent GAI tools, in late 2022. While academic communities are increasingly recognizing the potential of GAI in teaching and learning, concerns persist regarding the impact of individual backgrounds and employment statuses on attitudes toward GAI, particularly in private higher education. This paper examines the perspectives of academic staff across different disciplines and employment statuses on their familiarity with and incorporation of GAI technologies in teaching. It emphasizes how to integrate GAI technologies effectively into teaching while upholding academic integrity and ensuring the quality of education. The findings, derived from an online survey and descriptive analysis, reveal significant variation in GAI familiarity among disciplines, as well as differing approaches to integrating GAI tools into teaching practices and formulating policies to maintain academic integrity. Notably, full-time staff are generally more familiar with GAI than their casual counterparts. While most teaching staff are open to students using GAI in their studies, concerns about potential breaches of academic integrity, particularly in assessments, remain prominent. To address these concerns, we recommend developing a transparent academic integrity policy along with clear guidelines for GAI use tailored to different disciplines and employment statuses. Such measures would foster an innovative and creative learning environment while safeguarding the quality of education.

### Correspondence

ttran43@une.edu.au <sup>A</sup>

### Article Info

Received 25 October 2024  
Received in revised form 31 January 2025  
Accepted 4 February 2025  
Available online 12 February 2025

DOI: <https://doi.org/10.37074/jalt.2025.8.1.23>

## Introduction

In today's society, Generative Artificial Intelligence (GAI) has attracted much interest from scholars through its significant contributions to educational technologies for adaptive learning environments (Minn, 2022; Marrone et al., 2022). GAI has been progressing at an accelerated pace and generated effective technologies to support education such as learning management systems, online discussion boards, transcriptions of lectures, online exams, and so on in and outside class (Chai et al., 2021; Chaudhry et al., 2023). The applicability of GAI technologies in higher education was considered positive until November 2022 when a US company, OpenAI, released ChatGPT that has caused critical concern among academics about the integrity of students in their assessments (Sullivan et al., 2023). ChatGPT refers to a Generative Pretrained Transformer, a language model developed by OpenAI, which was trained on large language databases and generates human-like responses, including providing real-time communication in response to requests of users (Chaudhry et al., 2023; Lund & Wang, 2023; Sullivan et al., 2023; Neumann et al., 2023). As a conversational tool, AI-based ChatGPT can give users relatively detailed answers to the questions asked (Van Dis et al., 2023; Chaudhry et al., 2023) that inevitably would hinder learners' performance and their academic skills for their future careers.

Recent studies showed that after releasing AI-based ChatGPT, approximately one-fifth of students utilized AI-based ChatGPT for their assessment tasks (Cassidy et al., 2023). As reported by Intelligent (2023), one-third used this tool for their academic writing in a survey of one thousand university students, albeit 75% of students in this survey recognized that using ChatGPT was cheating, but they did so. While AI-related tools are assessed as innovative, ChatGPT has arisen as a "threat" regarding the academic integrity of students in assessments (Sawahel, 2023; Weissman, 2023, Sullivan et al., 2023), which might affect learning efficiency, given that ChatGPT can be accessed by students worldwide regardless of on-campus, online, domestic, or international students.

Since 2023, the empirical literature in higher education has started focusing on ChatGPT and its effects on learning and teaching in higher education through critical review content analysis (Lo, 2023; Sullivan et al., 2023; Firat, 2023) to emphasize the importance of using ChatGPT in higher education processes. In Australia, the Tertiary Education Quality and Standards Agency (TEQSA, 2024c) has provided guidelines and resources to assist higher education providers and teaching staff to meet new challenges and benefit from opportunities afforded by advances in GAI. It can be observed that while previous studies made attempts to examine the perspective of students and teaching staff on using ChatGPT via a rapid survey, very little is known about whether teaching staff in the private higher education sector have perceived advantages and disadvantages of using GAI in learning and teaching that they are engaging with and thus encouraging private higher education institutions (HEIs) to have an appropriate strategy to mitigate the impact of GAI on the integrity of learning (TEQSA, 2024b). The potential differences in academic perspectives on using AI in learning and teaching, based on discipline and employment status,

have not yet been explored.

This paper aims to address these gaps in the literature on GAI in higher education by examining the perspectives of academic staff at an Australian private HEI on the use of GAI, particularly ChatGPT, in learning and teaching and exploring whether GAI impacts the integrity of learning and, consequently, the integrity of the higher education qualifications it awards. In doing this, a descriptive analysis is used to provide overall perspectives of academic staff on GAI through an anonymous online survey at an Australian private HEI with both casual and permanent staff for three disciplines: Accounting (ACC), Business (BUS), and Business Information System (BIS). In addition, an inferential analysis is employed to examine whether there is a significant difference in academic staff's perspectives by types of disciplines and employment statuses. A case study conducted at this private HEI is expected to provide insightful information for educational managers to design appropriate learning and teaching methods for improving learning and learning efficiency in the presence of GAI and, thus, upholding the education quality of private higher education providers.

The paper is organized as follows. Section 2 presents the development of GAI in higher education with the event of ChatGPT and the requirements and guidelines of TEQSA. The research design and empirical analysis are illustrated in Section 3. This is followed by Section 4 presenting the results of the survey. Section 5 discusses the results found in the survey with academic perspectives on using GAI and academic integrity. Section 6 outlines theoretical and practical implications in designing the AI integrity policy and integrating AI in the learning and teaching process. Section 7 ends with conclusions and limitations.

## Generative Artificial Intelligence in higher education

### Generative Artificial Intelligence and the advent of ChatGPT

Generative Artificial Intelligence (GAI) is defined as an overarching term covering a range of technologies and methods, namely machine learning, natural language processing, data mining, neural networks or an algorithm (Baker & Smith, 2019). The use of GAI in higher education is not a new topic. It was first introduced in 1997 by the International Artificial Intelligence Education Society. However, it has only recently attracted the attention of educators, who are now exploring the potential opportunities for AI to support learning throughout students' academic journeys (Zawacki-Richter et al., 2019). In education, AI can contribute to software applications in learning and teaching in terms of three categories: personal tutors, intelligent support for collaborative learning and intelligent virtual reality (Luckin et al., 2016). Intelligent tutoring system (ITS) can run modules with thousands of students albeit online collaboration needs to be facilitated and moderated (Salmon, 2000). In addition, under intelligent virtual reality (IVR), students can engage in and be guided in authentic virtual reality and game-based learning environment, and with virtual agents acting as facilitators in virtual or remote

labs (Perez et al., 2017; Zawacki-Richter et al., 2019).

Previous studies revealed that GAI-based chatbots can enhance student interaction, motivation, engagement and improve learning process and outcomes (D'Mello et al., 2014, Winkler & Söllner, 2018, Deng & Yu, 2023). A recent study of Alotaibi et al. (2020) reported that using a chatbot significantly enhanced performance of students and their knowledge retention in a computer science course. In addition, Song et al. (2023) indicated that students perceived a chatbot as a useful tool with a positive attitude in the process of learning language. Most recently, Ahmad et al. (2024) surveyed respondents from 11 Asian and African countries and found that those who used AI tools reported significantly greater benefits than those who did not. Additionally, it is found that individuals with a master's degree perceived AI tools as more threatening than those with a diploma, and female participants reported greater AI-related threats than males. While snowball and convenience sampling methods were used in this paper, which are not randomly selected and may not fully represent the population, the authors still provided valuable insights into the strengths and threats of AI tools in learning and teaching.

While the enormous opportunities for the application of AI to support learning and teaching can be observed, the advent of ChatGPT, one of GAI-based tools, in its version 3.0, launched in late 2022 has augmented concern about its influence on HEIs, for example, academic integrity in learning and teaching while HEIs have no clue on how to respond to this new tool (Chaudhry et al., 2023). While the use of technology in learning is encouraged, it is essential to consider ethics, responsibilities, and caution (Gelman, 2023). Farooqi et al. (2024) highlighted several key points in their systematic review. First, data privacy should be a top priority, as AI systems rely on extensive data, which raises the risk of breaches and misuse. Second, there must be a robust mechanism for data protection and compliance with general data protection regulations. Another critical concern is algorithmic bias: biased training data can lead to discriminatory decisions, exacerbating inequalities in education. However, rather than restricting the use of GAI tools, HEIs should focus on exploring ways to use them safely (García-Peñalvo, 2023). As can be seen, ChatGPT has provided an opportunity to reconsider the purpose of assessment, assignment development, writing support, and reflection in AI utilization in society that can enhance the effectiveness of learning and teaching (Strzelecki, 2023, Sullivan et al., 2023, Crawford et al., 2023, van Dis et al., 2023).

While AI-based technologies have generally been seen as having a positive impact on teaching and learning, the introduction of ChatGPT in late 2022 has raised concerns about its potential to significantly affect the academic environment (Thorp, 2023). Lack of integrity and less critical thinking in problem solving in learning are inevitable when students much rely on ChatGPT. In addition, answers of ChatGPT are found to have issues in information generation and biases in data training and privacy (Baidoo-Anu & Owusu Ansah, 2023). In order to limit the adverse effects of ChatGPT, academics are required to rethink about innovative teaching methods and produce assessments that are not

easily solved by AI (Firat, 2023).

### **Academic integrity**

Academic integrity is interpreted as a proxy of the students' conduct with respect to plagiarism and cheating (Macfarlane et al., 2014). Academic integrity plays an important role in higher education aiming at displaying honesty, accountability, and credibility of learners. Integrity failures can damage the credibility and reputation of HEIs (Altbach, 2004). To ensure reputation and education quality, HEIs presently have their academic integrity policies in place to deal with academic misconducts and strengthen academic standards. These integrity policies are well communicated to students by academics on a regular basis (Chaudhry et al., 2023).

In addition, to ensure good academic conduct of learners, the role of technology is important to verify the identity and authorship, but not being intrusive of privacy by providing platforms for secure and efficient evaluation of learners' work (Macfarlane et al., 2014, Amigud et al., 2017). Some technologies, such as remote live proctoring, remote web processing, browser lockdown, keystroke pattern recognizers, and plagiarism detectors, are currently available; however, each serves a specific goal. For example, the lockdown browser can verify identity, but it cannot confirm authorship if cheating is suspected (Chaudhry et al., 2023, Smith et al., 2021). On the other hand, while online assignments can be checked for plagiarism and authorship, they cannot verify student identity (Amigud et al., 2017; Chaudhry et al., 2023). Although no technological tools currently offer a complete solution for academic misconduct, further investigation and the experience of instructors are essential when issues arise. Nevertheless, these tools have proven effective in supporting academic integrity, particularly in detecting plagiarism. For instance, tools like Turnitin and Edutic have helped educational institutions gather evidence to address instances of student misconduct (Denisova-Schmidt, 2016; Boehm et al., 2009).

However, with the advent of ChatGPT which allows quick essay generation and answers close to human-like writings, a critical question arises regarding how academic integrity can be ensured in students' work produced by ChatGPT (Ventayen, 2023). In addressing this, in April 2023, Turnitin released an AI writing detection integrated into Turnitin Feedback Studio available for HEIs to use on their online learning platform. This tool provides an overall percentage of the text that might have been generated by AI. However, students cannot see this score. Together with this, a report highlighting sections written by AI is available for instructors to view and download. While the AI report may be used, it does not mean that a student has committed misconduct. This may require the marker's expertise to evaluate both the AI-generated score and the assignment in context (Howie, 2023).

Academic perspectives on ChatGPT have not considered AI tools as a serious threat in higher education (Firat, 2023, Chaudhry et al., 2023). However, while AI tools such as ChatGPT can enhance learning, they may produce factual



inaccuracies and biases (Sullivan et al., 2023), which could impact students who heavily rely on ChatGPT for their studies. The literature suggests that with the widespread availability of AI today, teaching and assessment practices must be adapted by academics. These tools offer an opportunity to rethink how written tasks are assigned to foster higher-order critical thinking skills (Liu et al., 2023; García-Peñalvo, 2023; Rudolph et al., 2023; Hess, 2023). As a result, universities and their academic staff can encourage students to use ChatGPT and other related tools in an ethical manner that promotes the development of critical thinking (García-Peñalvo, 2023). Since the arrival of ChatGPT version 1.0 onwards, several studies have been conducted on such GAI tools; however, most recent studies focus on the impacts of the release of ChatGPT 3.0. For example, a study by Rudolph et al. (2023) explored the fundamental features of ChatGPT and its implications for university teaching and learning. On the other hand, Tlili et al. (2023) explored social media sentiments about ChatGPT in the educational context. The authors found that public discourse generally responded positively to Generative AI (GAI) tools. In terms of AI tools in assessment, Ofem et al. (2024) noted that incorporating AI-driven tools into the curriculum allows both teachers and students to benefit from timely feedback, automated scoring, and efficient assessment planning. The authors further highlighted that AI-powered assessment systems can analyse vast amounts of data, identify patterns in student performance, and offer adaptive feedback tailored to individual learning needs.

Research on Generative AI (GAI) has surged since late 2022, with 160 papers published across 50 countries (Ismail et al., 2024). Among them, Australia ranks second with 18 papers, following the United States, which has published 28 papers. However, to our knowledge, there is limited understanding of whether teaching staff are familiar with GAI technologies, or if academic perspectives on the impact of ChatGPT in learning and teaching differ by discipline (e.g., business, accounting, information systems) and employment type (e.g., casual, full-time). This gap is particularly evident in private higher education in Australia, where AI research is still limited. Additionally, there is a lack of insight into whether teaching staff are comfortable with students using ChatGPT in assessments and the potential risks to academic integrity. Addressing these questions is crucial for providing educational managers with the information needed to design integrity policies that support the effective use of GAI in the learning and teaching process. By doing so, this research aims to make valuable contribution to the literature on AI in higher education, supporting efforts to maintain the quality of education in the sector as required by TEQSA.

### **Tertiary Education Quality and Standard Agency (TEQSA) with GAI guidelines**

In the presence of GAI, TEQSA Australian Academic Integrity Network (AAIN) Generative AI Working Group has provided GAI guidelines to students and academics (AAIN, 2023). This need has been sourced from recent advances in AI technologies with a high demand for public understanding of these technologies (Selwyn & Gallo Cordoba, 2022), especially in higher education. The guidelines aim at

assisting education providers to manage better practices, ethics and policy in using GAI at their institutions.

While acknowledging the benefits of AI technologies to education such as automatic generation of outlines and summaries, support for personalized learning, and writing feedback, AAIN (2023) indicated some challenges of AI including "(1) the authentication of individual attainment for accreditation purposes, (2) potential challenges to the principles of academic integrity, (3) the need for sustainable and adaptable responses to generative AI in learning, teaching and assessment and academic integrity policies and procedures, (4) support for staff and students in understanding and using the technology" (p. 1). In order to address these challenges, AAIN (2023) aimed to provide guidelines to support existing and new guidance for students, academics, professional staff, university administrators and decision-makers.

AAIN (2023) provided nine points for teaching staff. The guidelines of the nine points for teaching staff mainly focus on the importance of clear instructions and expectation that should be provided to students regarding the appropriate use of generative AI in assessment tasks and learning activities. These instructions and expectations should be consistent with institutional guidelines and available on teaching platforms for students' reference. Teaching staff also needs to communicate to students any inappropriate uses of generative AI that may result in academic misconduct. Academics should inform students about the potential for detection software (e.g., Turnitin) to detect generative AI use and that they are risking academic misconduct if using generative AI without appropriate acknowledgement by following the referencing guidelines provided by their institution. The ethical use of GAI or indicating when not permitted should be incorporated in unit outline, course learning outcomes, assessment tasks and marking criteria. All these should align with institutional policies and any accreditation requirements.

In addition, AAIN (2023) provided other guidelines for professional staff such as librarians, learning advisors to support students to develop academic skills and academic integrity, governance officers to update and maintain policies and procedures to facilitate the investigation of potential academic misconduct. Training should be provided to academic integrity officers to maintain current, relevant knowledge on changes in policies as well as trends in the permitted use of AI tools.

AAIN (2023) also provides guidelines to higher education providers in designing policies and procedures on the ethical use of GAI across disciplines and changes should be communicated to staff and students. These policies and procedures should be treated as live documents, reviewed and updated regularly according to changes in GAI technologies. If GAI applications are required for units and courses, they should be made available for students at no additional cost to ensure equitable access.

Since the arrival of ChatGPT 3.0, TEQSA has aided higher education providers in reflecting the risks of GAI that could potentially impose on higher education in terms of teaching

and assessment, student privacy, equity considerations and academic integrity. The information about AI and the reflection of some HEIs are available on the website of TEQSA (TEQSA, 2024b). To ensure consistency in the ethical use of AI, TEQSA has requested that HEIs submit detailed and credible action plans by June 2024. These plans should provide assurance that institutions are engaging with GAI technologies and have strategies in place to mitigate the impact of GAI on the integrity of their higher education awards. Given the diversity of providers, student cohorts, and courses, it is expected that institutions will adopt varied approaches to address the challenges posed by AI technologies. This request underscores their responsibility under the Threshold Standards, ensuring that potential risks to academic activities are being effectively managed and mitigated (TEQSA, 2024c, p. 1). While the action plans of TEQSA appear to focus on students, the role of academics becomes crucial in being familiar with, understanding, and integrating GAI technologies into the teaching process to enhance students' learning experiences. However, to our knowledge, there is limited research on this aspect, presenting an opportunity for us to contribute to the literature on GAI applications in the private higher education sector by (1) exploring teaching staff's familiarity with GAI technologies across different disciplines and employment statuses and (2) examining whether staff are willing to incorporate GAI into their teaching and identifies concerns related to academic integrity in its use. The goal is to ensure the quality of teaching in the private higher education sector.

## Research design and methods of analysis

### Research design

This paper aims to use a quantitative research design to address the proposed research objectives. The study employs quantitative methods, including an online survey, descriptive analysis, and inferential analysis, to provide a comprehensive understanding of how academic staff perceive the impact of generative AI (GAI) on learning and teaching since the public release of ChatGPT in late 2022. The online survey (Burns & Veeck, 2020) was specifically designed to investigate academic staff's perceptions of using GAI tools like ChatGPT in teaching and assessments, focusing on their potential influence on student learning integrity. The survey questions were designed to gather comprehensive data on various aspects of GAI integration in teaching and learning. Questions covered topics such as types of GAI tools used, purposes for which they were used, and perceived benefits and drawbacks. The rationale for each question was to explore the depth and breadth of utilizing GAI technology among academic staff and to understand the challenges and concerns related to academic integrity.

The online survey, including 19 closed and open questions, was sent out to all academic staff of a private Australian HEI. This online survey was launched in November 2023, anonymous, confidential and pre-tested. Its ethics approval was obtained from the Scholarship of Learning and Teaching Committee of this HEI before being sent out to respondents. While focusing on academic staff at a single Australian private HEI may limit the ability to generalize findings

to other studies, it allows for a controlled, homogeneous environment. This approach ensures a consistent comparison of academic perspectives across different disciplines and employment statuses regarding the use of GAI technologies in teaching and learning within this HEI. A total of 55 academic staff members were invited to participate in the online survey via email. At the close of the survey period, 17 responses were received, representing 31% of the total academic staff. This response rate met the required sample size criteria, corresponding to a confidence level of 0.8, a margin of error of 0.1, and a population of at least 50 for an internal survey (Nulty, 2008; Oribhabor & Anyanwu, 2019). Among 17 responses, 41% were casual staff and 59% were permanent staff. Regarding disciplines, 18% of responses were of ACC; 53% of responses were BUS and 29% of responses were BIS. All questions were answered for both quantitative and qualitative responses with high reliability. To minimize sampling errors and improve the response rate, the master list of academic staff was updated, and a friendly reminder was sent to follow up with participants invited to complete the online survey. Previous studies have shown that surveys with smaller sample sizes typically require response rates of 20%–25% to yield reliable estimates (Fosnacht et al., 2017; Wu et al., 2022). Therefore, the 31% response rate achieved in our internal survey is considered acceptable for an online survey.

### Empirical strategies

In this paper, we used two methods of analysis to address our research objectives. First, the descriptive analysis was utilized to provide an overall evaluation of academics' perceptions of quantitative questions on using GAI in teaching and learning. Descriptive analysis is a method of statistical analysis that involves summarizing and interpreting data to identify patterns, trends, and key characteristics. This type of analysis helps to describe the main features of a dataset without making inferences or predictions, offering a straightforward understanding of the data's distribution in the survey (Burns & Veeck, 2020, p. 343). We used this method to answer the following questions: (1) whether academic staff are familiar with using GAI technologies, and what kind of GAI have experienced, (2) whether academic staff are comfortable with their students using GAI in their courses, and (3) how likely they think their students were to violate the policy of integrity before or after the release of ChatGPT and other GAI technologies. In addition to this, we asked academic staff about their employment status (casual or full-time) and discipline that they are teaching (e.g. ACC, BUS, BIS). The questions were designed using a 5-point Likert scale format and analysed as categorical variables for cross-tabulation. The Cronbach's alpha for the Likert scale questions was 0.96, indicating a high level of consistency in measuring the same underlying concept, which demonstrates strong reliability for our study (George & Mallery, 2003). For the open-ended questions, responses were summarized and categorized by the main themes of analysis.

The inference analysis (e.g. ANOVA, Cross-tabulation) was then used to investigate whether there is a significant difference in academics' perceptions classified by types of employment (casual or full-time) and disciplines (ACC, BUS,

BIS). The inference analysis refers to statistical procedures to generalize the results of the sample to the target population that it represents (Burns & Veeck, 2020, p. 344). The student's t-test and F-test are used, where appropriate, for hypothesis testing with small sample sizes (Levine et al., 2021). These analytical methods help explore the relationships between different categorical variables, allowing for a deeper analysis of the data. This approach simplifies the process of identifying trends and opportunities, providing valuable insights into the perceptions of academic staff, categorized by their employment status and teaching disciplines.

## Results of survey

### Perspectives of academics on GAI technologies

The arrival of GAI technologies, especially ChatGPT used in education have brought teachers to much attention of academic integrity (Firat, 2023, Sullivan et al., 2023). The familiarity with GAI technologies among academics can vary based on their expertise in teaching and research. The survey results revealed that 35% of teachers are very familiar with GAI technologies, while another 35% are moderately familiar. However, 18% of respondents reported being slightly familiar, and 12% indicated they were not familiar with GAI technologies at all. Additionally, the levels of familiarity with GAI were found to differ according to employment status. Figure 1 shows that the permanent teachers are more familiar with GAI technologies than their casual counterparts, 53% versus 35%. The analysis of variance (ANOVA) reveals that the difference in the level of familiarity with GAI technologies by the employment status, permanent versus casual teachers is statistically significant at the 5% level ( $p = 0.0386 < 0.05$ ). The survey reveals that the proportion of teachers who are not familiar with GAI at all is low at 6% and the same for both casual and permanent teaching staff. This has demonstrated concerns of academic staff about the development of GAI technologies that might affect students' learning experience.

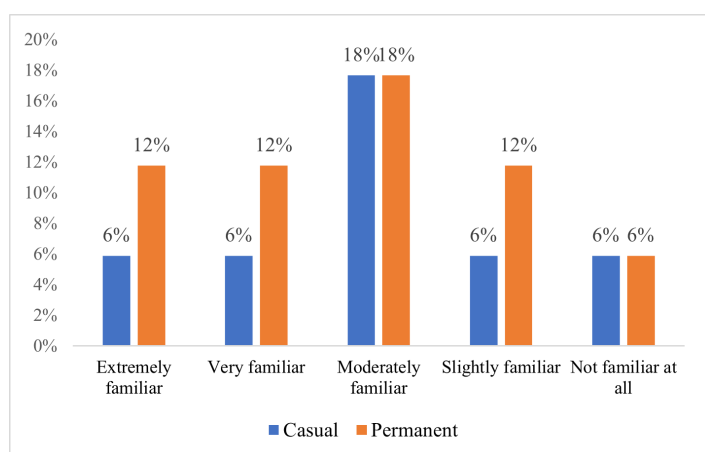


Figure 1: The level of familiarity (%) of GAI technologies by employment.

The level of familiarity with GAI technologies is then classified by disciplines. Table 1 shows that 22% of BUS teaching staff are not familiar and 33% of BUS teaching staff are slightly familiar with GAI technologies whereas teaching staff in the

disciplines of BIS and ACC are familiar with GAI technologies. More specifically, 60% of BIS teaching staff are very familiar with GAI given that their expertise focuses on information technology. Although there are differences in the level of familiarity with GAI technologies across disciplines, these differences are not statistically significant at the 5% level.

Table 1: The level of familiarity of GAI technologies by disciplines.

	ACC	BUS	BIS
Extremely familiar	0%	0%	60%
Very familiar	33%	11%	20%
Moderately familiar	67%	33%	20%
Slightly familiar	0%	33%	0%
Not familiar at all	0%	22%	0%

Regarding using ChatGPT, the respondents were asked in what ways they used ChatGPT, or other GAI technologies giving respondents the possibility to choose multiple options that fit their experience. The results from Figure 2 show that using ChatGPT to conduct a conversation out of curiosity, ask general knowledge questions, technical questions or research-related activities are key reasons chosen by more than 40% of respondents. This is followed by 29% of respondents using ChatGPT to prepare materials for their units. The lowest proportion of 23.5% of respondents used ChatGPT for other activities of teaching and learning. It can be observed that 29% of academic staff did not use ChatGPT for any purposes. The respondents reveal that among different types of GAI tools, ChatGPT was chosen as the most familiar with 88% of responses. This reflects the fact that ChatGPT has influenced academic perspectives since its arrival in late 2022.



Figure 2: The ways teaching staff have used ChatGPT and other GAI technologies.

Regarding the potential benefits of GAI in higher education, 71% of respondents shared their views on using GAI in an academic environment. The majority of responses indicated that the ChatGPT tool can offer advantages to both students and academics in learning and teaching. This finding is consistent with previous literature (Chaudhry et al., 2023; Gilson et al., 2023), which suggests that ChatGPT can have a positive impact on teaching and learning when used appropriately. Specifically, respondents answered that ChatGPT could enhance the learning experience for students

in various ways such as 24-hour interactive learning services, academic writing, improving understanding of concepts, gaining general knowledge, problem-solving support and to some extent, inspiring students to think outside the box (Crawford et al., 2023). In addition, ChatGPT can also provide useful information for academic staff in creating assessments, research and general knowledge from other disciplines (Baidoo-Anu & Owusu Ansah, 2023). However, some concerns have been raised about the negative effects of ChatGPT potentially outweighing its positive impact on students' learning experiences (Chaudhry et al., 2023). This highlights the need for HEIs, particularly in the private higher education sector, to implement appropriate policies for the use of GAI.

Integrating AI-ChatGPT into learning and teaching activities Recent studies revealed that instead of being against using ChatGPT, integrating AI in learning and teaching activities by using it safely may enhance students' learning experiences (Badam, 2023; Garcia-Peñalvo, 2023). Our survey found different perspectives by disciplines on how teaching staff feel comfortable with students using ChatGPT in their courses.

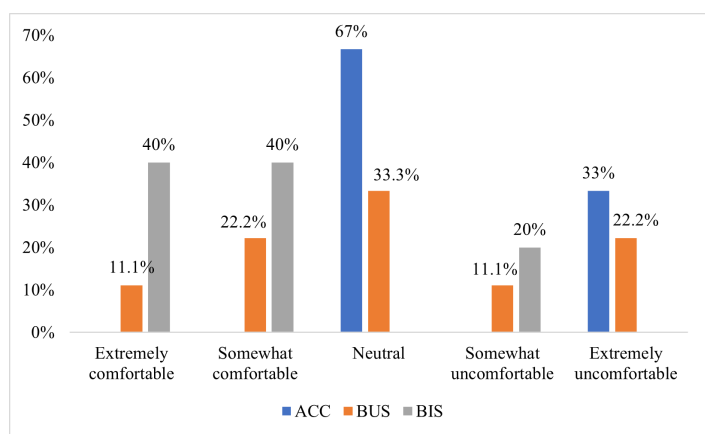


Figure 3: Teaching staff feel comfortable with students using ChatGPT in their courses.

Figure 3 reveals that 80% of teaching staff in BIS felt comfortable if their students used AI in their courses, only 20% said that they were not comfortable. Due to the nature of the BIS discipline, teaching staff find it easier to adapt the use of GAI in teaching and learning as technological development in the GAI age. In a recent study, Sullivan et al. (2023) revealed that although ChatGPT is less effective in computer science assignments as these assignments are more based on practical and problem solving, students said that they were using ChatGPT for both computer science and statistics classes.

On the other hand, teaching staff in BUS and ACC provided different perspectives. While only one-third of BUS teaching staff felt comfortable if students used AI in their study, no teaching staff in ACC discipline did. Instead, 67% of ACC staff were neutral and could not decide if they felt comfortable or not. However, 33% of ACC staff said they were extremely uncomfortable whereas 22% of BUS teaching staff said so. The prior literature revealed that social sciences and arts disciplines were most under threat (Jacobson, 2023) and students can now outsource their essay writing to the

chatbot (Venkataraman, 2023). This reflects the fact that teaching staff in BUS and ACC showed their concern about using GAI by their students because this could potentially cause cheating and inevitably restrict the capacities of brainstorming and problem-solving of students.

When asked about suggestions to modify assessments to control or stop AI cheating, 71% of respondents in our survey provided a variety of suggestions such as using AI detection tools, supervised assessments with blocking access to ChatGPT, applying Viva oral assessment, and acknowledging the use of GAI in assessments with an acceptable level, e.g. 20%, and considering this as plagiarism. The AI detectors such as Turnitin, GPTZero or Copyleaks are unable to detect AI-generated text completely. Instead, the AI detector-generated reports need further testing and validation by instructors (Chaudhry et al., 2023; Howie, 2023). Blocking access to ChatGPT may be feasible for the online supervised exams but not for take-home assignments, thus banning its use seems not to be a practical approach (Sullivan et al., 2023). Redesigning innovative assessment methods where academic integrity can be ensured and clear guidelines established for staff and students as to how ChatGPT could be used in ethically appropriate ways are highly appreciated in the GAI age (Chaudhry et al., 2023; Firat, 2023; Sullivan et al., 2023).

The survey also reveals that while teaching staff are willing to engage in using GAI tools, such as ChatGPT and other GAI technologies in learning and teaching activities, there should be a threshold of GAI usage to ensure that students produce their assessments using their own knowledge, rather than much rely on GAI to submit their work (Chaudhry et al., 2023). The respondents reveal that whilst GAI can be used in practical learning of different areas, it appears to contribute significantly to the fields of information technology and business information systems such as learning coding and programming by providing real-time feedback, suggesting code improvements, and offering solutions to programming challenges (Silva et al., 2024).

### Academic integrity and impact of AI-ChatGPT on learning experiences

Academic integrity is still an issue attracting much concern from academics since GAI has been released (Sullivan et al., 2023, Yusuf et al., 2024). With the ability of producing answers free of cost and in a few seconds, GAI becomes one of the most attractive tools for students to use in their studies, for example, GPT-4 could improve the model's ability to understand the meaning of a text (Okuyama & Suzuki, 2023). Our survey finds that before the release of ChatGPT and other GAI tools, 24% of teaching staff thought that their students were extremely likely to violate the integrity policy, 47% said somewhat likely and 29% of teaching staff had a neutral thought. However, after the release of ChatGPT and other GAI tools, their thoughts are significantly different. Specifically, 82% said that their students would be likely to violate the integrity policy by using these GAI technologies. Indeed, AI tools are easy to access (Chaudhry et al., 2023) whilst their generated contents are hard to assess students' true level of understanding of the material (Cotton et al.,

2024).

Having a close look at the opinion of teaching staff on violating the integrity policy by disciplines, Figure 4 showed that 100% of ACC academics said that their students are likely to violate academic integrity. This is followed by the BUS discipline with 66%. Although BIS staff are more comfortable with their students using GAI technologies than the ACC and BUS disciplines, 60% of BIS staff acknowledged that their students are likely to violate academic integrity. The literature indicates that students could potentially use GAI tools such as ChatGPT to cheat on their assignments by producing essays that are not their own work (Cotton et al., 2024). According to Yusuf et al. (2024, p.14), 46% of participants in a survey presented their firm belief that "incorporating GenAI tools in academic endeavours, whether by students or educators, constitutes outright cheating confirmed". This implies that GAI technologies could increase the number of cases violating the integrity policy (Sullivan et al., 2023, Venkataraman, 2023).

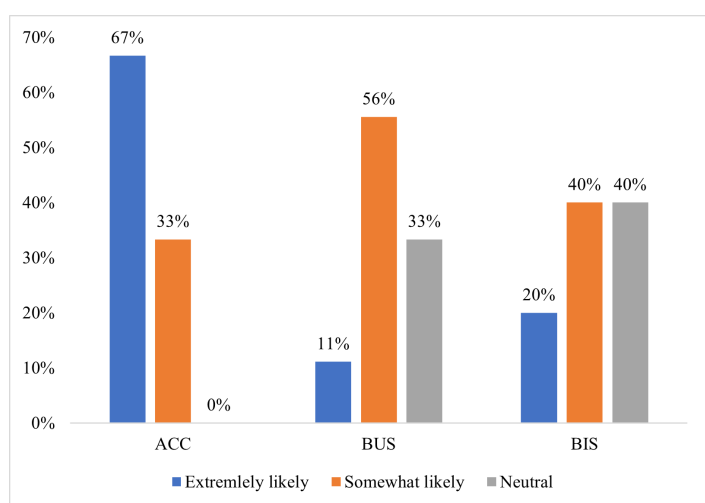


Figure 4: Teaching staff think their students are to violate the integrity policy.

However, on the other hand, our survey also finds that 76% of teaching staff think that ChatGPT is beneficial for students' personalized learning. This result is in line with the previous literature presented by Sullivan et al. (2023), Chaudhry et al. (2023), and Firat (2023) in which ChatGPT can assist to explain complex concepts in plain language, provide suggestions for the structure of an assessment task, check grammar and develop a sample quiz for test preparation. However, to use GAI effectively, the academic integrity policy should be designed appropriately with clear guidelines (Cotton et al., 2024) to ensure that students can use GAI for their study without negative influence on their learning capabilities.

## Discussion

Using GAI technologies is common in today's higher education. However, how to effectively use GAI in learning and teaching, such as ChatGPT has attracted much concern from academics (Sullivan et al., 2023; Yusuf et al., 2024). Our findings through the academic survey reveal a difference in academic perspectives by disciplines in terms of familiarity

with GAI tools, though this difference is not statistically significant. By nature, teaching staff in BIS are more familiar with GAI technologies than those in BUS and ACC. This could be attributed to accessibility by discipline, thus on the adoption of using GAI in teaching. This is in line with the previous literature showing that differences in familiarity with GAI tools, e.g., ChatGPT might be due to heterogeneity in accessibility, marketing and flexibility (Yusuf et al., 2024, Ipek et al., 2023, Denejkina, 2023).

Our survey reveals that the benefits of using GAI technologies have been recognized in terms of personalized learning support, learning coding, and offering solutions to programming challenges (Rawas, 2023), thus timesaving and improving efficiency (Yusuf et al., 2024). This result aligns with the findings of Ismail et al. (2024), which showed that respondents who used AI tools reported greater benefits than those who did not. However, using GAI technologies should be controlled by a transparent and effective policy to ensure that students reflect their own work in assessments, rather than with much reliance on ChatGPT, they could potentially write articles on various topics (Thorp, 2023), but have issues of misinformation generation and bias in privacy issues (Baidoo-Anu & Owasu, 2023; Yusuf et al., 2024).

Regarding academic integrity, 82% of respondents in our survey believe that students would be likely to violate the integrity policy after ChatGPT was released in late 2022. This result is in line with concerns of the literature about using GAI that could potentially facilitate academic dishonesty, namely plagiarism including inaccurate outputs, irrelevant contents and biased results (Chan & Hu, 2023, Naik et al., 2022). Respondents in our survey are not pessimistic about using GAI in learning and teaching; however, how to ensure that students use GAI effectively for their personalized learning without violating academic integrity is still a major concern of academic staff as GAI technologies have added complexity to long-term academic challenges of plagiarism detection and prevention (Ali et al., 2023). Although AI writing detection has been added to Turnitin Feedback Studio to produce an AI report if students did use AI in their assessments, this needs to have the expertise of markers to assess the AI score and assignments (Chaudhry et al., 2023, Howie, 2023). Previous studies reveal that the regulations of GAI in higher education require a subtle approach to acknowledge both potential benefits and the imperative to uphold academic integrity (Chan, 2023; Yusuf et al., 2024).

According to the Australian Academic Integrity Network (AAIN, 2023) under TEQSA, both public and private higher education institutions must address the challenges posed by GAI technologies in their learning environments. This includes developing sustainable and adaptable responses to GAI, particularly in relation to integrity policies, procedures, and support systems. Institutions should focus on helping both teaching staff and students understand and effectively use GAI technologies. As individual education providers, the private institution as a case study in our study, has the responsibility to ensure that these technologies are integrated in ways that uphold academic integrity and provide clear guidelines for their ethical use in teaching and learning. Our results reveal that academic integrity policies and procedures for using GAI technologies play

an important role in higher education to ensure education quality is secured (Sullivan et al., 2023, Yusuf et al., 2024). In addition, teaching staff, especially those who are not from an information technology background, needs to be technically supported for more understanding of using GAI in teaching activities and how to instruct students to commit to the integrity policy in the learning environment (Chaudhry et al., 2023).

Our findings show that full-time staff are more familiar with GAI technologies than their casual counterparts at the 5% level of significance. This is consistent with the literature (e.g., McComb et al., 2021; Leathwood & Read, 2022), which suggests that the employment conditions of casual staff offer limited opportunities for professional development, thus hindering their engagement in academic activities such as the knowledge development of GAI. In addition, if their teaching has traditionally not used information technology, casual staff might not consider announcements on using GAI technologies from education providers as compulsory tasks to peruse. Education providers should be concerned about this to have a more appropriate policy to get all staff to engage with and enhance ethical awareness of using GAI technologies (Yusuf et al., 2024).

### Theoretical and practical implications

The findings of this study contribute to the growing body of literature on the impact of GAI on higher education. Theoretically, this research highlights the nuanced perspectives of academic staff on the integration of GAI technologies, particularly in terms of maintaining academic integrity. It provides an empirical basis for understanding how GAI tools, such as ChatGPT, are perceived across different disciplines and employment statuses (Firat, 2023; Sullivan et al., 2023; Cotton et al., 2024). Additionally, it adds to the discourse on digital ethics and academic integrity by examining the potential for GAI to influence student behaviour and academic standards (Sullivan et al., 2023; Yusuf et al., 2024). The practical implications of this research are particularly relevant for educators, policymakers, and institutional leaders in higher education. The following recommendations are based on the findings of our study:

**(a) Development of clear policies and guidelines:** Educational institutions should develop transparent and detailed policies regarding the use of GAI technologies in academic work (TEQSA, 2024c, Cotton, 2024). These policies should clearly define acceptable and unacceptable uses of such tools, ensuring that students understand the boundaries and ethical considerations involved.

**(b) Training and professional development:** Institutions should offer training programs for both academic staff and students to enhance their understanding and ethical use of GAI technologies (TEQSA, 2024a, 2024b). This training should include practical sessions on identifying AI-generated content and the responsible use of these technologies in educational settings.

**(c) Assessment design:** Educators should consider redesigning assessments to minimize the potential for GAI-related misconduct. This could include the development of effective frameworks for incorporating different types of assessment such as more oral examinations, project-based assessments, and assessments requiring critical thinking and personal reflection, which are less likely to be effectively completed using GAI tools alone (Grassini, 2023).

**(d) Monitoring and support systems:** Implement monitoring systems to detect the use of GAI in academic submissions, such as integrating AI detection tools like Turnitin's AI writing detection feature (Chaudhry et al., 2023). Additionally, support systems should be established to assist students in understanding how to use GAI technologies ethically and responsibly.

**(e) Interdisciplinary collaboration:** Encourage collaboration between disciplines, especially between technological and humanities disciplines, to develop interdisciplinary approaches to teaching and learning with GAI (Bahroun et al., 2023). This can help in creating balanced and comprehensive educational experiences that harness the benefits of GAI while mitigating risks.

### Conclusions

The use of GAI technologies in teaching and learning has become more widespread in higher education. However, the potential differences in academic perspectives on GAI usage across disciplines and employment statuses within the private higher education sector have yet to be explored. This paper has filled the gap by examining academic perspectives on integrating GAI technologies into teaching and learning, as well as concerns about academic integrity across different disciplines and employment statuses. It contributes to the emerging literature on AI applications in higher education, particularly regarding the effectiveness of GAI in teaching and the importance of maintaining academic integrity.

Using the survey in a private Australian HEI, our paper revealed that the level of familiarity is different among academics depending on their disciplines. Academics who are teaching information system-related units are more familiar with GAI than other academics. In addition, full-time staff are more familiar with GAI technologies than their casual counterparts given the availability of information provided to them. Most teaching staff inserted that students are likely to violate academic integrity, particularly with the ChatGPT application. Because of this, academics are more prudent in integrating GAI tools in the process of learning and teaching. While teaching staff in BIS are comfortable with integrating GAI into learning activities, the survey showed that 67% of teaching staff in BUS and ACC said that they are neutral. On top of that, academics posit that using GAI tools should be limited to a threshold level that is acceptable to maintain the quality of education and academic integrity. Accordingly, an integrity policy should be transparent to both academics and students regarding ethical use, innovative teaching and learning practices, thus ensuring equitable access to educational opportunities.

Whilst our paper has contributed to the literature of GAI application by investigating academic perspectives on integrating GAI in learning and teaching and concern about academic integrity, it has faced some limitations. First, although the survey conducted in a private Australian institution aims to ensure a homogenous environment of surveyed respondents, the sample size for analysis was relatively low, thus it did not reflect all academic perspectives in private HEIs in Australia. Second, our survey focused on three disciplines—Business, Accounting, and Business Information Systems—currently offered at this institution. Future studies could expand on this by examining additional disciplines, allowing for broader generalization of our findings. Finally, education managers should be included in a separate survey to gather managerial perspectives on designing integrity policies, which are crucial for ensuring the quality of education in the private higher education sector is effectively maintained.

## References

AAIN (TEQSA Australian Academic Integrity Network – AAIN - Generative AI Working Group, 2023). *Generative artificial intelligence guidelines*. Australian Academic Integrity Network (AAIN) Generative AI Working Group. <https://www.teqsa.gov.au/sites/default/files/2023-04/aain-generative-ai-guidelines.pdf>

Ahmad, M., Subih, M., Fawaz, M., Alnuqaidan, H., Abuejheisheh, A., Naqshbandi, V., & Alhalaiqa, F. (2024). Awareness, benefits, threats, attitudes, and satisfaction with AI tools among Asian and African higher education staff and students. *Journal of Applied Learning and Teaching*, 7(1), 57-64. <https://doi.org/10.37074/jalt.2024.7.1.10>

Ali, D., Fatemi, Y., Boskabadi, E., Nikfar, M., Ugwuoke, J., & Ali, H. (2024). ChatGPT in teaching and learning: A systematic review. *Education Sciences*, 14(6), 643. <https://doi.org/10.3390/educsci14060643>

Alotaibi, H., S. Al-Khalifa, H., & AlSaeed, D. (2020). Teaching programming to students with vision impairment: Impact of tactile teaching strategies on student's achievements and perceptions. *Sustainability*, 12(13), 5320. <https://doi.org/10.3390/su12135320>

Altbach, P. G. (2004). The question of corruption in academe. *International Higher Education*, 34, 8–10. <https://doi.org/10.6017/ihe.2004.34.7399>

Amigud, A. M., Arnedo-Moreno, Daradoumis, Daradoumis, J., Guerrero-Roldan, T., & Guerrero-Roldan, A. -E. (2017). Using learning analytics for preserving academic integrity. *International Review of Research in Open and Distributed Learning*, 18(5), 192–210. <https://files.eric.ed.gov/fulltext/EJ1152043.pdf>

Badam, R. (2023, March 4). *UAE working on 'GPT-powered AI tutors' to transform education*. The National UAE. <https://www.thenationalnews.com/uae/education/2023/03/04/uae-working-on-gpt-powered-ai-tutors-to-transform-education/>

Bahroun, Z., Anane, C., Ahmed, V., & Zacca, A. (2023). Transforming education: A comprehensive review of generative artificial intelligence in educational settings through bibliometric and content analysis. *Sustainability*, 15(17), 12983. <https://doi.org/10.3390/su151712983>

Baidoo-Anu, D. & Owusu Ansah, L. (2023, January 25). *Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning*. <http://dx.doi.org/10.2139/ssrn.4337484>

Baker, T., & Smith, L. (2019). *Educ-AI-tion rebooted? Exploring the future of artificial intelligence in schools and colleges*. [https://media.nesta.org.uk/documents/Future\\_of\\_AI\\_and\\_education\\_v5\\_WEB.pdf](https://media.nesta.org.uk/documents/Future_of_AI_and_education_v5_WEB.pdf)

Boehm, P. J., Justice, M., & Weeks, S. (2009). Promoting academic integrity in higher education. *The Community College Enterprise*, 15(1), 45-61.

Burns, A. C., & Veeck, A. (2020). *Marketing research*. Pearson, Australia.

Cassidy, B., Yap, M. H., Pappachan, J. M., Ahmad, N., Haycocks, S., O'Shea, C., ... & Reeves, N. D. (2023). Artificial intelligence for automated detection of diabetic foot ulcers: A real-world proof-of-concept clinical evaluation. *Diabetes Research and Clinical Practice*, 205, 110951. <https://doi.org/10.1016/j.diabres.2023.110951>

Chai, C. S., Lin, P. Y., Jong, M. S. Y., Dai, Y., Chiu, T. K., & Qin, J. (2021). Perceptions of and behavioural intentions towards learning artificial intelligence in primary school students. *Educational Technology & Society*, 24(3), 89–101. <https://www.jstor.org/stable/27032858>

Chan, C. K. Y. (2023). A comprehensive AI policy education framework for university teaching and learning. *International Journal of Educational Technology in Higher Education*, 20(1), 38. <https://doi.org/10.1186/s41239-023-00408-3>

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20(1), 43. <https://doi.org/10.1186/s41239-023-00411-8>

Chaudhry, I. S., Sarwary, S. A. M., El Refae, G. A., & Chabchoub, H. (2023). Time to revisit existing student's performance evaluation approach in higher education sector in a new era of ChatGPT—a case study. *Cogent Education*, 10(1), 2210461. <https://doi.org/10.1080/2331186X.2023.2210461>

Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 61(2), 228-239. <http://dx.doi.org/10.35542/osf.io/mrz8h>

Crawford, J., Cowling, M., & Allen, K. A. (2023). Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI). *Journal of University Teaching & Learning Practice*, 20(3), 02. <https://>

doi.org/10.53761/1.20.3.02

Denejkina, A. (2023). *Young people's perception and use of Generative AI*. YouthInsight. ISBN: 978-0-646-88006-8.

Deng, X., & Yu, Z. (2023). A meta-analysis and systematic review of the effect of chatbot technology use in sustainable education. *Sustainability*, 15(4), 2940. <https://doi.org/10.3390/su15042940>

Denisova-Schmidt, E. (2016). *The slippery business of plagiarism*. Center for International Higher Education. <https://www.insidehighered.com/blogs/world-view/slippery-business-plagiarism>

D'Mello, S., Olney, A., Williams, C., & Hays, P. (2014). Gaze tutor: A gaze-reactive intelligent tutoring system. *International Journal of Human-Computer Studies*, 70(5), 377-398. <https://doi.org/10.1016/j.ijhcs.2012.01.004>

Farooqi, M. T. K., Amanat, I., & Awan, S. M. (2024). Ethical considerations and challenges in the integration of artificial intelligence in education: A systematic review. *Journal of Excellence in Management Sciences*, 3(4), 35-50. <http://dx.doi.org/10.69565/jems.v3i4.314>

Firat, M. (2023). What ChatGPT means for universities: Perceptions of scholars and students. *Journal of Applied Learning and Teaching*, 6(1), 57-63. <https://doi.org/10.37074/jalt.2023.6.1.22>

Fosnacht, K., Sarraf, S., Howe, E., & Peck, L. K. (2017). How important are high response rates for college surveys? *The Review of Higher Education*, 40(2), 245-265.

García-Peñalvo, F. (2023). La percepción de la Inteligencia Artificial en contextos educativos tras el lanzamiento de ChatGPT: disrupción o pánico. *Education in the Knowledge Society (EKS)*, 24, e31279. <https://doi.org/10.14201/eks.31279>

Gelman, S. (2023). *DC region schools ban AI tool ChatGPT*. <https://wtop.com/local/2023/01/dc-region-schools-ban-ai-tool-chatgpt/>

George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. Boston, MA: Allyn & Bacon.

Gilson, A., Safranek, C. W., Huang, T., Socrates, V., Chi, L., Taylor, R. A., & Chartash, D. (2023). How does ChatGPT perform on the United States Medical Licensing Examination (USMLE)? The implications of large language models for medical education and knowledge assessment. *JMIR Medical Education*, 9(1), e45312. <https://doi.org/10.2196/45312>

Grassini, S. (2023). Shaping the future of education: Exploring the potential and consequences of AI and ChatGPT in educational settings. *Education Sciences*, 13(7), 692. <http://dx.doi.org/10.3390/educsci13070692>

Hess, F. (2023, February 8). Will ChatGPT be a blow to learning, or a boom? We'll decide. *Forbes*. <https://www.forbes.com/>

[sites/frederickhess/2023/02/08/will-chatgpt-be-a-blow-to-learning-or-a-boom-well-decide/?sh=29824ba66651](https://www.forbes.com/sites/frederickhess/2023/02/08/will-chatgpt-be-a-blow-to-learning-or-a-boom-well-decide/?sh=29824ba66651)

Howie, C. (2023). *Turnitin AI writing detection preview*. <https://www.adelaide.edu.au/learning/news/list/2023/04/05/turnitin-ai-writing-detection-preview>

*Intelligent*. (2023, January 23). Nearly 1/3 college students have used ChatGPT on written assessments. *Intelligent*. <https://www.intelligent.com/nearly-1-in-3-college-students-have-used-chatgpt-on-written-assignments/>

Ipek, Z. H., Gozum, A. C., Papadakis, S., & Kallogianakis, M. (2023). Educational applications of the ChatGPT AI system: A systematic review research. *Educational Process: International Journal*, 12(3), 26-55. <http://dx.doi.org/10.22521/edupij.2023.123.2>

Ismail, F., Crawford, J., Tan, S., Rudolph, J., Tan, E., Seah, P., ... & Kane, M. (2024). Artificial intelligence in higher education database (AIHE V1): Introducing an open-access repository. *Journal of Applied Learning and Teaching*, 7(1), 140-148. <https://doi.org/10.37074/jalt.2024.7.1.35>

Jacobson, S. (2023, January 25). *Sheldon Jacobson: Is ChatGPT actually exposing problems with college education?* Chicago Tribune (Online). <https://www.chicagotribune.com/2023/01/25/sheldon-jacobson-is-chatgpt-actually-exposing-problems-with-college-education/>

Leathwood, C., & Read, B. (2022). Short-term, short-changed? A temporal perspective on the implications of academic casualisation for teaching in higher education. *Teaching in Higher Education*, 27(6), 756-771. <https://doi.org/10.1080/13562517.2020.1742681>

Levine, D. M., Stephan, D., & Szabat, K. (2021). *Statistics for managers*. London, UK: Pearson Education.

Liu, A., Bridgeman, D., & Miller, B. (2023, February 28). As uni goes back, here's how teachers and students can use ChatGPT to save time and improve learning. *The Conversation*. <https://theconversation.com/as-uni-goes-back-heres-how-teachers-and-students-can-use-chatgpt-to-save-time-and-improve-learning-199884>

Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, 13(4), 410. <https://doi.org/10.3390/educsci13040410>

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed - an argument for AI in education*. <http://discovery.ucl.ac.uk/1475756/>

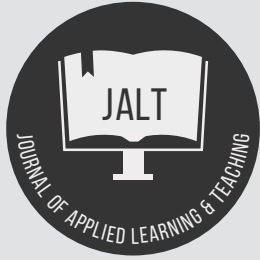
Lund, B. D., & Wang, T. (2023). Chatting about ChatGPT: How may AI and GPT impact academia and libraries? *Library Hi Tech News*, 40(3), 26-29. <https://doi.org/10.1108/LHTN-01-2023-0009>

Macfarlane, B., Zhang, J., & Pun, A. (2014). Academic integrity: A review of the literature. *Studies in Higher Education*, 39(2), 339-358. <http://dx.doi.org/10.1080/03075079.2012.709495>



- Marrone, R., Taddeo, V., & Hill, G. (2022). Creativity and artificial intelligence—A student perspective. *Journal of Intelligence*, 10(3), 65. <https://doi.org/10.3390/jintelligence10030065>
- McComb, V., Eather, N., & Imig, S. (2021). Casual academic staff experiences in higher education: Insights for academic development. *International Journal for Academic Development*, 26(1), 95-105. <https://doi.org/10.1080/1360144X.2020.1827259>
- Minn, S. (2022). AI-assisted knowledge assessment techniques for adaptive learning environments. *Computers and Education: Artificial Intelligence*, 3, 100050. <https://doi.org/10.1016/j.caeai.2022.100050>
- Naik, N., Hameed, B. Z., Shetty, D. K., Swain, D., Shah, M., Paul, R., ... & Somani, B. K. (2022). Legal and ethical consideration in artificial intelligence in healthcare: Who takes responsibility? *Frontiers in Surgery*, 9, 862322. <https://doi.org/10.3389/fsurg.2022.862322>
- Neumann, M., Rauschenberger, M., & Schön, E. M. (2023). *We need to talk about ChatGPT: The future of AI and higher education*. <https://serwiss.bib.hs-hannover.de/frontdoor/index/index/docId/2467>
- Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: What can be done? *Assessment & Evaluation in Higher Education*, 33(3), 301-314. <https://doi.org/10.1080/02602930701293231>
- Ofem, U.J, Asuquo, E.N., Akele, M.N.G., Idung, J.U. Anake, P.M. Ajuluchukwu, E.N. ...& Echu, A.E. (2024). Curriculum factors and sustainable artificial intelligence-driven classroom assessment. The mediating role of computer self-efficacy and digital literacy. *Journal of Applied Learning & Teaching*, 7(2), 205-222. <https://doi.org/10.37074/jalt.2024.7.2.10>
- Okuyama, K., & Suzuki, K. (2023). *Correlators of double scaled SYK at one-loop*. arXiv preprint. arXiv:2303.07552. <https://doi.org/10.48550/arXiv.2303.07552>.
- Oribhabor, C. B., & Anyanwu, C. A. (2019). Research sampling and sample size determination: A practical application. *Journal of Educational Research (Fudjer)*, 2(1), 47-57.
- Perez, S., Massey-Allard, J., Butler, D., Ives, J., Bonn, D., Yee, N., & Roll, I. (2017). Identifying productive inquiry in virtual labs using sequence mining. In E. André, R. Baker, X. Hu, M. M. T. Rodrigo, & B. du Boulay (Eds.), *Artificial intelligence in education* (Vol. 10,331, pp. 287–298). [https://doi.org/10.1007/978-3-319-61425-0\\_24](https://doi.org/10.1007/978-3-319-61425-0_24).
- Rawas, S. (2023). ChatGPT: Empowering lifelong learning in the digital age of higher education. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-023-12114-8>
- Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? *Journal of Applied Learning and Teaching*, 6(1), 1-22. <https://doi.org/10.37074/jalt.2023.6.1.9>
- Salmon, G. (2000). *E-moderating - the key to teaching and learning online* (1st ed.). London: Routledge.
- Sawahel, W. (2023, February 7). *Embrace it or reject it? Academics disagree about ChatGPT*. University World News. <https://www.universityworldnews.com/post.php?story=20230207160059558>
- Selwyn, N., & Gallo Cordoba, B. (2022) Australian public understandings of artificial intelligence. *AI & Society*, 37, 1645–1662. <https://doi.org/10.1007/s00146-021-01268-z>
- Silva, C. A. G. D., Ramos, F. N., de Moraes, R. V., & Santos, E. L. D. (2024). ChatGPT: Challenges and benefits in software programming for higher education. *Sustainability*, 16(3), 1245. <https://doi.org/10.3390/su16031245>
- Smith, A., Johnson, B., & Davis, C. (2021). The impact of digital transformation on managerial roles. *Journal of Management Innovation*, 42, 57-78.
- Song, M., Jiang, H., Shi, S., Yao, S., Lu, S., Feng, Y., ... & Jing, L. (2023). *Is ChatGPT a good key phrase generator? A preliminary study*. <https://doi.org/10.48550/arXiv.2303.13001>
- Strzelecki, A. (2023). To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology. *Interactive Learning Environments*, 1-14. <https://doi.org/10.1080/10494820.2023.2209881>
- Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning & Teaching*, 6(1), 1– 10. ChatGPT in higher education: Considerations for academic integrity and student learning
- TEQSA. (2024a). *Artificial intelligence*. <https://www.teqsa.gov.au/guides-resources/higher-education-good-practice-hub/artificial-intelligence>.
- TEQSA. (2024b). *Artificial intelligence*. <https://www.teqsa.gov.au/guides-resources/higher-education-good-practice-hub/artificial-intelligence>
- TEQSA. (2024c). *Artificial intelligence request for information*. <https://www.teqsa.gov.au/sites/default/files/2024-03/request-for-information-artificial-intelligence-key-considerations.pdf>
- Thorp, H. H. (2023). ChatGPT is fun, but not an author. *Science*, 379(6630), 313. <https://www.science.org/doi/10.1126/science.adg7879>
- Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environments*, 10(1), 1-24. <https://doi.org/10.1186/s40561-023-00237-x>
- van Dis, E. A. M., Bollen, J., Zuidema, W., van Rooij, R., & Bockting, C. L. (2023). ChatGPT: Five priorities for research. *Nature*, 614(7947), 224–226. <https://doi.org/10.1038/d41586-023-00288-7>

- Venkataraman, B. (2023, January 30). *Are you for real? The most urgent question with artificial intelligence as a new interlocutor*. Boston Globe (Online). <https://www.bostonglobe.com/2023/01/30/opinion/are-you-real-most-urgent-question-with-artificial-intelligence-new-interlocutor/>
- Ventayen, R. (2023). OpenAI ChatGPT generated results: Similarity index of artificial intelligence-based contents. *Social Science Research Network Electronic Journal*. <https://doi.org/10.2139/ssrn.4332664>
- Weissman, J. (2023, February 9). *ChatGPT is a plague upon education*. Inside Higher Ed. <https://www.insidehighered.com/views/2023/02/09/chatgpt-plague-upon-education-opinion>
- Winkler, R., & Söllner, M. (2018). Unleashing the potential of chatbots in education: A state-of-the-art analysis. In *Academy of Management annual meeting (AOM)*. <https://doi.org/10.5465/AMBPP.2018.15903abstract>
- Wu, M. J., Zhao, K., & Fils-Aime, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports*, 7, 100206. <https://doi.org/10.1016/j.chbr.2022.100206>
- Yusuf, A., Pervin, N., & Román-González, M. (2024). Generative AI and the future of higher education: A threat to academic integrity or reformation? Evidence from multicultural perspectives. *International Journal of Educational Technology in Higher Education*, 21(1), 21. <https://www.proquest.com/scholarly-journals/generative-ai-future-higher-education-threat/docview/2973800413/se-2>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education—where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1-27. <https://doi.org/10.1186/s41239-019-0171-0>



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## AI vs AI: How effective are Turnitin, ZeroGPT, GPTZero, and Writer AI in detecting text generated by ChatGPT, Perplexity, and Gemini?

---

Muhammad Abid Malik<sup>A</sup>      *A*      *Academic Research Advisor, Shandong Vocational University of Foreign Affairs, Weihai, China*

Amjad Islam Amjad<sup>B</sup>      *B*      *School Education Department, Government of Punjab, Kasur, Pakistan*

---

### Keywords

---

AI-detection tool;  
artificial intelligence;  
ChatGPT;  
large language model;  
adversarial technique.

### Abstract

---

AI chatbots and LLMs have made a significant impact in a short time. Despite their benefits, they pose serious threats to academic integrity and ethics by generating human-like text, which is very hard to detect. Various AI-detection tools have been developed to tackle this issue. However, their effectiveness is questionable. This study investigates the performance of four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI) in detecting AI-generated text. That text was generated using three LLMs (ChatGPT, Perplexity, and Gemini). Furthermore, three adversarial techniques (edited through Grammarly, paraphrased through Quillbot, and 10%-20% editing by a human expert) were applied to see their effects on the performance of AI-detection tools. Turnitin turned out to be the most accurate and consistent one, with a 100% AI score even with the adversarial techniques. ZeroGPT and GPTZero also reported relatively high AI scores, especially with the original files and the first and third adversarial techniques. Among the three adversarial techniques, paraphrasing through Quillbot affected the performance of three AI-detection tools (ZeroGPT, GPTZero, and Writer AI) the most. Among the three LLMs, text generated through Perplexity was more accurately detected, while Gemini-generated text showed a relatively lower AI score. What was the most note-worthy was the fact that in many cases, even when the text was generated through the same LLM, and detected through the same AI-detection tool; different files showed different AI scores, further highlighting the inconsistencies among AI-detection tools.

---

### Correspondence

[m\\_abidmalik7@yahoo.com](mailto:m_abidmalik7@yahoo.com) <sup>A</sup>

---

### Article Info

Received 11 October 2024  
Received in revised form 9 November 2024  
Accepted 25 December 2024  
Available online 13 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.9>

## Introduction

Artificial intelligence (AI) has made an immense impact on human life in a short span of time (Jiang et al., 2022; Malik, 2024). AI chatbot is a software-based electronic system that emulates conversations by responding to recognized keywords or phrases. They have evolved to the extent that they are executing activities that usually necessitate human ability (Chandra et al., 2022; Nawaz & Gomes, 2019), such as reading and understanding language, analyzing data, identifying patterns, writing computer programming codes, developing new medicines, and solving complex problems (Bawack et al., 2021; Kaul et al., 2020; Liu & Li, 2024; Raisch & Fomina, 2023; Rusmiyanto et al., 2023).

AI chatbots and large language models (LLMs) have been extensively employed for different writing tasks (Huang et al., 2023; Lee & Yoon, 2021; Malik et al., 2024). Various programs and platforms like ChatGPT, Bing, Grammarly, and Hemingway employ AI to offer immediate feedback on spelling, style, and structure to improve the quality of work (Barbetta, 2023; Rasul et al., 2023; Reza et al., 2023). In addition, AI-powered chatbots and LLMs can enhance communication between the users and the software, facilitating immediate cooperation and feedback (Gill et al., 2024; Song & Song, 2023).

LLMs gained popularity and started to be used widely for text generation (Amjad et al., 2024; Hussain & Qazi, 2023; Malik, 2024; Malik et al., 2024). With their ability to think, synthesize, and generate text similar to human writing; they have been transforming academic and non-academic writing (Bates et al., 2020; Carobene et al., 2024; Dwivedi et al., 2021); and are widely used for summarization, literature review, developing manuscripts and to support research (Rasul et al., 2023; Xames & Shefa, 2023). As a result, it provides more opportunities to the researchers and scholars by assisting them in their academic and research work, and saving their time (Malik et al., 2024). Despite the advantages and benefits that ChatGPT brings with it, there are also multiple apprehensions and concerns about its negative use and adverse impact (Hutson, 2022; Malik et al., 2024). There have been fears about its negative influence on writing and cognitive skills. Shidiq (2023) said that "relying too much on ChatGPT can make individuals weak in thinking critically" (p. 354). Multiple studies have also expressed fears that overdependence on ChatGPT may degrade students' writing skills (Malik, 2024; Malik et al., 2024).

It started with the advent of ChatGPT in November 2022, owned by OpenAI (OpenAI, 2022). It can produce human-like text for different questions and contexts (Malik, 2024). It can also be employed for various other tasks, such as creating social media materials, computer coding, and responding to customer service questions (Kocoń et al., 2023; Taecharungroj, 2023).

Following the success of ChatGPT, more LLMs were developed (Javaid et al., 2023; Kooli & Yusuf, 2024; Onal & Kulavuz-Onal, 2024). Despite having similar purposes and objectives, they come with their own unique set of strengths and weaknesses. Perplexity, another LLM, was launched in 2022. It is extensively used for text generation and provides

users with textual responses to their queries (Iorliam & Ingio, 2024). Like other LLMs, it has the ability to analyze, review, and write text with human-like characteristics. It is widely used for brainstorming ideas, developing an outline for the topic, and generating relevant citations and references (Tilwani et al., 2024).

Gemini is another well-known LLM that utilizes Google's advanced language models (Hasanein et al., 2024; Mainaly, 2023). With its ability to respond to diverse prompts, it can also produce text resembling human language, making it a valuable tool for various tasks and purposes (Guo et al., 2023). Due to these qualities, it is becoming increasingly popular, especially among students (Hasanein et al., 2024).

## Increased fears of academic fraud and plagiarism due to LLMs

As computers, the internet, and easy access to digitalized materials made it easier to plagiarize (Malik et al., 2021), the rise of various LLMs is leading to a higher number and more sophisticated cases of plagiarism (Dwivedi et al., 2023; Malik, 2024; Motlagh et al., 2023; Rasul et al., 2023; Sullivan et al., 2023; Xames & Shefa, 2023). Their ability to generate human-like texts and difficulty in detecting them makes those LLMs ideal for those who are looking for shortcuts (Alsabhan, 2023; Malik, 2024; Malik et al., 2024). "LLMs therefore represent a clear potential threat to academic integrity as academic staff may be unable to identify the amount of content produced by a student correctly" (Perkins, 2023, p. 7). Malik et al. (2024) also said that ChatGPT would "increase plagiarism in academic writing due to its ease of use and ability to generate human-like text" (p. 9). In the same study, one participant pointed out how many school students in Trinidad and Tobago had been using ChatGPT to generate assignments for creative writing tasks (Malik et al., 2024). Haider et al. (2024) conducted a study to trace ChatGPT-generated papers on Google Scholar. They downloaded a sample of scientific papers with signs of GPT-use from the website. The study found that almost two-third of the sampled papers used ChatGPT fraudulently or did not declare its use. Most of them were from health science, computer science, and environmental studies. Liang et al. (2024) conducted a large-scale study across 950,965 papers that were published from January 2020 to February 2024 in the arXiv, bioRxiv, and Nature portfolio journals. They found that the use of LLMs in research papers was increasing over the years with the fastest growth observed in the field of computer science (up to 17.5%). In October 2024, it was reported on Retraction Watch that since September, Springer Nature had retracted over 200 papers due to malpractices including fraudulent or undeclared use of AI (Chawla, 2024). Many researchers have, therefore, called for increased vigilance and measures to detect such malpractices (Cingillioglu, 2023; Gustilo et al., 2024; Malik et al., 2024). Different steps, such as implementing strict policies and penalties for AI-generated text and using advanced AI-detection tools, have been recommended to tackle this issue (Elkhatat et al., 2023).

## Use of AI-detection tools to trace AI-driven plagiarism

With the advent of AI chatbots and LLMs, AI-detection tools have also become widespread to check AI-driven plagiarism (Alhijawi et al., 2024; Carobene et al., 2024; Dwivedi et al., 2023; Gustilo et al., 2024). These tools utilize different algorithms and AI approaches to examine the text and compare it with an extensive library of sources to detect any occurrences or patterns that may flag it as AI-generated (Nwohiri et al., 2021).

Turnitin, ZeroGPT, GPTZero, Copyleaks, Writer AI, and Winston AI are some of the AI-powered tools for detecting AI-driven plagiarism (Ladha et al., 2023). They utilize advanced AI functions to identify AI-generated text (Odri & Yoon, 2023). The algorithm can analyze text in many languages and claim to accurately identify AI-generated text with a high precision rate (Ladha et al., 2023). These tools can identify plagiarism with or without different adversarial techniques with varying degrees of accuracy (Arabi & Akbari, 2022; Mitchell et al., 2023; Perkins et al., 2024). In addition, many of these tools have the ability to identify plagiarism across various languages, rendering them valuable in different professional and educational contexts (Fairouz et al., 2023). Some can also be integrated into learning management systems (LMS) and other platforms, making it easier to detect AI-driven plagiarism (Kumar, 2023). They also offer extensive data and analytics, helping stakeholders monitor plagiarism patterns and pinpoint AI-generated text (George & Wooden, 2023).

However, studies have shown mixed results regarding the accuracy and efficiency of those AI detection tools. Weber-Wulff et al. (2023) concluded that AI-detection tools were unreliable and did not show consistent results. It was further reinforced by Odri and Yoon (2023), who generated text through ChatGPT4 and detected AI-generated text using eleven different AI-detection tools. They found that most of them presented AI-generated text as human-written text. Elkhatat et al. (2023) carried out a study to examine the efficiency of five AI-detection tools for text generated by two versions of ChatGPT (3.5 and 4). They also reported the inconsistencies and false-positive scores of AI-detection tools. When Foster (2023) used Turnitin to detect a text for AI that was entirely generated by ChatGPT4, it showed a 0% AI score.

Ladha et al. (2023) conducted a study to explore the efficiency of different AI-detection tools, i.e. Copyleaks, Writer, and Content@scale. The study found that those AI-detection tools were inconsistent in distinguishing between AI and human-generated texts. Akram (2023) also tested the accuracy of six AI-detection tools (GPTZero, GPTkit, Originality, Writer, Sapling, and Zylalab) and found that they showed inconsistent results, with their accuracy ranging from 55.29% to 97%. In another study, Walters (2023) investigated the accuracy and effectiveness of 16 AI-detection tools for 42 essays produced by AI and humans. It found that most of the tools were inconsistent in detecting AI-generated text; however, Copyleaks, Originality.AI, and Turnitin were more accurate, efficient, and consistent. The study also found that registered and paid tools were more reliable and accurate than the free ones.

Chaka conducted a few studies investigating the effectiveness of different AI-detection software and tools in tracing AI-generated text. In 2023, one study compared the effectiveness of five AI-detection tools (GPTZero, OpenAI Text Classifier, Writer, Copyleaks, and GLTR) in identifying text generated by three AI chatbots (ChatGPT, YouChat, and Chatsonic). In that study, Copyleaks turned out to be the most effective in detecting AI-generated text (Chaka, 2023). In another study in which Chaka reviewed 17 journal articles, Crossplag was found to be the most effective AI-detection tool, followed by Copyleaks (Chaka, 2024a). In the same year, he conducted another study, this time evaluating the effectiveness of thirty freely available non-premium AI-detecting tools for detecting AI-generated text in the essays written by L1 and L2 university students. The study investigated the accuracy, false-positive, and true-negative rates of those AI-detecting tools. Only two of the tools (Copyleaks and Undetectable AI) were able to identify the essays as human writings accurately. The study concluded that most of the freely available AI-detecting tools showed inconsistent results and were not very effective (Chaka, 2024b).

Some researchers also used different adversarial techniques to check how effective they were in evading the detection of AI-generated text. Mitchell et al. (2023) found that once AI-generated text was paraphrased using an automated paraphrasing tool (APT), the detection rate drastically reduced from 70.3% to 4.6%. Perkins et al. (2024) investigated the effectiveness of seven AI-detection tools (Turnitin AI detector, GPTZero, ZeroGPT, Copyleaks, Crossplag, GPT-2 Output Detector, and GPTKit) to detect AI-generated text in different human-written and AI-generated texts (generated by Bard, Claude 2, and GPT-4). They used six adversarial techniques (i.e. adding spelling errors, increasing burstiness, paraphrasing, decreasing complexity, writing as a non-native English speaker, and increasing complexity) to evade detection. The study showed that those adversarial techniques had different degrees of success in evading detection (drop in accuracy for different adversarial techniques: adding spelling errors 27%; increasing burstiness 24%; paraphrasing 21%; decreasing complexity 19%; writing as non-native English speaker 12%; increasing complexity 2%). Overall, Copyleaks and Turnitin were the top two AI-detection tools, while ZeroGPT was the least effective.

All these studies show inconsistent results for AI-detection tools in identifying AI-generated text. Not only are they inconsistent in detecting AI-generated text, but they also show inconsistencies in false-positive and true-negative results. However, as the LLMs and AI-detection tools are evolving at an incredible pace, it is important to continue conducting research to find the most efficient ones.

The current study further contributes to the existing literature in this area by detecting the text generated by three different LLMs (ChatGPT 3.5, Gemini, and Perplexity) through four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI). It not only checks the original files generated through those LLMs but also carries out three adversarial techniques to further check their efficiency and accuracy in detecting AI-generated text. More specifically, the study has the following research objectives.

- To investigate the effectiveness of four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI) for text generated through three LLMs (ChatGPT 3.5, Gemini, and Perplexity) without any adversarial technique
- To investigate the effectiveness of four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI) for text generated through three LLMs (ChatGPT 3.5, Gemini, and Perplexity) with a first adversarial technique (edited by Grammarly)
- To investigate the effectiveness of four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI) for text generated through three LLMs (ChatGPT 3.5, Gemini, and Perplexity) with a second adversarial technique (paraphrased by Quillbot)
- To investigate the effectiveness of four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI) for text generated through three LLMs (ChatGPT 3.5, Gemini, and Perplexity) with a third adversarial technique (10-20% editing by a human expert).

## Methods and materials

The main purpose of this study was to determine the effectiveness and accuracy of different AI-detection tools for identifying text generated through different LLMs. Furthermore, it investigated if the performance of those AI-detection tools was in any way affected by automated or human adversarial techniques. Figure 1 further explains the research process.

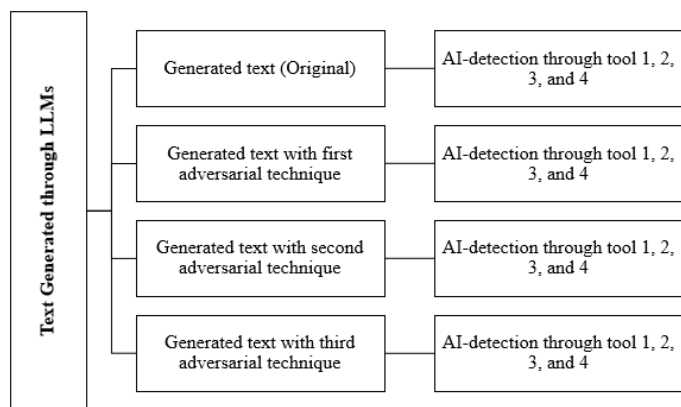


Figure 1. Research process.

### Selection of LLMs and text generation

After developing the process, we looked at different LLMs to generate text for this study. Both free and paid versions/LLMs are available. Free ones are usually less advanced, while paid ones have better features and modelling abilities (Walters, 2023). However, we decided to use free versions for generating text as they are more easily accessible and more commonly used by the students. After running through different search engines, we opted to use ChatGPT 3.5, Gemini, and Perplexity to generate text. Although both

Application Programming Interface (API) and websites are available for all three LLMs, we used websites for text generation. Further details about those LLMs are given in Table 1.

Table 1. Details and features of LLMs.

Name	ChatGPT 3.5	Perplexity	Gemini
Developed by	OpenAI	Perplexity AI	Google Deepmind
First launched in	November 2022	August 2023	March 2023
Paid or Free	Free	Free	Free
Latest version	ChatGPT 4	Perplexity LLM2	Gemini 1.5
Type of Modelling	Unimodalling (advanced, paid versions also have multimodally capabilities)	Unimodalling (some multimodal capabilities are available through subscriptions, etc.)	Multimodalling
Access	Both API and website	Both API and website	Both API and website

Once the LLMs were selected, the study proceeded to develop a prompt to generate the text. As a pilot, we developed five prompts and generated texts from the LLMs mentioned above. After looking at the generated texts, we selected the following prompt: "Generate an essay for an undergraduate student about Higher Education in America: Challenges, Strategies, and Future Opportunities. The essay should be around 500 words long." To make the task manageable, the generated essays had a maximum word limit of 500 words each. 15 essays were generated at this stage (five each from ChatGPT, Perplexity, and Gemini).

### Further adversarial techniques

The study aimed not only to find the effectiveness and accuracy of AI-detection tools for text generated by different LLMs but also to see if (and how much) any software-based or human adversarial technique would affect their performance.

After talking to the students and looking at the literature, it was decided to carry out three adversarial techniques that we thought were the most commonly used to evade detection: editing the generated text through Grammarly, paraphrasing it through Quillbot, and editing by a human expert.

Grammarly is a software that is commonly used to edit and correct language. It suggests changes to the user, which the user can accept or dismiss. We decided to accept all the changes Grammarly suggested. It has both paid and free versions; however, this study used the premium/ paid version. One set of all fifteen originally generated essays was edited through Grammarly.

Quillbot, developed in 2017, can suggest language editing, paraphrasing, and sentence completion. Students frequently use it to paraphrase plagiarized text to avoid similarity index detection. Its recent versions use AI. Quillbot has both free

and paid versions. For this study, we used the paid version.

The third adversarial technique involved human editing. An English language expert was asked to read one set of text generated by each of the three LLMs and make 10% to 20% editing. Overall, 60 essays were generated for this study (15 original and 45 with three adversarial techniques).

### Selection of AI-detection tools and the process

Finally, we proceeded to select AI-detection tools for this study. Since the inception of LLMs, different software and tools have been developed to track AI-generated text (Chaka, 2023; Elkhayat et al., 2023; Ladha et al., 2023). We made a list of the available AI-detection tools and then decided to use four of them (Turnitin, ZeroGPT, GPTZero, and Writer AI) in this study.

Turnitin is a well-renowned software used to check similarity indexes. In 2023, it also added features to detect AI-generated text. ZeroGPT, GPTZero, and Writer AI are AI-based tools that can be used not only to detect AI-generated text but also for text generation, summarization, and editing.

All 60 pieces of generated texts (15 original and 45 with adversarial techniques) were checked through these four AI-detection tools.

### Results

This section discusses the performance of four AI-detection tools in accurately detecting AI-generated text with and without adversarial techniques.

#### Comparing the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (original)

First, all the original essays generated through ChatGPT, Perplexity, and Gemini were checked through Turnitin, ZeroGPT, GPTZero, and Writer AI for AI-detection. The results (Table 2) show that Turnitin was able to detect all the files perfectly with 100% detection. ZeroGPT and GPTZero also had relatively high AI-detection rates. ZeroGPT was able to detect Perplexity-generated text with 100% accuracy. Even for ChatGPT and Gemini, its AI scores were quite high (for ChatGPT, range 97%-100%, average 99.4%; for Gemini, range 82%-100%, average 95.4%). GPTZero had a 100% accuracy rate for both Perplexity and Gemini; however, for ChatGPT, its accuracy rate was slightly lower (range 92%-100%, average 97.2%). Writer AI performed quite poorly for all three LLMs with very low average AI scores (for ChatGPT, range 32%-35%, average 34.6%; for Perplexity, range 31%-35%, average 33%; for Gemini, range 26%-28%, average 26.8%).

Table 2. Comparison of the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (original).

AI-generated (Original)	essay	Turnitin (%)	ZeroGPT (%)	GPTZero (%)	Writer AI (%)
ChatGPT1		100	100	92	34
ChatGPT2		100	97	100	35
ChatGPT3		100	100	98	32
ChatGPT4		100	100	98	37
ChatGPT5		100	100	98	35
Perplexity1		100	100	100	35
Perplexity2		100	100	100	34
Perplexity3		100	100	100	33
Perplexity4		100	100	100	31
Perplexity5		100	100	100	32
Gemini1		100	82	100	28
Gemini2		100	100	100	26
Gemini3		100	100	100	26
Gemini4		100	96	100	28
Gemini5		100	99	100	26

#### Comparing the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (with the first adversarial technique - edited through Grammarly)

In the second stage, all AI-generated essays with the first adversarial technique were checked through those four AI-detection tools. The results (Table 3) show that Turnitin was again able to detect all the files with the first adversarial technique with a 100% detection rate. ZeroGPT and GPTZero detected Perplexity-generated files perfectly and had a quite high detection rate for ChatGPT and Gemini (ZeroGPT: for ChatGPT range 97%-100%, average 99%; for Gemini range 81%-100%, average 95.2%; GPTZero: for ChatGPT range 98%, average 98%; for Gemini range 90%-100%, average 98%). Writer AI once more performed quite poorly in detecting AI-generated content with the first adversarial technique (for ChatGPT, range 30%-33%, average 32%; for Perplexity, range 29%-32%, average 31%; for Gemini, range 24%-27%, average 25.8%).

#### Comparing the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (with second adversarial technique-paraphrased through Quillbot)

In the third step, all AI-generated essays with the second adversarial technique were checked for AI-generated text. The results (Table 4) show that even when all AI-generated text was paraphrased through Quillbot, Turnitin was able to

Table 3. Comparison of the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (with the first adversarial technique- edited through Grammarly).

AI-generated essay (Edited by Grammarly)	Turnitin (%)	ZeroGPT (%)	GPTZero (%)	Writer AI (%)
ChatGPT1	100	100	98	32
ChatGPT2	100	97	98	30
ChatGPT3	100	100	98	33
ChatGPT4	100	98	98	33
ChatGPT5	100	100	98	32
Perplexity1	100	100	100	32
Perplexity2	100	100	100	32
Perplexity3	100	100	100	31
Perplexity4	100	100	100	29
Perplexity5	100	100	100	31
Gemini1	100	81	100	26
Gemini2	100	100	100	26
Gemini3	100	100	90	24
Gemini4	100	96	100	27
Gemini5	100	99	100	26

Table 4. Comparison of the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (with second adversarial technique- paraphrased through Quillbot).

AI-generated essay (Edited through Quillbot)	Turnitin (%)	ZeroGPT (%)	GPTZero (%)	Writer AI (%)
ChatGPT1	100	32	23	14
ChatGPT2	100	57	78	14
ChatGPT3	100	29	23	13
ChatGPT4	100	66	82	12
ChatGPT5	100	81	44	15
Perplexity1	100	64	99	14
Perplexity2	100	28	100	13
Perplexity3	100	68	100	16
Perplexity4	100	42	92	13
Perplexity5	100	63	92	11
Gemini1	100	38	91	7
Gemini2	100	37	46	10
Gemini3	100	37	82	8
Gemini4	100	36	43	10
Gemini5	100	11	43	15

detect all the files perfectly with 100% detection. However, the ability of the other three AI-detection tools was greatly affected due to this adversarial technique (ZeroGPT: for ChatGPT range 29%-81%, average 53%; for Perplexity range 28%-68%, average 53%; for Gemini range 11%-38%, average 31.8%; GPTZero: for ChatGPT range 23%-82%, average 50%; for Perplexity range 92%-100%, average 96.6%; for Gemini range 43%-91%, average 61%; Writer AI: for ChatGPT range 12%-15% average 13.6%; for Perplexity range 11%-16%, average 13.4%; for Gemini range 7%-15%, average 10%).

**Comparing the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (with third adversarial technique- 10%-20% editing by a human expert)**

In the last analysis, all AI-generated essays with the third adversarial technique were checked by the four AI-detection tools (Table 5). Turnitin again performed perfectly by being able to detect all the AI-generated text with 100% accuracy despite the adversarial techniques. ZeroGPT was also able to detect contents generated by Perplexity with 100% accuracy. Both ZeroGPT and GPTZero were able to detect other files with high level of accuracy (ZeroGPT: for ChatGPT range 96%-100%, average 98%; for Gemini range 56%-99%, average 81.2%; GPTZero: for ChatGPT range 74%-100%, average 88.6%; for Perplexity range 83%-100%, average 96.2%; for Gemini range 91%-100%, average 97.8%). Writer AI once more performed below-par in accurately detecting AI-generated content with the third adversarial technique

(for ChatGPT range 15%-29%, average 20.6%; for Perplexity range 23%-28%, average 25.8%; for Gemini range 18%-22%, average 20%).

The results revealed quite a few things. First of all, Turnitin performed the best among all four AI-detection tools that had been tested in this study. Even different adversarial techniques were not able to affect its ability to detect AI-generated text accurately. ZeroGPT and GPTZero were also able to detect AI-generated text with a high rate of accuracy; however, Writer AI was not that effective in detecting AI-generated text.

Among the LLMs, the essays generated through Perplexity were the most easily and accurately detected; on the other hand, AI-detection tools reported relatively low AI scores for the essays generated through Gemini. Of the three adversarial techniques, paraphrasing by Quillbot had the biggest impact on the AI-detection tools' ability to detect AI-generated text.

**Discussion and conclusion**

AI-driven chatbots and LLMs have made a significant impact in a relatively short span of time (Jiang et al., 2022; Malik, 2024). Academic and research writing is one of the areas that has been influenced the most due to their ability to generate human-like text for different subjects, levels, and contexts (Carobene et al., 2024; Dwivedi et al., 2021; Malik et al., 2024). This has proven to be a double-edged sword which,



Table 5. Comparison of the accuracy of AI-detection tools in identifying AI-generated text from ChatGPT, Perplexity, and Gemini (with third adversarial technique- 10%-20% editing by a human expert).

AI-generated essay (Edited by a human expert)	Turnitin (%)	ZeroGPT (%)	GPTZero (%)	Writer AI (%)
ChatGPT1	100	96	91	20
ChatGPT2	100	97	91	19
ChatGPT3	100	100	87	15
ChatGPT4	100	100	100	29
ChatGPT5	100	97	74	20
Perplexity1	100	100	100	27
Perplexity2	100	100	100	23
Perplexity3	100	100	100	28
Perplexity4	100	100	98	23
Perplexity5	100	100	83	28
Gemini1	100	88	100	22
Gemini2	100	91	100	22
Gemini3	100	72	100	19
Gemini4	100	56	91	19
Gemini5	100	99	98	18

on one side, facilitates saving time and improving the writing but, on the other, assists in AI-driven plagiarism (Alsabhan, 2023; Dwivedi et al., 2023; Malik et al., 2024; Motlagh et al., 2023; Xames & Shefa, 2023). AI-driven plagiarism is much harder to detect due to its advanced features and modeling abilities. Although many AI-detection tools have been developed to trace AI-generated text, their efficiency, accuracy, and consistency are questionable (Elkhatat et al., 2023; Weber-Wulff et al., 2023; Walters, 2023). However, as more advanced LLMs and AI-detection tools and versions are being developed, more studies need to be carried out using different tools and their versions.

This study further contributes to this area by checking the efficiency and accuracy of four AI-detection tools (Turnitin, ZeroGPT, GPTZero, and Writer AI) in detecting AI-generated text from the essays generated through three different LLMs (ChatGPT, Perplexity, and Gemini). This study not only checks the original files generated by those LLMs but also uses three different adversarial techniques (edited by Grammarly, paraphrased by Quillbot, and 10%-20% editing by a human expert). The study found that the four AI-detection tools showed inconsistent AI scores - from very high by Turnitin (almost perfect) to very low by Writer AI. It further endorses the findings of the previous studies about the inconsistent performance of AI-detection tools (Ladha et al., 2023; Perkins et al., 2024; Weber-Wulff et al., 2023).

Turnitin reported a 100% AI score even with the three adversarial techniques. In their study, Perkins et al. (2024) found Turnitin to be the second most accurate AI-detection

tool. In another study, Walters (2023) also found Turnitin to be one of the more accurate and consistent AI-detection tools; however, in another study that was carried out to detect AI-generated text in files generated through ChatGPT4, Turnitin showed 0% AI score (Foster, 2023). This is not a surprise, as multiple studies have pointed toward the inconsistencies in AI-detection tools (Ladha et al., 2023; Weber-Wulff et al., 2023).

However, there were also inconsistencies in the AI-detection of the original files and with the first adversarial technique (e.g. in the essays generated through Gemini, ZeroGPT reported an AI score of 82% for one file while in two others generated through the same LLM, it was 100%); ZeroGPT and GPTZero were able to report relatively high average AI scores. However, their accuracy decreased, and the inconsistencies increased when the second and third adversarial techniques were applied (much more with the third adversarial technique, as Quillbot paraphrased the entire text compared to human editing, which was restricted to 10%-20% of the text). Once the AI-generated text was paraphrased through Quillbot, the AI scores decreased considerably. Multiple studies have also shown that paraphrasing or rephrasing is one of the most effective adversarial techniques to evade AI-detection (Mitchell et al., 2023; Perkins et al., 2024). However, another interesting observation was that after the second adversarial technique, the AI score ranges for the files generated through the same LLM also became much bigger (ZeroGPT: for ChatGPT range 29%-81%; for Perplexity range 28%-68%; for Gemini range 11%-38%; GPTZero: for ChatGPT range 23%-82%; for Perplexity range 92%-100%; for Gemini range 43%-91%). These differences may be due to different algorithms and patterns used by both Quillbot (through which text was paraphrased) and AI-detection tools (that were used to trace AI-generated text). Although all the AI-detection tools work on the same principle, their algorithms, approaches, and the dataset upon which they were trained might be different (Nwohiri et al., 2021).

One interesting finding was the relatively minimal effect of editing by a human expert. It may be attributed to the fact that the editor was asked to improve the text, rephrase it, or improve sentence structure from 10 to 20 per cent of the entire text. Studies have shown that adding errors in AI-generated text is a more effective way of evading AI-detection (Perkins et al., 2024). When edited by the human expert, those algorithms or patterns may not be altered or disturbed prominently (there were some changes/corrections here and there, which may not disturb the algorithm or the pattern). AI scores after adversarial techniques may be linked to how and how much those patterns and algorithms were disturbed (making them harder to detect). Amongst the LLMs, Perplexity provides the most accurate detection, even after adversarial techniques. Again, it may be attributed to its unique algorithm, patterns, and the dataset that it was trained upon.

Despite all the inconsistencies, it is important to note that at least three AI-detection tools had reasonably high average AI scores. Even in the text paraphrased by Quillbot, those three tools were able to report an AI score of 50% or above (with the exception of ZeroGPT for Gemini, which reported an average AI score of 31.8%;). Writer AI, although with a

smaller range, reported low AI scores for AI-generated texts, proving to be the most inefficient and inaccurate among the four AI-detection tools tested in this study. However, what was really concerning was the fact that even when the files were generated by the same LLM (with or without adversarial technique) and checked through the same AI-detection tool; their AI scores showed big ranges. It raises further questions about the consistencies of AI-detection tools.

This study shows that despite certain inconsistencies, Turnitin, and to a lesser extent, GPTZero and ZeroGPT can be used for AI-detection as they can indicate AI-generated text by reporting relatively high AI scores. However, due to relatively high inconsistencies (as indicated by high ranges) even when the same LLM, same AI-detection tool, and the same adversarial technique are used; such indications should not be taken as a final verdict, and further checks and investigations should be carried out before labelling a text as AI-generated or otherwise.

### Further research

As LLMs and AI-detection tools are evolving at an unprecedented pace, it is important to continue conducting studies with different LLMs and AI-detection tools and their latest versions to check their accuracy and reliability. This way, we can find more reliable and accurate ones that can be used for AI detection. It is also important to employ a wider variety of adversarial techniques such as deliberating incorporating errors, translating and retranslating, and using multiple paraphrasing software to gauge their effects on the performance of different AI-detection tools.

During data analysis, we also noticed the differences in the quality of text generated by three LLMs; however, as it falls out of the scope of the study, we did not focus on that. Further studies may be conducted to see the quality of text generated through different LLMs.

### References

Akram, A. (2023). *An empirical study of AI-generated text detection tools*. arXiv preprint arXiv:2310.01423.

Alhijawi, B., Jarrar, R., AbuAlRub, A., & Bader, A. (2024). *Deep learning detection method for large language models-generated scientific content*. arXiv preprint arXiv:2403.00828.

Alsabhan, W. (2023). Student cheating detection in higher education by implementing machine learning and LSTM techniques. *Sensors*, 23(8), 4149. <https://doi.org/10.3390/s23084149>

Amjad, A. I., Aslam, S., & Tabassum, U. (2024). Tech-infused classrooms: A comprehensive study on the interplay of mobile learning, ChatGPT and social media in academic attainment. *European Journal of Education*, 59(2). e12625. <https://doi.org/10.1111/ejed.12625>

Arabi, H., & Akbari, M. (2022). Improving plagiarism

detection in text documents using hybrid weighted similarity. *Expert Systems with Applications*, 207, 118034. <https://doi.org/10.1016/j.eswa.2022.118034>

Barbetta, P. M. (2023). Remedial and compensatory writing technologies for middle school students with learning disabilities and their classmates in inclusive classrooms. In *Preventing school failure: Alternative education for children and youth* (pp. 1-12). <https://doi.org/10.1080/1045988X.2023.2259837>

Bates, T., Cobo, C., Mariño, O., & Wheeler, S. (2020). Can artificial intelligence transform higher education? *International Journal of Educational Technology in Higher Education*, 17, 1-12. <https://doi.org/10.1186/s41239-020-00218-x>

Bawack, R. E., Fosso Wamba, S., & Carillo, K. D. A. (2021). A framework for understanding artificial intelligence research: Insights from practice. *Journal of Enterprise Information Management*, 34(2), 645-678. <http://dx.doi.org/10.1108/JEIM-07-2020-0284>

Carobene, A., Padoan, A., Cabitza, F., Banfi, G., & Plebani, M. (2024). Rising adoption of artificial intelligence in scientific publishing: Evaluating the role, risks, and ethical implications in paper drafting and review process. *Clinical Chemistry and Laboratory Medicine (CCLM)*, 62(5), 835-843. <https://doi.org/10.1515/cclm-2023-1136>

Chaka, C. (2023). Detecting AI content in responses generated by ChatGPT, YouChat, and Chatsonic: The case of five AI content detection tools. *Journal of Applied Learning & Teaching*, 6(2), 94-104. <https://doi.org/10.37074/jalt.2023.6.2.12>

Chaka, C. (2024a). Reviewing the performance of AI detection tools in differentiating between AI-generated and human written texts: A literature and integrative hybrid review. *Journal of Applied Learning & Teaching*, 7(1), 1-12. <https://doi.org/10.37074/jalt.2024.7.1.14>

Chaka, C. (2024b). Accuracy pecking order—How 30 AI detectors stack up in detecting generative artificial intelligence content in university English L1 and English L2 student essays. *Journal of Applied Learning and Teaching*, 7(1), 1-13. <https://doi.org/10.37074/jalt.2024.7.1.33>

Chandra, S., Shirish, A., & Srivastava, S. C. (2022). To be or not to be... human? Theorizing the role of human-like competencies in conversational artificial intelligence agents. *Journal of Management Information Systems*, 39(4), 969-1005. <https://doi.org/10.1080/07421222.2022.2127441>

Chawla, D. S. (2024, October 15). *Springer Nature journal has retracted over 200 papers since September*. Retraction Watch. <https://retractionwatch.com/2024/10/15/springer-nature-journal-has-retracted-over-200-papers-since-september/>

Cingillioglu, I. (2023). Detecting AI-generated essays: The ChatGPT challenge. *The International Journal of Information and Learning Technology*, 40(3), 259-268. <http://dx.doi.org/10.1108/IJILT-03-2023-0043>

- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., ... & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International Journal of Information Management*, 57, 101994. <https://doi.org/10.1016/j.ijinfomgt.2019.08.002>
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., ... & Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>
- Elkhatat, A. M., Elsaid, K., & Almeer, S. (2023). Evaluating the efficacy of AI content detection tools in differentiating between human and AI-generated text. *International Journal for Educational Integrity*, 19(1), 17. <https://doi.org/10.1007/s40979-023-00140-5>
- Fairooz, F., Jayasundara, A., & Udara, N. (2023). Using artificial intelligence tools in language learning in tertiary education in Sri Lanka: A challenge to academic integrity? In *Annual International Conference On Business Innovation (ICOBI)* (pp. 281-294).
- Foster, A. (2023). *Can GPT-4 fool TurnItIn? Testing the limits of AI detection with prompt engineering*. [https://digital.kenyon.edu/cgi/viewcontent.cgi?article=1041&context=dh\\_iphs\\_ai](https://digital.kenyon.edu/cgi/viewcontent.cgi?article=1041&context=dh_iphs_ai)
- George, B., & Wooden, O. (2023). Managing the strategic transformation of higher education through artificial intelligence. *Administrative Sciences*, 13(9), 196. <https://doi.org/10.3390/admsci13090196>
- Gill, S. S., Xu, M., Patros, P., Wu, H., Kaur, R., Kaur, K., ... & Buyya, R. (2024). Transformative effects of ChatGPT on modern education: Emerging era of AI chatbots. *Internet of Things and Cyber-Physical Systems*, 4, 19-23. <https://doi.org/10.1016/j.iotcps.2023.06.002>
- Guo, D., Chen, H., Wu, R., & Wang, Y. (2023). AIGC challenges and opportunities related to public safety: A case study of ChatGPT. *Journal of Safety Science and Resilience*, 4(4), 329-339. <https://doi.org/10.1016/j.jnlssr.2023.08.001>
- Gustilo, L., Ong, E., & Lapinid, M. R. (2024). Algorithmically-driven writing and academic integrity: Exploring educators' practices, perceptions, and policies in AI era. *International Journal for Educational Integrity*, 20(1), 3. <https://doi.org/10.1007/s40979-024-00153-8>
- Haider, J., Söderström, K. R., Ekström, B., & Rödl, M. (2024). GPT-fabricated scientific papers on Google Scholar: Key features, spread, and implications for preempting evidence manipulation. *Harvard Kennedy School Misinformation Review*, 5(5), 1-16. <https://doi.org/10.37016/mr-2020-156>
- Hasanein, A., Sobaih, A., & Elshaer, I. (2024). Examining Google Gemini's acceptance and usage in higher education. *Journal of Applied Learning and Teaching*, 7(2), 1-9. <https://doi.org/10.37074/jalt.2024.7.2.5>
- Huang, X., Zou, D., Cheng, G., Chen, X., & Xie, H. (2023). Trends, research issues and applications of artificial intelligence in language education. *Educational Technology & Society*, 26(1), 112-131. <https://www.jstor.org/stable/48707971>
- Hussain, A., & Qazi, K. A. (2023). Textual Alchemy: AI, authorship and the shifting paradigms of interpretation. *Rupkatha Journal on Interdisciplinary Studies in Humanities*, 15(4). <https://doi.org/10.21659/rupkatha.v15n4.08>
- Hutson, M. (2022). Could AI help you to write your next paper? *Nature*, 611(7934), 192-193. <https://doi.org/10.1038/d41586-022-03479-w>
- Iorliam, A., & Ingio, J. A. (2024). A comparative analysis of generative artificial intelligence tools for natural language processing. *Journal of Computing Theories and Applications*, 2(1), 91-105. <http://dx.doi.org/10.62411/jcta.9447>
- Javaid, M., Haleem, A., Singh, R. P., Khan, S., & Khan, I. H. (2023). Unlocking the opportunities through ChatGPT Tool towards ameliorating the education system. *BenchCouncil Transactions on Benchmarks, Standards and Evaluations*, 3(2), 100115. <https://doi.org/10.1016/j.tbench.2023.100115>
- Jiang, Y., Li, X., Luo, H., Yin, S., & Kaynak, O. (2022). Quo vadis artificial intelligence?. *Discover Artificial Intelligence*, 2(1), 4. <https://doi.org/10.1007/s44163-022-00022-8>
- Kaul, V., Enslin, S., & Gross, S. A. (2020). History of artificial intelligence in medicine. *Gastrointestinal Endoscopy*, 92(4), 807-812. <https://doi.org/10.1016/j.gie.2020.06.040>
- Kocoń, J., Cichecki, I., Kaszyca, O., Kochanek, M., Szydło, D., Baran, J., ... & Kazienko, P. (2023). ChatGPT: Jack of all trades, master of none. *Information Fusion*, 99, 101861. <https://doi.org/10.1016/j.inffus.2023.101861>
- Kooli, C., & Yusuf, N. (2024). Transforming educational assessment: Insights into the use of ChatGPT and large language models in grading. *International Journal of Human-Computer Interaction*, 1-12. <https://doi.org/10.1080/10447318.2024.2338330>
- Kumar, R. (2023). Faculty members' use of artificial intelligence to grade student papers: A case of implications. *International Journal for Educational Integrity*, 19(1), 9. <https://doi.org/10.1007/s40979-023-00130-7>
- Ladha, N., Yadav, K., & Rathore, P. (2023). AI-generated content detectors: Boon or bane for scientific writing. *Indian Journal of Science and Technology*, 16(39), 3435-3439. <https://doi.org/10.17485/IJST/v16i39.1632>
- Lee, D., & Yoon, S. N. (2021). Application of artificial intelligence-based technologies in the healthcare industry: Opportunities and challenges. *International Journal of Environmental Research and Public Health*, 18(1), 271. <https://doi.org/10.3390/ijerph18010271>
- Liang, W., Zhang, Y., Wu, Z., Lepp, H., Ji, W., Zhao, X., ... & Zou, J. Y. (2024). *Mapping the increasing use of LLMs in scientific papers*. arXiv preprint arXiv:2404.01268.

- Liu, J., & Li, S. (2024). Toward artificial intelligence-human paired programming: A review of the educational applications and research on artificial intelligence code-generation tools. *Journal of Educational Computing Research*, 62(11). <http://dx.doi.org/10.1177/07356331241240460>
- Mainaly, S. (2023). Bing, bard, and brainstorming: A triadic tenor of AI pedagogy. *Journal of Global Literacies, Technologies, and Emerging Pedagogies*, 9(2), 1595-1613. <https://jogltep.com/wp-content/uploads/2023/12/14.0-Shiva-Mainaly-final.pdf>
- Malik, M. A. (2024). Challenges and opportunities about ChatGPT in higher education: A qualitative study about university teachers in Pakistan. *Voyage Journal of Educational Studies*, 4(2), 315-324. <https://doi.org/10.58622/vjes.v4i2.166>
- Malik, M. A., Amjad, A. I., Aslam, S., & Fakhrou, A. (2024). Global insights: ChatGPT's influence on academic and research writing, creativity, and plagiarism policies. *Frontiers in Research Metrics and Analytics*, 9, 1-12, 1486832. <https://doi.org/10.3389/frma.2024.1486832>
- Malik, M. A., Mahroof, A., & Ashraf, M. A. (2021). Online university students' perceptions on the awareness of, reasons for, and solutions to plagiarism: The development of the AS&P model to combat plagiarism. *Applied Sciences*, 11(24), 1-14, 12055. <https://doi.org/10.3390/app112412055>
- Mitchell, E., Lee, Y., Khazatsky, A., Manning, C. D., & Finn, C. (2023). *DetectGPT: Zero-shot machine-generated text detection using probability curvature* (arXiv:2301.11305). arXiv. <http://arxiv.org/abs/2301.11305>
- Motlagh, N. Y., Khajavi, M., Sharifi, A., & Ahmadi, M. (2023). *The impact of artificial intelligence on the evolution of digital education: A comparative study of OpenAI text generation tools including ChatGPT, Bing Chat, Bard, and Ernie*. arXiv preprint arXiv:2309.02029.
- Nawaz, N., & Gomes, A. M. (2019). Artificial intelligence chatbots are new recruiters. *International Journal of Advanced Computer Science and Applications*, 10(9), 1-5. <https://dx.doi.org/10.2139/ssrn.3521915>
- Nwohiri, A., Opemipo, J. O. D. A., & Ajayi, O. (2021). AI-powered plagiarism detection: Leveraging forensic linguistics and natural language processing. *Fudma Journal of Sciences*, 5(3), 207-218. <http://dx.doi.org/10.33003/fjs-2021-0503-700>
- Odri, G. A., & Yoon, D. J. Y. (2023). Detecting generative artificial intelligence in scientific articles: Evasion techniques and implications for scientific integrity. *Orthopaedics & Traumatology: Surgery & Research*, 109(8), 103706. <https://doi.org/10.1016/j.otsr.2023.103706>
- Onal, S., & Kulavuz-Onal, D. (2024). A cross-disciplinary examination of the instructional uses of ChatGPT in higher education. *Journal of Educational Technology Systems*, 52(3), 301-324.
- OpenAI. (2022). *Introducing ChatGPT*. <https://openai.com/index/chatgpt/>
- Perkins, M. (2023). Academic integrity considerations of AI large language models in the post-pandemic era: ChatGPT and beyond. *Journal of University Teaching and Learning Practice*, 20(2), 1-24. <https://doi.org/10.53761/1.20.02.07>
- Perkins, M., Roe, J., Vu, B. H., Postma, D., Hickerson, D., McGaughan, J., & Khuat, H. Q. (2024). Simple techniques to bypass GenAI text detectors: Implications for inclusive education. *International Journal of Educational Technology in Higher Education*, 21(1), 1-25. <https://doi.org/10.1186/s41239-024-00487-w>
- Raisch, S., & Fomina, K. (2023). Combining human and artificial intelligence: Hybrid problem-solving in organizations. *Academy of Management Review*, 1-24. <https://doi.org/10.5465/amr.2021.0421>
- Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., ... & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching*, 6(1), 41-56. <https://doi.org/10.37074/jalt.2023.6.1.29>
- Reza, M., Laundry, N., Musabirov, I., Dushniku, P., Yu, Z. Y., Mittal, K., ... & Williams, J. J. (2023). *ABScribe: Rapid exploration of multiple writing variations in human-AI co-writing tasks using large language models*. arXiv preprint arXiv:2310.00117.
- Rusmiyanto, R., Huriati, N., Fitriani, N., Tyas, N. K., Rofi'i, A., & Sari, M. N. (2023). The role of artificial intelligence (AI) in developing English language learner's communication skills. *Journal on Education*, 6(1), 750-757. <http://dx.doi.org/10.31004/joe.v6i1.2990>
- Shidiq, M. (2023). The use of artificial intelligence-based Chat-GPT and its challenges for the world of education; From the viewpoint of the development of creative writing skills. In *Proceeding of International Conference on Education, Society, and Humanity*, 1(1), 360-364. <https://ejournal.unuja.ac.id/index.php/icesh>
- Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: Assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology*, 14, 1-14. <https://doi.org/10.3389/fpsyg.2023.1260843>
- Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning & Teaching*, 6(1), 1-10. <https://doi.org/10.37074/jalt.2023.6.1.17>
- Taecharungroj, V. (2023). "What can ChatGPT do?" Analyzing early reactions to the innovative AI chatbot on Twitter. *Big Data and Cognitive Computing*, 7(1), 35. <https://doi.org/10.3390/bdcc7010035>
- Tilwani, D., Saxena, Y., Mohammadi, A., Raff, E., Sheth, A., Parthasarathy, S., & Gaur, M. (2024). *REASONS: A benchmark for retrieval and automated citations of scientific*

*sentences using public and proprietary LLMs.* arXiv preprint arXiv:2405.02228.

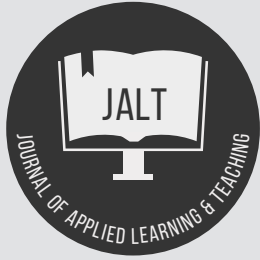
Walters, W. H. (2023). The effectiveness of software designed to detect AI-generated writing: A comparison of 16 AI text detectors. *Open Information Science*, 7(1), 20220158. <https://doi.org/10.1515/opis-2022-0158>

Weber-Wulff, D., Anohina-Naumeca, A., Bjelobaba, S., Foltýnek, T., Guerrero-Dib, J., Popoola, O., ... & Waddington, L. (2023). Testing of detection tools for AI-generated text.

*International Journal for Educational Integrity*, 19(1), 1-39. <https://doi.org/10.1007/s40979-023-00146-z>

Xames, M. D., & Shefa, J. (2023). ChatGPT for research and publication: Opportunities and challenges. *Journal of Applied Learning and Teaching*, 6(1), 390-395. <https://doi.org/10.37074/jalt.2023.6.1.20>

Copyright: © 2025. Muhammad Abid Malik and Amjad Islam Amjad. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Understanding factors influencing AI adoption in education: Insights from a Meta-Analytic Structural Equation Modelling study

---

Caleb Or<sup>A</sup>

A

*Independent Researcher, Singapore*

---

### Keywords

Technology Acceptance Model;  
Artificial Intelligence in Education;  
Meta-analysis;  
Structural Equation Modelling;  
Educational Technology.

---

### Correspondence

[caleb.chin.poh.or@gmail.com](mailto:caleb.chin.poh.or@gmail.com)<sup>A</sup>

---

### Article Info

Received 6 September 2024  
Received in revised form 12 February 2025  
Accepted 13 February 2025  
Available online 14 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.26>

### Abstract

The rapid integration of Artificial Intelligence in Education (AIED) transformed teaching and learning processes. The study employed the Technology Acceptance Model (TAM) to analyse factors influencing the acceptance of AI tools in educational settings. By utilising One-step Meta-analytic Structural Equation Modelling (OSMASEM), findings from 17 empirical studies were synthesised to explore the relationships among TAM constructs—Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Attitude Towards Use (ATU), and Intention to Use (ITU)—in the context of AIED. The analysis revealed significant direct and indirect effects, with PEOU strongly influencing PU and both PEOU and PU positively affecting ATU and ITU. The results highlighted TAM's robustness and applicability in predicting technology acceptance behaviours in education, highlighting the critical roles of usability and perceived benefits in driving AI adoption. The findings provided valuable insights for educators, policymakers, and developers aiming to enhance AI integration in education, emphasising the importance of designing user-friendly and beneficial AI tools to foster positive attitudes and increased usage intentions among educators and students.

## Introduction

The rapid evolution of artificial intelligence (AI) technologies has significantly impacted various sectors, including education, where AI can enhance teaching strategies, offer personalised learning experiences, and streamline administrative tasks (Holmes et al., 2019; Luckin et al., 2016; Tan, 2020). As educational institutions increasingly adopt AI tools, it is crucial to understand the factors influencing the acceptance and use of these technologies. The Technology Acceptance Model (TAM), developed by Davis (1989), provides a robust framework for exploring how users accept new technologies, focusing on perceived usefulness and perceived ease of use. This study aims to utilise TAM to examine the acceptance of Artificial Intelligence in Education (AIED), offering insights into educators' and students' perceptions of AI tools and identifying factors that either facilitate or hinder their adoption.

Davis and Granić (2024) have comprehensively reviewed the origins and impact of TAM, tracing its development from Davis' doctoral research at MIT in the 1980s (Davis, 1986). Originally designed to predict technology acceptance, TAM introduced perceived usefulness (PU) and perceived ease of use (PEOU) as key determinants, thereby linking system design with user experience. This foundational model has since been central to understanding technology acceptance across diverse fields, evolving from an innovative concept to a cornerstone of information systems and human-computer interaction (Davis & Granić, 2024).

Its applicability spans various contexts, including educational technology (Aldraiweesh & Alturki, 2023), healthcare settings such as telemedicine and electronic health records (Taufiq-Hail et al., 2023), and business environments for ERP system adoption (Virani et al., 2023). Over time, TAM has been utilised to examine the evolving landscape of educational technology (Al-Azawei et al., 2017; Mayer & Girwidz, 2019; Venter et al., 2012).

AIED offers numerous benefits, including personalised learning, efficient administration, and improved student engagement (Chen et al., 2020; Zawacki-Richter et al., 2019). However, the adoption of AIED tools largely depends on users' willingness to engage with these technologies. This research applied TAM to identify key factors affecting AI acceptance in educational contexts, aiming to enhance the theoretical and practical understanding of technology acceptance in AI settings. Previous studies have validated TAM's broad applicability across various technologies (Davis, 1989; Venkatesh & Bala, 2008). For example, King and He (2006) conducted a meta-analysis that confirmed TAM's robustness across different technologies and user groups. Additionally, Zawacki-Richter et al. (2019) conducted a systematic review of AI in higher education, emphasising the need for further research into educators' perspectives, while Chen et al. (2020) explored AI's impact on student engagement, highlighting the importance of understanding user acceptance.

This study synthesised findings from previous research to deepen our understanding of TAM's application to AIED. By employing One-step Meta-analytic Structural Equation

Modelling (OSMASEM), as developed by Jarek and Cheng (2022), this research analysed TAM literature specific to AIED, uncovering trends and key determinants of technology acceptance within this field. The study also assessed the robustness and consistency of TAM's relationships when applied to AIED, aiming to bridge gaps in TAM research through a meta-analytic approach and providing an updated perspective on the factors influencing technology acceptance in educational settings.

## Literature review

### Artificial intelligence in education (AIED)

AI is increasingly recognised as a change catalyst in education, promising to revolutionise traditional teaching methods and enhance the overall learning experience (Holmes et al., 2019). The field of AIED explores how intelligent technologies can be integrated into educational settings to support and improve learning and teaching (Luckin & Holmes, 2016). AIED involves a broad range of applications, including intelligent tutoring systems, adaptive learning platforms, administrative tools, and predictive analytics (Holmes et al., 2019; Luckin et al., 2016; Chen et al., 2020; Zawacki-Richter et al., 2019). According to Holmes et al. (2019), AIED combines machine learning, natural language processing, and data analytics to personalise learning experiences, optimise educational outcomes, and automate administrative tasks. These technologies emulate human cognitive functions such as inference, analysis, and decision-making, providing personalised guidance and feedback to students while also assisting educators and policymakers in making informed decisions. Recent research has particularly focused on AIED's potential to deliver tailored educational experiences that meet individual student needs (Chen et al., 2020; Zawacki-Richter et al., 2019). These technologies are not merely theoretical but are increasingly being implemented in classrooms worldwide, demonstrating their practical utility and transformative potential (Luckin et al., 2016).

Baker (2000) discussed the evolution of models in AIED research, advocating for a shift from individual cognition models to more collaborative learning scenarios. This era marked the early integration of AI in educational technologies, with a focus on intelligent tutoring systems (ITS) and adaptive learning environments. These systems have shown significant improvements in learning outcomes by providing personalised feedback and guidance, particularly in STEM disciplines (Chen et al., 2020; Ezzaim et al., 2022; Hamal et al., 2022; Hwang et al., 2020; Roll & Wylie, 2016; Zhai et al., 2021). Among the most notable AI applications in education are intelligent tutoring systems (ITS) and adaptive learning technologies. ITS was designed to offer immediate, personalised feedback to learners, closely resembling one-on-one tutoring (Nkambou et al., 2010). Research by VanLehn (2011) and Graesser et al. (2014) demonstrated ITS's effectiveness in enhancing student learning outcomes, especially in subjects like mathematics and science. These systems employed AI algorithms to evaluate student responses and modify instruction as needed, thus enhancing both efficiency and effectiveness

in learning. Adaptive learning platforms use AI to create dynamic and personalised learning paths for students, adjusting content delivery based on real-time analysis of student performance and engagement (Khosravi et al., 2020). Studies by Walkington (2013) and Pane et al. (2017) indicated that adaptive learning could lead to substantial gains in student achievement by ensuring instructional material is appropriately challenging and relevant.

Roll and Wylie (2016) noted that research efforts had focused on developing systems as effective as human one-on-one tutoring, addressing the problem by achieving similar learning gains more efficiently. This focus led to the creation of various interactive learning environments that improved learning efficiency by reducing the time needed to achieve similar outcomes. Traditionally, AIED research has concentrated on empirical studies evaluating system performance and student interactions within specific domains, primarily in STEM (VanLehn, 2011; Koedinger et al., 2012). These studies have consistently shown that ITS and adaptive learning environments significantly enhance learning outcomes by providing personalised, immediate feedback (Graesser et al., 2014; Aleven et al., 2013). However, the traditional emphasis on domain-specific, step-based problem-solving has often overlooked broader educational goals, such as metacognition, critical thinking, and collaboration, which are increasingly valued in modern educational theories (Luckin et al., 2016).

Beyond classroom instruction, AI has demonstrated the potential to improve administrative efficiency within educational institutions. AI-powered systems can automate routine tasks like grading, scheduling, and attendance tracking, allowing educators to focus more on teaching and mentoring (Luckin et al., 2016). Moreover, predictive analytics can help identify at-risk students and tailor interventions to improve retention and success rates (Sclater, 2017). Research by Siemens and Baker (2012) and Arnold and Pistilli (2012) highlighted the potential of learning analytics to provide actionable insights for educators and administrators.

Hwang et al. (2020) discussed the vision, challenges, roles, and research issues of AIED, emphasising the need for interdisciplinary collaboration to tackle the complexities of integrating AI technologies into educational practices. They stressed the importance of aligning AI applications with educational theories and pedagogical practices to ensure AIED systems' effectiveness and relevance. The study also highlighted the potential of advanced AI techniques, such as deep learning and natural language processing, to further personalise and enhance educational experiences. Chen et al. (2020) expanded the traditional focus by highlighting the development of adaptive systems that support general learning skills and competencies. They noted that recent shifts in educational priorities have led to the creation of more complex and authentic learning environments that incorporate collaborative structures and real-world problem-solving activities. These environments aim to provide students with meaningful, context-rich learning experiences that promote deeper understanding and skill development. Chen et al. (2023) also emphasised the importance of future research focusing on embedding AI technologies within students' everyday lives, supporting their cultural practices,

goals, and communities.

Hamal et al. (2022) noted that over the past 30 years, AIED had effectively combined AI with learning sciences to create adaptive learning environments that addressed challenges brought by emerging technologies such as smartphones, tablets, cloud computing, and big data. This interdisciplinary approach led to the development of AIED systems, including ITS, adaptive learning technologies, and AI-driven feedback mechanisms. These significantly enhanced learning outcomes by providing personalised educational experiences tailored to individual learner needs. Ezzaim et al. (2022) highlighted the diverse and impactful applications of AIED across various educational contexts, including adaptive learning systems, ITS, conversational agents, recommendation systems, virtual learning environments, and expert systems. These applications aimed to personalise content, increase learner engagement, and offer real-time feedback and support. Meanwhile, Chen et al. (2022) conducted a comprehensive review of AIED, identifying key areas of progress and ongoing challenges, emphasising the importance of integrating AI technologies with educational theories and practices and the need for interdisciplinary collaboration to effectively address the complexities of implementing AI in educational settings.

Crompton and Burke (2023) examined the use of AI in higher education, noting a rapid increase in publications and emerging trends in researcher affiliations and study focuses. They identified five primary usage codes for AI in education: assessment/evaluation, predicting, AI assistants, ITS, and managing student learning, highlighting AI's potential to make higher education more personalised, engaging, and effective. Hwang et al. (2024) defined AIED as the application of AI technologies to enhance educational processes through personalised learning experiences, support for teachers in administrative tasks, and decision-making assistance (Ifelebuegu et al., 2023). These technologies used advanced machine learning, natural language processing, and data analytics to simulate cognitive functions, thus improving educational outcomes and operational efficiency. Significant advancements in AIED included personalised learning, adaptive assessment, and real-time feedback mechanisms that used AI-driven learning analytics to monitor student performance and tailor instructional strategies. AI-powered tools enhanced interactive learning environments by fostering collaborative learning and peer interactions, adapting to individual learning styles. Additionally, the use of conversational agents and AI tutors improved student engagement and academic performance.

Luckin et al. (2024) highlighted the importance of integrating artificial intelligence (AI) into education in a way that is both learner-centred and ethically responsible. She advocated for balancing the roles of AI and human educators, highlighting AI's potential to personalise learning and streamline educational processes. However, Luckin warned of ethical challenges, particularly concerning data privacy, transparency, and the risk of over-reliance on AI systems for decision-making and critical thinking. She stressed the need for interdisciplinary collaboration among educators, researchers, and developers to design AI tools that are trustworthy and promote equitable learning outcomes.



## Technology acceptance model (TAM)

The development of AM was driven by the need for a comprehensive and user-centric framework to understand the adoption and acceptance of new technologies. Over the past three decades, TAM has become one of the most influential theories in technology adoption research. Before the emergence of TAM, researchers had explored various models and theories, including Rogers's (1962) Diffusion of Innovations theory, Fishbein and Ajzen's (1975) Theory of Reasoned Action, and Ajzen's (1985) Theory of Planned Behaviour. However, these models did not specifically target technology acceptance. TAM originated from Davis's (1986) doctoral dissertation, which laid the groundwork for the model. Davis drew on concepts from cognitive psychology, such as Festinger's (1957) Theory of Cognitive Dissonance. He incorporated the Perceived Usefulness construct from Delone and McLean (1992) to develop a model explaining how individuals decide to accept and use technology.

Davis introduced the Technology Acceptance Model (TAM) in 1989, suggesting that a user's intention to use technology is primarily influenced by perceived usefulness (PU) and perceived ease of use (PEOU) (Figure 1). PU refers to the belief that using a particular technology will enhance one's performance or effectiveness, highlighting the utilitarian aspect of technology acceptance. PEOU, on the other hand, pertains to how easily the user finds the technology to learn and operate; a system perceived as user-friendly is more likely to be adopted. Intention to Use (ITU) acts as a mediator between PU, PEOU, and actual use (AU) in TAM, reflecting the user's intention to utilise the technology, which is a strong predictor of their subsequent behaviour. AU represents the real usage of the technology, driven by behavioural intention. Attitude towards Using (ATU) encapsulates the user's overall emotional and evaluative response to technology, including their feelings, predispositions, and subjective assessment of its value and utility.

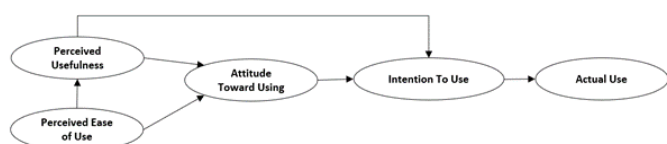


Figure 1. Technology Acceptance Model. *Note.* Adapted from "Technology Acceptance Model" by D. Marikyan & S. Papagiannidis, in S. Papagiannidis (Ed.), *Theory Hub Book*, 2023 (<https://open.ncl.ac.uk/theories/1/technology-acceptance-model/>). CC BY-NC-ND 4.0.

One of the reasons why TAM is a useful framework for studying and understanding technology adoption and acceptance is its simplicity and clarity. The model only has a few key constructs, mainly PU and PEOU, which are not difficult to measure and analyse. This makes TAM user-friendly and practical for various purposes. Another reason is TAM's strong predictive power in explaining and forecasting technology adoption and usage behaviour. Research has consistently shown that PU and PEOU are reliable predictors of users' behavioural intentions and technology use. This predictive accuracy is essential for organisations and policymakers seeking to understand and

influence technology adoption. A third reason is that TAM's core constructs are generic and broad, making the model applicable to various technologies and contexts.

Researchers in education have applied TAM to examine how educators adopt different educational technologies, such as online learning platforms, digital teaching tools, and collaborative software (Camilleri & Camilleri, 2022; Fearnley & Amora, 2020; Davis & Granić, 2024). TAM has enabled researchers to compare how different technologies are accepted in the same educational context. By using TAM to evaluate various tools or platforms, researchers can better identify which ones match users' needs and preferences. Researchers in education have also used TAM to investigate the factors that affect technology acceptance among educators and students. They have explored how training, support, attitudes, and external pressures shape users' perceptions of technology (Hamutoglu, 2021; Saleh et al., 2022). Educational institutions have relied on TAM to inform their technology integration strategies. By knowing teachers' and students' perceptions, institutions can make better decisions about which technologies to invest in and how to support their effective implementation (Almulla, 2021; Chugh et al., 2023; Hamutoglu, 2021). TAM has also helped educators design educational content and instruction that aligns with students' needs and preferences (Etemi et al., 2024; De Vega et al., 2023; Tawafak et al., 2023). By focusing on technologies that are perceived as useful and easy to use, educators can create more engaging and effective learning experiences. With the increase of online and remote learning, TAM has been used to evaluate the acceptance of digital tools and platforms in virtual learning environments (Almulla, 2022; Alqahtani & Al-Rahmi, 2022; Camilleri & Camilleri, 2022). This research informs the design of online courses and the selection of appropriate technologies.

## One-stage meta-analytic structural equation modelling (OSMASEM)

OSMASEM is a statistical technique that integrates meta-analysis and structural equation modelling (SEM) elements. This technique offers several advantages, such as estimating construct relationships more precisely by pooling data across studies, addressing complex questions involving indirect effects and mediation, accounting for measurement error and modelling latent variables, and reducing bias and improving the accuracy of parameter estimates (Cheung, 2015; Cheung & Chan, 2005; Eisenberg et al., 2019; Jak, 2015). OSMASEM provides a comprehensive framework for synthesising research findings, especially in fields where constructs are complex and interrelated (Cheung, 2019). As such, OSMASEM can benefit TAM research in educational contexts in several ways. It can integrate diverse datasets from various educational institutions, settings, and populations, facilitating the generalisation of findings about technology acceptance in education (Or, 2023). It can also enhance statistical power, allowing researchers to detect smaller effects and relationships that may be missed in individual studies due to sample size limitations. This is valuable for identifying nuances in the associations between PEOU, PU, ITU, and AU. Within OSMASEM, SEM

quantitatively synthesises relationships between TAM constructs, calculating summary effect sizes that provide a clearer understanding of the strength and direction of associations between PU, PEOU, ITU, and AU in educational settings.

### The current study using one-stage meta-analytic structural equation modelling (OSMASEM)

The current study utilised the correlation-based OSMASEM technique (Jak et al., 2021) to synthesise existing empirical research on the Technology Acceptance Model (TAM) in the context of AI in Education (AIED). TAM is widely used to explore the factors influencing the acceptance and adoption of AIED systems by both learners and educators (Gros, 2016; Looi et al., 2011). While previous studies on TAM have employed various methods, such as traditional meta-analysis (King & He, 2006), structural equation modelling (SEM) (Lee et al., 2003), and longitudinal studies, to investigate the relationships between TAM constructs, these approaches have limitations in integrating diverse findings and adapting to the specific characteristics of AIED contexts (Marangunić & Granić, 2015). To address these gaps, this meta-analysis aimed to answer the following research questions:

- 1) How stable are the relationships between key factors in TAM, based on a synthesis of past studies using meta-analytic techniques?
- 2) To what extent does TAM provide a good explanation of how educators and students accept AIED based on a combined analysis of data from multiple studies?
- 3) What role does ATU play in shaping the acceptance of AIED, and how does including this factor impact the relationships among other key factors in TAM?

The need for this study is driven by the rapid adoption of AI in educational settings and the growing necessity to understand how educators and students interact with these technologies. While TAM has been widely used to assess technology adoption, its application to AIED remains underexplored, particularly in terms of synthesising existing empirical evidence through meta-analytic techniques. Given the increasing integration of AI-powered tools in classrooms, universities, and administrative processes, understanding the stability of relationships among TAM constructs is crucial for designing AI systems that are not only effective but also widely accepted by users. This study provides valuable insights for educators, policymakers, and developers by identifying key determinants of AI acceptance and addressing gaps in existing research. By doing so, it offers a comprehensive perspective on how usability, perceived benefits, and attitudes shape AI adoption, ultimately contributing to more informed decision-making in AI-driven educational innovation.

The other important mention is the theoretical framework for this meta-analysis study. Despite AU being the endogenous construct in the original TAM, it was not included in this

study's model because only four out of the 17 studies in the analysis included AU as a variable. The limited representation of AU across the datasets raised concerns about consistency and completeness, which could have impacted the reliability and validity of the model. As a result, the study prioritised constructs that were more consistently measured across the available studies, as shown in Figure 2. This approach ensured that the model accurately reflected the most reported relationships while acknowledging the constraints of the existing data.

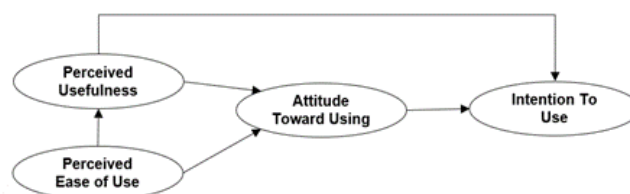


Figure 2. Adapted theoretical framework for meta-analysis.

## Methodology

### Literature search and screening procedures

The literature search for relevant studies on TAM in education covered the period from 1989 to 2024. Using Primo by Ex Libris, the following search string was applied across multiple databases: "technology" AND "acceptance" AND "model" AND "education" AND "artificial intelligence". The databases included the DOAJ, IngentaConnect Journals, Springer Ejournals, Journals@Ovid Ovid Autoload, Springer Nature OA/Free Journals, ScienceDirect Ejournals, CINAHL Complete, Wiley Online Library - AutoHoldings Journals, Public Library of Science, Taylor & Francis Online, Business Source Complete, IOP Publishing Free Content, BMJ Journals, Taylor & Francis Open Access, Wiley Online Library Open Access, SAGE Journals PREM24 Premier 2024, and Oxford Journals Online. The search filters were English language, article document type, open access, peer-reviewed, and the specified years. The initial screening of the 3440 identified studies was based on the following criteria: (1) the studies examined technology acceptance in school or university settings; (2) the studies reported quantitative data and correlations of TAM constructs; (3) the studies were written in English. This resulted in 29 eligible empirical studies. Further exclusion criteria were: (1) the studies did not target teachers, lecturers, educators, or students in K-12, college, or university education; (2) TAM was examined outside of educational contexts; (3) the studies were not based on the TAM models; (4) the studies had insufficient statistical reporting of the correlations between TAM constructs; (5) correlations between variables were negative, which the R package "metaSEM" (Cheung, 2014) could not compute (R Core Team, 2024); (6) the studies did not include original TAM endogenous constructs, ITU. Finally, 17 studies with sample sizes greater than 100 were included in the meta-analysis using correlation matrices. Figure 3 shows PRISMA, which describes the literature search and selection process. Table 1 lists the studies that provided the data for this OSMASEM study.

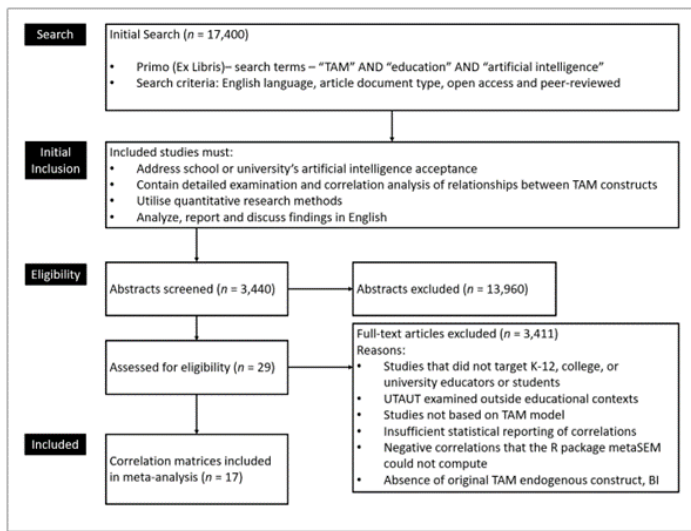


Figure 3. PRISMA diagram depicting the literature search and selection process for eligible studies in the meta-analysis.

Table 1. TAM studies from which data are used.

S/N	Sample Size	Study
1	314	Li, K. (2023). Determinants of College Students’ Actual Use of AI-Based Systems: An Extension of the Technology Acceptance Model. <i>Sustainability</i> , 15(6), 5221.
2	311	Wang, Y., Liu, C., & Tu, Y. F. (2021). Factors affecting the adoption of AI-based applications in higher education. <i>Educational Technology &amp; Society</i> , 24(3), 116-129.
3	147	Musyaffi, A. M., Baxtishodovich, B. S., Afriadi, B., Hafeez, M., Adha, M. A., & Wibowo, S. N. (2024). New Challenges of Learning Accounting With Artificial Intelligence: The Role of Innovation and Trust in Technology. <i>European Journal of Educational Research</i> , 13(1).
4	215	Choi, S., Jang, Y., & Kim, H. (2023). Influence of pedagogical beliefs and perceived trust on teachers’ acceptance of educational artificial intelligence tools. <i>International Journal of Human-Computer Interaction</i> , 39(4), 910-922.
5	665	Chen, S., Qiu, S., Li, H., Zhang, J., Wu, X., Zeng, W., & Huang, F. (2023). An integrated model for predicting pupils’ acceptance of artificially intelligent robots as teachers. <i>Education and Information Technologies</i> , 28(9), 11631-11654.
6	528	Ni, A., & Cheung, A. (2023). Understanding secondary students’ continuance intention to adopt AI-powered intelligent tutoring system for English learning. <i>Education and Information Technologies</i> , 28(3), 3191-3216.
7	303	Pan, Z., Xie, Z., Liu, T., & Xia, T. (2024). Exploring the Key Factors Influencing College Students’ Willingness to Use AI Coding Assistant Tools: An Expanded Technology Acceptance Model. <i>Systems</i> , 12(5), 176.
8	372	Malik, R., Shrama, A., Trivedi, S., & Mishra, R. (2021). Adoption of chatbots for learning among university students: Role of perceived convenience and enhanced performance. <i>International Journal of Emerging Technologies in Learning (IJET)</i> , 16(18), 200-212.
9	413	Awal, M. R., & Haque, M. E. (2024). Revisiting university students’ intention to accept AI-Powered chatbot with an integration between TAM and SCT: a south Asian perspective. <i>Journal of Applied Research in Higher Education</i> .
10	458	Almogren, A. S., Al-Rahmi, W. M., & Dahri, N. A. (2024). Exploring Factors Influencing the Acceptance of ChatGPT in Higher Education: A Smart Education Perspective. <i>Helvion</i> .
11	315	Molefi, R. R., Ayanwale, M. A., Kurata, L., & Chere-Masopha, J. (2024). Do in-service teachers accept artificial intelligence-driven technology? The mediating role of school support and resources. <i>Computers and Education Open</i> , 100191.
12	375	Tiwari, C. K., Bhat, M. A., Khan, S. T., Subramaniam, R., & ... (2023). The impact of artificial intelligence on the acceptance of educational technology: A meta-analysis. <i>Journal of Pedagogical Research</i> , 1(1), 1-15.

13 156 Saif, N., Khan, S. U., Shaheen, I., ALotaibi, F. A., Almfai, M. M., & Arif, M. (2024). Chat-GPT; validating Technology Acceptance Model (TAM) in education sector via ubiquitous learning mechanism. *Computers in Human Behavior*, 154, 108097.

14 274 Guo, S., Shi, L., & Zhai, X. (2024). Validating an Instrument for Teachers’ Acceptance of Artificial Intelligence in Education. *arXiv preprint arXiv:2406.10506*.

15 140 Gayashan, S. P., & Samarasinghe, S. (2024, April). Factors Affecting the Intention to Use AI-Based Chatbots in Learning. In *2024 International Research Conference on Smart Computing and Systems Engineering (SCSE) (Vol. 7, pp. 1-9)*. IEEE.

16 207 Bilquise, G., Ibrahim, S., & Salhieh, S. E. M. (2024). Investigating student acceptance of an academic advising chatbot in higher education institutions. *Education and Information Technologies*, 29(5), 6357-6382.

17 637 Albayati, H. (2024). Investigating undergraduate students’ perceptions and awareness of using ChatGPT as a regular assistance tool: A user acceptance perspective study. *Computers and Education: Artificial Intelligence*, 6, 100203.

### Analysis using metaSEM for one-stage meta-analytic structural equation modelling (OSMASEM)

The R package ‘metaSEM’ (Cheung, 2015; version 1.3.1) was used to analyse the correlation matrices derived from the TAM studies, utilising R software (R Core Team, 2024; version 4.3.1). This package implements the OSMASEM method, which integrates meta-analysis and SEM using the ‘OpenMx’ package in R. Meta-analysis is a statistical technique that combines the findings from independent studies to estimate the overall effect size and trend (Borenstein et al., 2009). It involves systematically collecting and synthesising data from multiple research studies to reach a comprehensive conclusion with greater statistical power and reliability than individual studies. The metaSEM package extends this technique by allowing for the evaluation of complex relationships between observed and latent variables using SEM. OSMASEM is especially relevant for this study because it can process past study data and map the evolution of relationships between variables over continuous time points (Cheung, 2014). OSMASEM combines all the data from multiple studies into a single analysis, treating the pooled data as if it were from one large study. This approach retains the complexity and richness of the original data while enhancing the statistical power to detect significant effects.

The correlation matrices from the included studies were inspected for completeness and consistency before analysis. Any discrepancies or missing data points were addressed through imputation or exclusion as appropriate. The matrices were then standardised to ensure comparability across studies. The meta-analytic technique in the ‘metaSEM’ package was used to combine the individual correlation matrices. Specifically, the OSMASEM method was employed to aggregate the data across studies. This process involves pooling the correlation matrices using a maximum likelihood estimation approach, which summed the sample sizes from each study rather than averaging them. This approach allowed for a more accurate computation of standard errors for the path coefficients in the SEM. Mediation analyses were conducted within the OSMASEM framework to examine the indirect effects between variables. These analyses were

moved from the results section to provide a more coherent and comprehensive description of the methodological process.

## Results

### Internal structure

The metaSEM package (Cheung, 2014; version 1.3.0) in R (version 4.3.3) and R Studio (version 2023.12.1, Build 402) was used to analyse the TAM model 1 using data from 17 TAM studies, encompassing a total sample size of 5,830 participants, to analyse the determinants of AI-based system adoption in educational settings. This analysis tested the model's theoretical framework by comparing the observed correlations with the proposed measurement model to assess the fit and loadings of the factors (Albright & Park, 2009; Bollen, 1989; Hair et al., 2006; Kline, 2015). Five fit indices were used to evaluate the model: (a) chi-square to degrees of freedom ratio ( $\chi^2/df$ ), (b) root mean square error of approximation (RMSEA; Steiger, 1990), (c) standardised root mean square residual (SRMR), (d) comparative fit index (CFI; Bentler, 1990), and (e) Tucker-Lewis index (TLI; Bentler & Bonett, 1980) as shown in Table 2. The  $\chi^2$  statistic is sensitive to sample size, so the  $\chi^2/df$  ratio was used, with values below 3 indicating acceptable fit (Kline, 2015). For RMSEA, values below .050 indicate a close fit, between .050 and .080 a good fit, between .080 and .100 a mediocre fit, and above .100 an unacceptable fit (Browne & Cudeck, 1992). Recent guidelines have confirmed these ranges, emphasising the importance of a lower RMSEA for a better model fit (Byrne, 2016; Kenny et al., 2015; Kline, 2015; Schreiber et al., 2006). The CFI and TLI, which compare the model with a baseline null model while adjusting for complexity, suggest an acceptable fit for values above .950. The TAM model's fit indices ( $\chi^2/df = 2.395$ ; RMSEA = .016; SRMR = .028; CFI = .994; TLI = .962) indicated that it fit the data well (Table 2). Reliability analysis conducted with IBM SPSS (version 28.0.1.1) showed high-scale reliability, as indicated by Cronbach's alpha ( $N = 17$ ;  $\alpha = .886$ ).

Table 2. Goodness-of-fit indices of model.

Measure	Threshold	Value
$\chi^2$	--	2.395
$df$	--	1.000
$\chi^2/df$	< 3.000	2.395
<i>p</i> -value	> .050	.122
RMSEA	< .050	.016
SRMR	< .080	.028
CFI	> .950	.994
TLI	> .950	.962

The effect of PEOU on PU was significant ( $\beta = .619, p < .001$ ), indicating that easier technology use is strongly linked to higher perceived usefulness (Figure 4). Additionally, PU directly influenced ATU ( $\beta = .340, p < .001$ ), indicating that as users perceived the technology to be more useful, their attitude toward using it became more favourable. PEOU also had a direct effect on ATU ( $\beta = .425, p < .001$ ). This suggested that PEOU not only contributed to PU but also independently enhanced users' attitudes toward the technology. ATU significantly predicted ITU ( $\beta = .488, p < .001$ ), while PU also had a direct effect on ITU ( $\beta = .324, p < .001$ ).

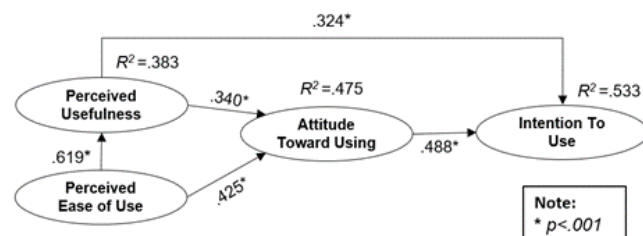


Figure 4: Paths analysis of meta-analysis.

The variance explained by the model was substantial across constructs. PU had an  $R^2$  value of .383, indicating that PEOU explained 38.3% of its variance. ATU had an  $R^2$  value of .475, showing that PU and PEOU explained 47.5% of its variance. Lastly, ITU had an  $R^2$  value of .533, meaning that ATU and PU together explained 53.3% of the variance in users' intention to use the technology.

Table 3: Direct, indirect and total effects.

Path	Direct Effect	Indirect Effect	Total Effect
PEOU → PU	.619*	-	-
PU → ATU	.340*	-	-
ATU → ITU	.488*	-	-
PEOU → ATU	.425*	.309*	.365*
PU → ITU	.324*	.166*	.490*
PEOU → ITU	-	.511*	.511*

Note: \* $p < .001$

The current study examined the relationships between the TAM constructs in a structural equation model. The results indicated several significant direct and indirect effects, highlighting the pathways through which these constructs interacted to influence ITU (Table 3). The analysis revealed several significant indirect effects. The indirect effect of PEOU on ATU, mediated through PU, was significant ( $\beta = .309, p < .001$ ), suggesting that the influence of PEOU on ATU occurred not only directly but also through its impact on PU. Similarly, the indirect effect of PU on ITU, mediated by ATU, was also significant ( $\beta = .166, p < .001$ ). Notably, the total indirect effect of PEOU on ITU, incorporating multiple pathways (PEOU → PU → ITU, and PEOU → PU → ATU → ITU), was significant ( $\beta = .511, p < .001$ ).

The total effect of PEOU on ATU, combining both direct and indirect pathways, was significant ( $\beta = .635, p < .001$ ), demonstrating that PEOU substantially influenced ATU. The total effect of PU on ITU was significant as well ( $\beta = .490$ ,

$p < .001$ ), highlighting the combined impact of direct and mediated pathways through which PU contributed to the ITU. The overall effect of PEOU on ITU was also significant ( $\beta = .511, p < .001$ ), affirming the importance of PEOU as a foundational determinant of technology acceptance through various mediated pathways.

Table 4: Estimated missing studies, heterogeneity statistics, and effect size estimates for each path.

Path	Estimated Missing Studies	Effect Size (95% CI)	$\tau^2$ (SE)	I <sup>2</sup> (%)
PEOU → PU	1 (SE = 2.701)	.628 [.561, .695]	.019 (.007)	91.56
PEOU → ATU	0 (SE = 1.535)	.611 [.514, .707]	.019 (.011)	91.41
PU → ATU	0 (SE = 2.046)	.619 [.522, .715]	.019 (.011)	91.8
PU → BIU	0 (SE = 2.427)	.611 [.542, .680]	.019 (.007)	91.65
ATU → BIU	0 (SE = 1.753)	.638 [.503, .772]	.040 (.021)	96.42

( $\tau^2 = .019, I^2 = 91.650\%$ ). The ATU → BIU path showed no missing studies, with an effect size of .638, 95% CI [.503, .772], and the highest heterogeneity observed among the paths ( $\tau^2 = .040, I^2 = 96.420\%$ ). Overall, the results indicated some potential publication bias for the PEOU → PU path due to the estimated missing study. Nevertheless, the effect sizes across all paths remained statistically significant after adjustment, demonstrating robust relationships within the TAM.

## Discussion

The results of the TAM model in this study confirmed the significant roles of its construct in predicting acceptance of AEID. The significant paths between these constructs, all statistically significant at  $p < 0.001$ , reinforced the foundational premises of TAM proposed by Davis (1989). Notably, the path from PEOU was strong ( $\beta = .635, p < .001$ ), suggesting that greater ease of use was significantly associated with increased perceived usefulness. This finding aligned with the core TAM assumption that usability is a critical determinant of perceived usefulness, as demonstrated in previous studies (Davis, 1989; Venkatesh & Davis, 2000). It iterated the importance of designing user-friendly interfaces to enhance the perceived value of the technology, thereby increasing the likelihood of adoption.

Furthermore, PU directly influenced ATU ( $\beta = .340, p < .001$ ), indicating that as users perceived the technology to be more useful, their attitude toward using it became more favourable. It is interesting to note that Davis (1989) had removed ATU from the TAM while many researchers have reintroduced it to their studies. The original TAM, proposed by Davis in 1986, included ATU as a central construct, reflecting the user's overall affective response to the technology (Davis, 1986). ATU was initially considered an important mediator between PU, PEOU, and ITU. However, in the 1989 revision of TAM, ATU was excluded after empirical studies revealed that its mediating role was redundant; PU directly and strongly influenced ITU, rendering ATU unnecessary (Davis, 1989).

The direct effect of PEOU on ATU ( $\beta = .425, p < .001$ ) further emphasised the role of usability in shaping users' attitudes. This finding supported previous meta-analytic results, such as those by King and He (2006), which found that PEOU not only contributed to PU but also independently enhanced users' attitudes toward the technology. The significant impact of ATU on ITU ( $\beta = .488, p < .001$ ) reaffirmed the mediating role of ATU in the TAM framework. This relationship suggested that a positive attitude toward using the technology strongly drove users' intentions to use it, a finding that aligned with prior studies that have established attitude as a critical mediator between PU, PEOU, and ITU (Wu & Chen, 2017). Additionally, the direct effect of PU on ITU ( $\beta = .324, p < .001$ ) emphasised the pivotal role of PU in technology acceptance. This direct link suggested that highlighting the practical benefits and usefulness of the technology could directly influence users' behavioural intentions, reinforcing findings from previous studies (Venkatesh & Davis, 2000; Schepers & Wetzels, 2007).

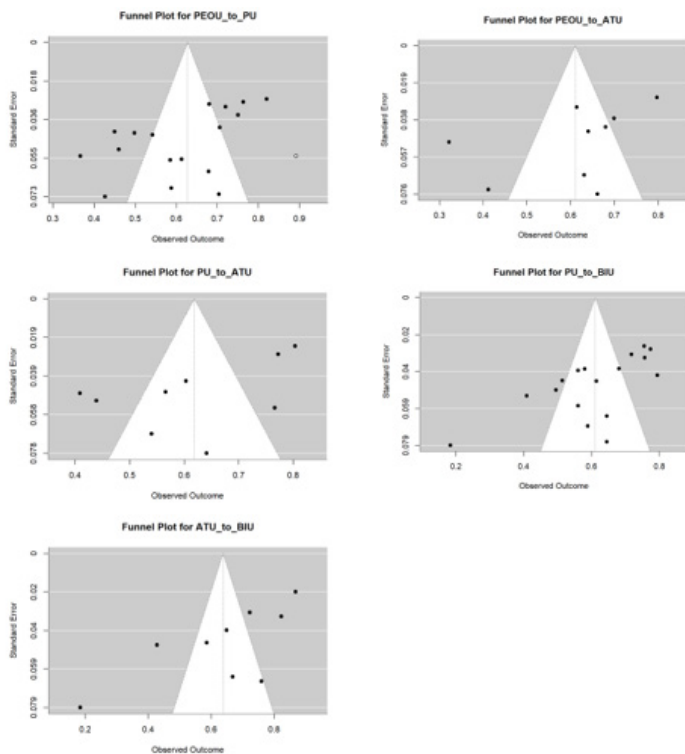


Figure 5: Funnel plots with Trim-And-Fill method for each path.

Publication bias was assessed using the Trim-and-Fill method in a funnel plot, focusing on key relationships within the Technology Acceptance Model (TAM). The analysis was conducted using R software (R Core Team, 2024; version 4.3.1) and the 'metafor' package (Viechtbauer, 2010; version 3.8-1). Table 1 presents the estimated number of missing studies, heterogeneity statistics, and effect size estimates for each relationship. For the PEOU → PU path, the Trim-and-Fill analysis suggested one potentially missing study on the right side, indicating possible publication bias, with the random-effects model estimating an effect size of .628, 95% CI [.561, .695], and substantial heterogeneity ( $\tau^2 = .019, I^2 = 91.560\%$ ). In contrast, the PEOU → ATU path showed no missing studies, suggesting minimal publication bias, with an effect size estimate of .611, 95% CI [.514, .707], and high heterogeneity ( $\tau^2 = .019, I^2 = 91.410\%$ ). Similarly, no missing studies were identified for the PU → ATU path, resulting in an effect size of .619, 95% CI [.522, .715], and considerable heterogeneity ( $\tau^2 = .019, I^2 = 91.800\%$ ). For the PU → BIU path, the analysis found no missing studies, with an effect size of .611, 95% CI [.542, .680], and high heterogeneity

The  $R^2$  values further illustrated the robustness of the TAM. PU explained 38.3% of its variance through PEOU, while PU and PEOU explained ATU with a combined variance of 47.5%. ITU had the highest explained variance at 53.3%, influenced by both ATU and PU. These findings were consistent with previous TAM studies, which reported similar levels of explained variance, affirming the model's predictive power (Venkatesh & Bala, 2008). However, compared to some studies that reported higher  $R^2$  values for ITU, the slightly lower explained variance in this study could have been attributed to contextual differences or the specific technology that was evaluated (King & He, 2006; Schepers & Wetzels, 2007; Chin et al., 2008). King and He (2006) conducted a meta-analysis of TAM and found that PEOU and PU consistently influenced ITU across various studies. Moreover, Chin et al. (2008) highlighted that interaction effects and specific contextual variables could significantly influence the variance explained in ITU, further emphasising the importance of considering the specific context and technology being evaluated.

OSMASEM has emerged as a powerful analytical approach in synthesising research findings across multiple studies, particularly within the context of TAM applications in AIED. In the context of AIED, OSMASEM is particularly useful because it can handle diverse datasets from studies that apply TAM to understand the acceptance of AI technologies in the educational context. For example, the technique allows researchers to examine whether the relationships between TAM constructs remain consistent when applied to different AI applications, such as intelligent tutoring systems, adaptive learning platforms, or AI-powered administrative tools (Jarek & Cheng, 2022). This approach not only provides a robust framework for understanding the determinants of AI acceptance in education but also addresses potential heterogeneity among studies by modelling latent variables and accounting for measurement errors, which is crucial given the varied nature of AI technologies and their implementation contexts (Eisenberg et al., 2019). OSMASEM is advantageous in educational settings where data may be incomplete or where constructs like AU are not consistently reported across studies. OSMASEM's ability to synthesise complex relationships offers a more accurate and comprehensive view of how educators and students perceive and engage with AI technologies, providing valuable insights for policymakers, educators, and technology developers aiming to enhance AI adoption in education (Jak et al., 2021). The findings of this study offered insights for educators navigating the integration of AIED. Given that PEOU and PU significantly influence ATU, educators should prioritise selecting AI tools that are user-friendly and demonstrate clear pedagogical benefits. For instance, AI-powered tutoring systems and personalised learning platforms that reduce cognitive load while enhancing learning outcomes are more likely to gain acceptance among both educators and students (Tapalova & Tapalova, 2023). Understanding these factors allows educators to advocate for professional development programmes that equip them with the necessary skills to integrate AI seamlessly into their teaching practices (Zawacki-Richter et al., 2019). Additionally, institutions can leverage these insights to design policies that promote meaningful AI use while mitigating concerns about workload and digital literacy barriers (Popenici & Kerr,

2017; Holmes et al., 2019).

## Limitations

The study identified two primary limitations: the availability of primary studies and the complexity of OSMASEM. These limitations may impact the reliability and applicability of the findings and pose challenges for researchers, especially those less experienced with OSMASEM. The availability and quality of primary studies are crucial for the scope and validity of OSMASEM, as the method relies on comprehensive datasets to accurately estimate relationships among constructs (Cheung, 2015). However, many studies lack sufficient and consistent data, such as correlation matrices and omission of constructs, which are essential for data extraction and synthesis in OSMASEM. This deficiency restricts the inclusion of potentially valuable research, thereby reducing the robustness of the meta-analytic structural equation model. A notable issue within the scope of TAM studies is the frequent omission of the AU construct, which significantly narrows the comprehension of technology acceptance behaviours. Out of 17 TAM studies analysed in this research, only four included AU. This assumption might prove slightly flawed in educational settings, wherein factors such as access, training, or institutional support can impede the conversion of intention into genuine use, thus compromising the practical relevance of the findings and the credibility of OSMASEM when evaluating AI adoption in education.

Additionally, OSMASEM's complexity combines the intricacies of SEM and meta-analysis, necessitating a high level of proficiency in both techniques. This study utilised the metaSEM package within the R software environment—a powerful tool for conducting MASEM analysis, but one that also has its own set of complexities and limitations. Users must be adept with both the metaSEM package and R software, highlighting the need for researchers to master SEM and meta-analysis fundamentals before attempting OSMASEM.

## Conclusions

This study's findings corroborated and extended the existing body of TAM research, reinforcing the critical roles of PEOU and PU in shaping ITU. The significant paths and robust  $R^2$  values provided strong empirical support for TAM, confirming its applicability in understanding technology acceptance across various contexts. These insights are valuable for higher education practitioners aiming to enhance technology adoption by emphasising usability and perceived benefits, and they contribute to the ongoing refinement of TAM in predicting technology-related behaviours.

Future studies should further examine the interplay between PU, PEOU, ITU and even ATU to ensure that technology acceptance models remain robust and relevant in evolving contexts. As AI continues to advance and its applications in education become more complex, understanding the role of ATU will likely become increasingly important (Hwang et al., 2024). This understanding can guide the design of AI

tools that not only meet functional needs but also resonate positively with users, fostering greater acceptance and more effective integration into educational environments.

With the continuous evolution of AI technologies, interdisciplinary collaboration will be essential to address the complex challenges and opportunities they present. Researchers, educators, policymakers, and technologists must work together to ensure that AIED is developed and implemented ethically, equitably, and effectively (Holmes et al., 2019). This collaborative approach will help maximise the benefits of AIED while mitigating potential risks. The integration of AI in education offers significant potential to enhance teaching and learning experiences, improve administrative efficiency, and personalise education. However, realising this potential requires careful consideration of ethical, practical, and pedagogical challenges. By leveraging insights from existing research and fostering collaborative efforts across disciplines, the educational community can harness AI to create more inclusive and effective learning environments.

Looking ahead, the future of AIED appears promising with ongoing advancements in technology and pedagogy. Emerging research areas include developing AI systems that can understand and respond to students' emotional and motivational states (D'Mello & Graesser, 2012; Bosch et al., 2020). There is also increasing interest in using AI to support collaborative learning and peer interactions (Rosé et al., 2019). These areas represent the next frontier in AI-enhanced education, focusing on the social and emotional aspects of learning. Zhai et al. (2021) emphasised the importance of developing adaptive systems that support general learning skills and competencies, incorporating collaborative learning structures and real-world problem-solving activities to provide students with meaningful, context-rich learning experiences. Integrating AI technologies with educational theories is crucial to achieving these goals. They identified emerging trends in AIED research, such as the integration of the Internet of Things (IoT), swarm intelligence, deep learning, and neuroscience, which are expected to further transform educational practices. However, significant challenges remain, including the inappropriate use of AI techniques, the evolving roles of teachers and students, and various social and ethical concerns. Addressing these challenges will be crucial for the effective implementation of AI in educational settings, as highlighted by Zhai et al. (2021).

## References

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11-39). Springer. [https://doi.org/10.1007/978-3-642-69746-3\\_2](https://doi.org/10.1007/978-3-642-69746-3_2).

Al-Azawei, A., Parslow, P., & Lundqvist, K. (2017). Investigating the effect of learning styles in a blended e-learning system: An extension of the Technology Acceptance Model (TAM). *Australasian Journal of Educational Technology*, 33(2), 1-23. <https://doi.org/10.14742/ajet.2741>

Albayati, H. (2024). Investigating undergraduate students' perceptions and awareness of using ChatGPT as a regular assistance tool: A user acceptance perspective study. *Computers and Education: Artificial Intelligence*, 6, 100203. <https://doi.org/10.1016/j.caeai.2024.100203>

Albright, J. J., & Park, H. M. (2009). *Confirmatory factor analysis using AMOS, LISREL, Mplus, SAS/STAT CALIS*. Indiana University. <https://hdl.handle.net/2022/19736>

Aldraiweesh, A., & Alturki, U. (2023). The effectiveness of TAM in educational technology. *Journal of Educational Technology Research and Development*, 71(1), 58-75. <https://doi.org/10.1007/s11423-023-10038-2>

Aleven, V., Roll, I., McLaren, B. M., & Koedinger, K. R. (2013). Help helps, but only so much: Research on help seeking with intelligent tutoring systems. *International Journal of Artificial Intelligence in Education*, 26(1), 205-218. <https://doi.org/10.1007/s40593-015-0089-1>

Almogren, A. S., Al-Rahmi, W. M., & Dahri, N. A. (2024). Exploring factors influencing the acceptance of ChatGPT in higher education: A smart education perspective. *Heliyon*. <https://doi.org/10.1016/j.heliyon.2024.e29317>

Almulla, M. (2021). Technology Acceptance Model (TAM) and e-learning system use for education sustainability. *Academy of Strategic Management Journal*. <https://www.abacademies.org/abstract/technology-acceptance-model-tam-and-e-learning-system-use-for-education-sustainability-11056.html>

Alqahtani, M., & Al-Rahmi, W. (2022). A systematic review of the Technology Acceptance Model for the sustainability of higher education during the COVID-19 pandemic. *Sustainability*, 14(18), 11389. <https://doi.org/10.3390/su141811389>

Alraimi, K. M., Zo, H., & Ciganek, A. P. (2015). Understanding the MOOCs continuance: The role of openness and reputation. *Computers & Education*, 80, 28-38. <https://doi.org/10.1016/j.compedu.2014.08.006>

Arnold, K. E., & Pistilli, M. D. (2012). Course signals at Purdue: Using learning analytics to increase student success. *Proceedings of the 2nd international conference on learning analytics and knowledge* (pp. 267-270). <https://doi.org/10.1145/2330601.2330666>

Awal, M. R., & Haque, M. E. (2024). Revisiting university students' intention to accept AI-Powered chatbot with an integration between TAM and SCT: A south Asian perspective. *Journal of Applied Research in Higher Education*. <https://doi.org/10.1108/JARHE-11-2023-0514>

Baker, M. (2000). The roles of models in artificial intelligence and education research: A prospectus. *Journal of Artificial Intelligence in Education*, 11(1), 122-141. <https://hal.science/hal-00190395/en/>.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107(2), 238-246. <https://doi.org/10.1037/a0019039>

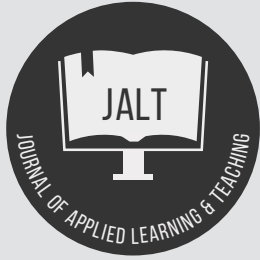
- org/10.1037/0033-2909.107.2.238
- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588-606. <https://doi.org/10.1037/0033-2909.88.3.588>
- Bilquise, G., Ibrahim, S., & Salhieh, S. E. M. (2024). Investigating student acceptance of an academic advising chatbot in higher education institutions. *Education and Information Technologies*, 29(5), 6357-6382. <https://doi.org/10.1007/s10639-023-12076-x>
- Bollen, K. A. (1989). *Structural equations with latent variables*. Wiley. <https://doi.org/10.1002/9781118619179>
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. Wiley. <https://doi.org/10.1002/9780470743386>
- Bosch, N., D'Mello, S., Baker, R. S., Shute, V., Ventura, M., Wang, L., & Zhao, W. (2020). Automatic detection of learning-centered affective states in the wild. *Proceedings of the National Academy of Sciences*, 117(2), 755-762. <https://doi.org/10.1073/pnas.1910402117>
- Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological Methods & Research*, 21(2), 230-258. <https://doi.org/10.1177/0049124192021002005>
- Byrne, B. M. (2016). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (3rd ed.). Routledge.
- Camilleri, M. A., & Camilleri, A. C. (2022). Technology-enhanced learning: The role of social media in online education. *Educational Technology & Society*, 25(2), 143-156.
- Chen, C.-M., Chen, C.-M., & Lin, M.-H. (2020). Artificial intelligence in education: A review. *IEEE Access*, 8, 75264-75278. <https://doi.org/10.1109/ACCESS.2020.2988510>
- Chen, G., Wang, C., & Liang, L. (2022). A comprehensive review of artificial intelligence in education: Progress and challenges. *Educational Technology & Society*, 25(1), 112-125. <https://doi.org/10.1016/j.eswa.2024.124167>
- Chen, S., Qiu, S., Li, H., Zhang, J., Wu, X., Zeng, W., & Huang, F. (2023). An integrated model for predicting pupils' acceptance of artificially intelligent robots as teachers. *Education and Information Technologies*, 28(9), 11631-11654. <https://doi.org/10.1007/s10639-023-11601-2>
- Cheung, M. W. L. (2014). metaSEM: An R package for meta-analysis using structural equation modeling. *Frontiers in Psychology*, 5, 1521. <https://doi.org/10.3389/fpsyg.2014.01521>
- Cheung, M. W.-L. (2015). Meta-analytic structural equation modeling: A primer. *Prevention Science*, 16(6), 843-851. <https://doi.org/10.1007/s11121-014-0480-5>
- Cheung, M. W.-L. (2019). A guide to conducting a meta-analysis with non-independent effect sizes using the metaSEM package. *Behavior Research Methods*, 51(5), 1971-1980. <https://doi.org/10.3758/s13428-018-1118-2>
- Cheung, M. W.-L., & Chan, W. (2005). Meta-analytic structural equation modeling: A two-stage approach. *Psychological Methods*, 10(1), 40-64. <https://doi.org/10.1037/1082-989X.10.1.40>
- Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2008). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research*, 14(2), 189-217. <https://doi.org/10.1287/isre.14.2.189.16018>
- Choi, S., Jang, Y., & Kim, H. (2023). Influence of pedagogical beliefs and perceived trust on teachers' acceptance of educational artificial intelligence tools. *International Journal of Human-Computer Interaction*, 39(4), 910-922. <https://doi.org/10.1080/10447318.2022.2049145>
- Chugh, R., Ruhi, U., & Brzozowski, M. (2023). Extending Technology Acceptance Model to higher-education students' use of digital academic reading tools on computers. *International Journal of Educational Technology in Higher Education*. <https://educationaltechnologyjournal.springeropen.com/counter/pdf/10.1186/s41239-023-00403-8.pdf>
- Crompton, H., & Burke, D. (2023). The rise of artificial intelligence in higher education: A review of research and trends. *Computers & Education*, 175, 104328. <https://doi.org/10.1016/j.compedu.2023.104328>
- Davis, F. D. (1986). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Massachusetts Institute of Technology. <https://dspace.mit.edu/handle/1721.1/15192>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319-340. <https://doi.org/10.2307/249008>
- Davis, F. D., & Granić, A. (2024). The evolution and impact of the Technology Acceptance Model. *Information Systems Research*, 35(2), 123-138. <https://doi.org/10.1287/isre.2024.1110>
- Delone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60-95. <https://doi.org/10.1287/isre.3.1.60>
- De Vega, R., Bustamante, M. S., & García, M. (2023). Extending the Technology Acceptance Model (TAM) to predict university students' intentions to use metaverse-based learning platforms. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-023-10950-7>
- D'Mello, S., & Graesser, A. (2012). Dynamics of affective states during complex learning. *Learning and Instruction*, 22(2), 145-157. <https://doi.org/10.1016/j.learninstruc.2011.10.001>



- Eisenberg, D., Post, C., & DiTomaso, N. (2019). Meta-analytic structural equation modeling in management research: A guide for using metaSEM in R. *Organizational Research Methods*, 22(4), 969-1000. <https://doi.org/10.1177/1094428118772670>
- Etemi, F., Basholli, A., & Bytyqi, A. (2024). Extending the Technology Acceptance Model (TAM) for AI-powered ChatGPT in education: A mixed-methods study. *Heliyon*, 10(8), e29317. <https://doi.org/10.1016/j.heliyon.2024.e29317>
- Ezzaim, F., Alarifi, I. M., & Al-Mutairi, S. (2022). AIED applications in diverse educational contexts. *Journal of Educational Technology Systems*, 50(4), 403-423. <https://doi.org/10.1177/00472395221043914>
- Fearnley, M. R., & Amora, J. T. (2020). Learning management system adoption in higher education using the Extended Technology Acceptance Model. *IAFOR Journal of Education: Technology in Education*, 8(2), 89-106. <https://doi.org/10.22492/ije.8.2.05>
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley.
- Gayashan, S. P., & Samarasinghe, S. (2024, April). Factors affecting the intention to use AI-based chatbots in learning. In *2024 International Research Conference on Smart Computing and Systems Engineering (SCSE)* (Vol. 7, pp. 1-9). IEEE. <https://doi.org/10.1109/SCSE61872.2024.10550537>
- Graesser, A. C., Conley, M. W., & Olney, A. (2014). Intelligent tutoring systems. In M. J. Furlong, R. Gilman, & E. S. Huebner (Eds.), *Handbook of positive psychology in schools* (pp. 311-321). Routledge.
- Gros, B. (2016). The design of smart educational environments. *Smart Learning Environments*, 3(1), 15. <https://doi.org/10.1186/s40561-016-0039-x>
- Guo, S., Shi, L., & Zhai, X. (2024). *Validating an instrument for teachers' acceptance of artificial intelligence in education*. arXiv preprint, arXiv:2406.10506. <https://doi.org/10.48550/arXiv.2406.10506>
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). *Multivariate data analysis* (6th ed.). Prentice Hall.
- Hamal, O., El Faddouli, N.-E., Alaoui Harouni, M. H., & Lu, J. (2022). Artificial intelligent in education. *Sustainability (Switzerland)*, 14(5), 2862. <https://doi.org/10.3390/su14052862>
- Hamutoglu, N. B. (2021). Testing the effects of technological barriers on high school teachers' role in technology integration. *Asian Journal of Distance Education*, 16(1), 74-89. <https://eric.ed.gov/?id=EJ1303725>
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign. <https://circls.org/primers/artificial-intelligence-in-education-promises-and-implications-for-teaching-and-learning>
- Hwang, G.-J., Sung, H.-Y., & Chang, S.-C. (2024). Artificial intelligence in education: Theories, applications, and challenges. *Journal of Educational Technology & Society*, 27(1), 1-14.
- Hwang, G.-J., Xie, H., & Yuan, C. (2020). The vision, challenges, roles, and research issues of artificial intelligence in education. *Computers & Education: Artificial Intelligence*, 1, 100001. <https://doi.org/10.1016/j.caeai.2020.100001>
- Ifelebuegu, A. O., Kulume, P., & Cherukut, P. (2023). Chatbots and AI in Education (AIED) tools: The good, the bad, and the ugly. *Journal of Applied Learning and Teaching*, 6(2), 332-345. <https://doi.org/10.37074/jalt.2023.6.2.29>
- Jak, S. (2015). *Meta-analytic structural equation modeling*. Springer. <https://doi.org/10.1007/978-3-319-27174-3>
- Jak, S., Cheung, M. W.-L., & Mak, T. M. (2021). Meta-analytic structural equation modeling with multiple mediators: A comparison of three methods. *Research Synthesis Methods*, 12(5), 590-606. <https://doi.org/10.1002/jrsm.1478>
- Jarek, P., & Cheng, L. (2022). One-step meta-analytic structural equation modelling (OSMASEM) in educational research. *Journal of Structural Equation Modelling*, 29(3), 201-215. <https://doi.org/10.1080/10705511.2022.2074236>
- Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research*, 44(3), 486-507. <https://doi.org/10.1177/0049124114543236>
- Khosravi, H., Cooper, K., & Kitto, K. (2020). Towards adaptive feedback for student learning improvement. *Journal of Learning Analytics*, 7(1), 33-46. <https://doi.org/10.18608/jla.2020.71.3>
- King, W. R., & He, J. (2006). A meta-analysis of the technology acceptance model. *Information & Management*, 43(6), 740-755. <https://doi.org/10.1016/j.im.2006.05.003>
- Kline, R. B. (2015). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.
- Koedinger, K. R., Anderson, J. R., Hadley, W. H., & Mark, M. A. (2012). Intelligent tutoring goes to school in the big city. *International Journal of Artificial Intelligence in Education*, 8(1), 30-43. [https://kithub.cmu.edu/articles/journal\\_contribution/Intelligent\\_Tutoring\\_Goes\\_To\\_School\\_in\\_the\\_Big\\_City/6470153](https://kithub.cmu.edu/articles/journal_contribution/Intelligent_Tutoring_Goes_To_School_in_the_Big_City/6470153)
- Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The Technology Acceptance Model: Past, present, and future. *Communications of the Association for Information Systems*, 12, 752-780. <https://doi.org/10.17705/1CAIS.01250>

- Li, K. (2023). Determinants of college students' actual use of AI-based systems: An extension of the Technology Acceptance Model. *Sustainability*, 15(6), 5221. <https://doi.org/10.3390/su15065221>
- Looi, C. K., Seow, P., Zhang, B., So, H.-J., Chen, W., & Wong, L. H. (2011). Leveraging mobile technology for sustainable seamless learning: A research agenda. *British Journal of Educational Technology*, 42(1), 154-169. <https://doi.org/10.1111/j.1467-8535.2009.01016.x>
- Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education. <https://discovery.ucl.ac.uk/id/eprint/1475756/>
- Luckin, R., Rudolph, J., Grünert, M., & Tan, S. (2024). Exploring the future of learning and the relationship between human intelligence and AI. An interview with Professor Rose Luckin. *Journal of Applied Learning and Teaching*, 7(1), 346-363. <https://doi.org/10.37074/jalt.2024.7.1.27>
- Malik, R., Shrama, A., Trivedi, S., & Mishra, R. (2021). Adoption of chatbots for learning among university students: Role of perceived convenience and enhanced performance. *International Journal of Emerging Technologies in Learning IJET*, 16(18), 200-212. <https://doi.org/10.3991/ijet.v16i18.24315>
- Marangunić, N., & Granić, A. (2015). Technology acceptance model: A literature review from 1986 to 2013. *Universal Access in the Information Society*, 14(1), 81-95. <https://doi.org/10.1007/s10209-014-0348-1>
- Marikyan, D., & Papagiannidis, S. (2023). Technology acceptance model. In S. Papagiannidis (Ed.), *Theory hub book*. Newcastle University. <https://open.ncl.ac.uk/theories/1/technology-acceptance-model/> (CC BY-NC-ND 4.0).
- Mayer, R. E., & Girwidz, R. (2019). Educational technology in a digital age: Promise and pitfalls. *Educational Psychologist*, 54(3), 170-183. <https://doi.org/10.1080/00461520.2019.1630068>
- Molefi, R. R., Ayanwale, M. A., Kurata, L., & Chere-Masopha, J. (2024). Do in-service teachers accept artificial intelligence-driven technology? The mediating role of school support and resources. *Computers and Education Open*, 6, 100191. <https://doi.org/10.1016/j.caeo.2024.100191>
- Musyaffi, A. M., Baxtishodovich, B. S., Afriadi, B., Hafeez, M., Adha, M. A., & Wibowo, S. N. (2024). New challenges of learning accounting with artificial intelligence: The role of innovation and trust in technology. *European Journal of Educational Research*, 13(1), 183-195. <https://doi.org/10.12973/eu-jer.13.1.183>
- Ni, A., & Cheung, A. (2023). Understanding secondary students' continuance intention to adopt AI-powered intelligent tutoring system for English learning. *Education and Information Technologies*, 28(3), 3191-3216. <https://doi.org/10.1007/s10639-022-11305-z>
- Nkambou, R., Bourdeau, J., & Mizoguchi, R. (Eds.). (2010). *Advances in intelligent tutoring systems*. Springer. <https://doi.org/10.1007/978-3-642-14363-2>
- Or, C. C. P. (2023). Examining unified theory of acceptance and use of Technology 2 through Meta-analytic Structural Equation Modelling. *Journal of Applied Learning and Teaching*, 6(2), 283-293. <https://doi.org/10.37074/jalt.2023.6.2.7>
- Pan, Z., Xie, Z., Liu, T., & Xia, T. (2024). Exploring the key factors influencing college students' willingness to use AI coding assistant tools: An expanded technology acceptance model. *Systems*, 12(5), 176. <https://doi.org/10.3390/systems12050176>
- Pane, J. F., Griffin, B. A., McCaffrey, D. F., & Karam, R. (2017). Effectiveness of cognitive tutor Algebra I at scale. *Educational Evaluation and Policy Analysis*, 36(2), 127-144. <https://doi.org/10.3102/0162373713507480>
- Popenici, S. A. D., & Kerr, S. (2017). Exploring the impact of artificial intelligence on teaching and learning in higher education. *Research and Practice in Technology Enhanced Learning*, 12(1), 22. <https://doi.org/10.1186/s41039-017-0062-8>
- R Core Team (2024). *\_R: A language and environment for statistical computing\_*. R Foundation for Statistical Computing, Vienna, Austria. <https://www.R-project.org>
- Rogers, E. M. (1962). *Diffusion of innovations*. Free Press.
- Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education*, 26(2), 582-599. <https://doi.org/10.1007/s40593-016-0110-3>
- Rosé, C. P., Wang, Y. C., Cui, Y., Arguello, J., Stegmann, K., Weinberger, A., & Fischer, F. (2019). Analysing collaborative learning processes automatically: Exploiting the advances of computational linguistics in computer-supported collaborative learning. *International Journal of Computer-Supported Collaborative Learning*, 3(3), 237-271. <https://doi.org/10.1007/s11412-008-9057-6>
- Saif, N., Khan, S. U., Shaheen, I., ALotaibi, F. A., Alnfai, M. M., & Arif, M. (2024). Chat-GPT; validating Technology Acceptance Model (TAM) in education sector via ubiquitous learning mechanism. *Computers in Human Behavior*, 154, 108097. <https://doi.org/10.1016/j.chb.2023.108097>
- Saleh, M., Alqahtani, M., & Al-Rahmi, W. (2022). Challenges and barriers for effective integration of technologies into teaching and learning. *Education and Information Technologies*. <https://doi.org/10.1007/s10639-022-10951-7>
- Schepers, J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Information & Management*, 44(1), 90-103. <https://doi.org/10.1016/j.im.2006.10.007>
- Schreiber, J. B., Stage, F. K., King, J., Nora, A., & Barlow, E. A. (2006). Reporting structural equation modeling and

- confirmatory factor analysis results: A review. *The Journal of Educational Research*, 99(6), 323-338. <https://doi.org/10.3200/JOER.99.6.323-338>
- Sclater, N. (2017). *Learning analytics explained*. Routledge.
- Siemens, G., & Baker, R. S. (2012). Learning analytics and educational data mining: Towards communication and collaboration. In *Proceedings of the 2nd International Conference on Learning Analytics and Knowledge* (pp. 252-254). <https://doi.org/10.1145/2330601.2330661>
- Steiger, J. H. (1990). Structural model evaluation and modification: An interval estimation approach. *Multivariate Behavioral Research*, 25(2), 173-180. <http://www.statpower.net/Steiger%20Biblio/Steiger90b.pdf>
- Tan, S. (2020). Artificial Intelligence in education: Rise of the machines. *Journal of Applied Learning and Teaching*, 3(1), 129-133. <https://doi.org/10.37074/jalt.2020.3.1.17>
- Tapalova, O., & Tapalova, O. (2023). Artificial Intelligence in education: AIED for personalised learning systems. *International Journal of Emerging Technologies in Learning*, 18(2), 45-60. <https://10.34190/ejel.20.5.2597>
- Taufiq-Hail, S., Ahmad, S., & Malik, F. (2023). Relevance of TAM in healthcare: The case of telemedicine and electronic health records. *Journal of Medical Systems*, 47(4), 23. <https://doi.org/10.1007/s10916-023-00510-8>
- Tawafak, R. M., Romli, A., & Alfarsi, G. (2023). *Extending the Technology Acceptance Model for e-learning platforms in higher education: Factors influencing student engagement*. Education and Information Technologies. <https://doi.org/10.1007/s10639-023-11816-3>
- Tiwari, C. K., Bhat, M. A., Khan, S. T., Subramaniam, R., & Khan, M. A. I. (2023). What drives students toward ChatGPT? An investigation of the factors influencing adoption and usage of ChatGPT. *Interactive Technology and Smart Education*, 21(3), 333-355. <https://doi.org/10.1108/ITSE-04-2023-0061>
- VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. *Educational Psychologist*, 46(4), 197-221. <https://doi.org/10.1080/00461520.2011.611369>
- Venkatesh, V., & Bala, H. (2008). Technology Acceptance Model 3 and a research agenda on interventions. *Decision Sciences*, 39(2), 273-315. <https://doi.org/10.1111/j.1540-5915.2008.00192.x>
- Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46(2), 186-204. <https://doi.org/10.1287/mnsc.46.2.186.11926>
- Venter, I. M., Blignaut, A. S., & Stoltz, A. (2012). Exploring the Technology Acceptance Model in explaining student intentions to use e-learning: The role of subjective norm and perceived behavioural control. *South African Journal of Higher Education*, 26(3), 352-370. <https://doi.org/10.20853/26-3-1665>
- Viechtbauer, W. (2010). Conducting Meta-Analyses in R with the Metafor package. *Journal of Statistical Software*, 36(3), 1-48. <https://doi.org/10.18637/jss.v036.i03>
- Virani, R., Khanna, K., & Desai, P. (2023). TAM and business: Adoption of ERP systems. *Journal of Business Research*, 148, 112-124. <https://doi.org/10.1016/j.jbusres.2023.02.015>
- Walkington, C. (2013). Using adaptive learning technologies to personalise instruction to student interests: The impact of relevant contexts on performance and learning outcomes. *Journal of Educational Psychology*, 105(4), 932-945. <https://doi.org/10.1037/a0031882>
- Wang, Y., Liu, C., & Tu, Y. F. (2021). Factors affecting the adoption of AI-based applications in higher education. *Educational Technology & Society*, 24(3), 116-129. <https://doaj.org/article/e2fe5622b1fa4f88a3f1f90285a4126a>
- Wu, B., & Chen, X. (2017). Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model. *Computers in Human Behavior*, 67, 221-232. <https://doi.org/10.1016/j.chb.2016.10.028>
- Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 39. <https://doi.org/10.1186/s41239-019-0171-0>
- Zhai, X., Chu, X., & Wang, Z. (2021). The role of artificial intelligence in education: A review and outlook. *Journal of Educational Computing Research*, 59(2), 303-327. <https://doi.org/10.1177/073563312111006728>



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

## The impact of AI- assisted language learning tools on augmenting university EFL students' speaking skills in Jordan

Naima Ahmad Al-husban<sup>A</sup> A

*Education and general studies faculty–Arab Open University–Jordan*

### Keywords

Artificial intelligence;  
artificial intelligence-assisted language learning;  
ELSA speech analyzer application;  
English as a foreign language;  
higher education;  
rubrics;  
speaking fluency;  
speaking standards.

### Abstract

This study aims to investigate the effect of the ELSA speech analyzer application, an artificial intelligence platform, on developing the speaking skills of English as a Foreign Language (EFL) students. The participants encompassed 34 university EFL students who were randomly assigned to either an experimental group or a control group. The students in the experimental group received instruction and assessment utilizing the ELSA speech analyzer application, while those in the control group were taught using traditional methods, specifically rubrics. Data were collected through the application of both the AI tool and rubrics. The findings indicated that the experimental group outperformed the control group in overall speaking skills and in all standards of speaking, including pronunciation, intonation, fluency, vocabulary, and grammar. Based on these results, it is essential to incorporate AI tools into university course descriptions and the teaching and assessment processes. Moreover, tutors should receive professional development training on efficiently employing AI applications like ELSA to maximize their potential in engaging students through interactive tasks, personalized real-life activities, and adapting course content to align with AI tools. Additionally, it is crucial to enhance students' use of AI applications in learning English, particularly in speaking, and to evaluate students' speaking skills through AI platforms.

### Correspondence

[n\\_husban@aou.edu.jo](mailto:n_husban@aou.edu.jo)<sup>A</sup>

### Article Info

Received 18 September 2024  
Received in revised form 11 December 2024  
Accepted 30 December 2024  
Available online 24 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.13>

## Introduction

Speaking English is a fundamental skill that EFL teachers strive to cultivate in students from early education through their university years. Teachers acknowledge the importance of this skill, as students will be required to employ it in several aspects of their lives, particularly in the context of globalization. English serves as the primary language for communication, science, and media. Consequently, it is essential for students to engage and interact effectively with others in English. However, achieving spoken proficiency in English can be challenging, especially in classroom settings where many students are primarily involved in listening activities as asserted by Tagg (2020).

Fear and anxiety are common experiences for students when participating in speaking tasks in front of their peers (Fulcher, 2015). At the same time, EFL tutors face substantial challenges in providing feedback on individual students' oral performance, particularly in large classes with a high student-to-teacher ratio. This issue is compounded at the university level, where speaking skills are sometimes overlooked, and evaluations are conducted without offering constructive feedback. Fan and Yan (2020) highlighted that teaching and assessing speaking skills often require students to make multiple attempts to improve, as psychological factors frequently hinder progress. Furthermore, the complexity of speaking skills, as elaborated by Huettig et al. (2022), can lead to their deprioritization in language instruction.

The psycholinguistic theory posits that second or foreign language speakers must possess cognitive skills that enable effective language production, anticipate conversational messages, and navigate social conversational dynamics. Assessing these speaking skills poses a considerable challenge for educators due to the multifaceted nature of the evaluation, which encompasses pronunciation, intonation, vocabulary, grammar, and fluency. This complex process demands significant time and expertise to objectively evaluate EFL (English as a foreign) students' proficiency in each criterion. Moreover, the interaction between speaker and listener, involving both verbal and nonverbal behaviors, further complicates the assessment process (Huettig et al., 2022).

Winaryo and Gusdian (2021) investigated speaking fluency levels using a rubric with three specific criteria: speech rate, pause rate, and the occurrence of disfluent syllables. Their findings revealed that participants generally exhibited an intermediate level of speaking proficiency. However, prolonged silent pauses and notable pronunciation challenges were prevalent among the participants. Additionally, students often reported feeling self-conscious and inadequately prepared, expressing a need for more opportunities to practice. These results underscore the importance of providing further practice opportunities to minimize silent pauses and foster self-correction during speaking tasks.

Traditionally, proficiency assessments of EFL learners' speaking skills have relied on human raters (De Jong, 2023). While effective, this method introduces challenges related to reliability, as scores must remain consistent across

different raters. Hana et al. (2022) identified potential issues such as leniency or severity, inconsistent scale usage, central tendency, and bias among raters. Furthermore, the time-intensive nature of human-led assessments often hampers their efficiency. To mitigate these limitations, Isaacs (2018) proposed a hybrid scoring method that integrates human ratings with automated measures. Supporting this approach, Gu et al. (2021) demonstrated the utility of automated analytic feedback, particularly using the TOEFL iBT (Internet-based Test of English as a Foreign Language) 'speech-rater' engine, to enhance the reliability and efficiency of speaking assessments.

The above discussion highlights a significant challenge in the research and development of speaking assessments: the need to explore practical, readily available technological tools that both teachers and students can use to practice speaking skills anytime and anywhere, while enabling teachers to objectively assess students' performance. Mills et al. (2023) emphasize that this trend has been accelerated by the COVID-19 pandemic, which prompted the closure of educational institutions and the transition to online instruction and assessment. Higher education institutions are increasingly recognizing the potential of generative artificial intelligence to perform assessment tasks traditionally carried out by human raters.

This emerging issue underscores the potential of AI-assisted language learning to enhance speaking instruction for both students and tutors. Artificial intelligence is rapidly transforming various aspects of life, including education, and presents innovative solutions as well as challenges for addressing teaching, learning, and assessment challenges (Tan, 2020; Rudolph et al., 2023a; Rudolph et al., 2023b). Zou et al. (2020) emphasize the need for software that develops speaking proficiency, provides personal feedback, and analyzes speakers' voices and speech according to the same standards used by teachers. Such tools can create a less intimidating environment, allowing students to engage with AI-assisted language learning in a supportive setting. Gamage et al. (2023) highlight how using AI applications supports students by analyzing their performance data, offering recommendations based on strengths and weaknesses, and tailoring instruction to meet individual needs. According to Popenici (2023), AI exhibits significant potential for tutors, including automating assessment, personalizing teaching, and providing individualized assistance. Similarly, Rudolph et al. (2023a) highlighted that intelligent tutoring systems are one of the most outstanding benefits of AI in transforming education. Consequently, numerous researchers have explored this area, examining both the advantages and drawbacks of AI applications depending on the approach taken.

Emerging technologies play a pivotal role in enhancing learners' pronunciation skills by delivering personalized feedback, real-time assessments, and adaptive learning opportunities (Mohammadkarimi, 2024). These tools also expand accessibility and flexibility within language learning environments, providing learners with dynamic opportunities to improve their skills. Similarly, language learning applications such as ELSA have proven highly effective in engaging students with adaptable content

aligned to English language curricula and suitable for various proficiency levels. By fostering a supportive and risk-free environment, these tools empower students to practice without fear of mistakes, encouraging more autonomous and confident learning experiences (Hana et al., 2022).

Artificial intelligence (AI) is broadly defined as a computerized system or virtual assistant capable of mimicking human-like activities, including learning, adapting, self-correcting, and performing complex tasks (Popenici, 2023). Recent advances in AI technology, such as speech evaluation programs utilizing automatic speech recognition, have demonstrated significant potential in supporting EFL learners to enhance their speaking skills. These tools are lauded for their user-friendly nature, engaging interfaces, and ability to improve pronunciation, vocabulary, and fluency. Furthermore, they alleviate the anxiety often associated with speaking in front of peers by providing a low-pressure practice environment (Zou et al., 2023; Dai & Wu, 2023; Tai & Chen, 2024). As a result, AI-driven speech evaluation tools have gained widespread popularity among educators and learners alike.

AI speech evaluation tools serve as interactive conversation partners for EFL learners, enabling them to practice a range of speaking topics in a stress-free setting. These tools also provide detailed feedback on speaking proficiency, covering pronunciation, fluency, vocabulary, and grammar (Jeon et al., 2023). Examples include Duolingo, an AI language-learning platform known for its engaging and interactive approach, and ELSA, a specialized AI-powered tool for improving speaking skills. ELSA offers features such as pronunciation correction and fluency enhancement, accessible through platforms like [<https://speechanalyzer.elsaspeak.com/>] (Kholis, 2021). Together, these innovations have made significant contributions to language education by enhancing learning outcomes and addressing learners' individual needs.

Numerous studies have explored the effectiveness of AI-based speech evaluation programs in developing EFL learners' speaking skills. Zou et al. (2023) investigated how feedback provided by such tools impacts skill development among 40 EFL learners in China. The results indicated that most participants believed their speaking abilities improved due to the tool's feedback. These findings were based on mean differences between experimental and control groups. However, Zou et al. (2023) also highlighted the importance of ensuring that AI feedback systems accurately reflect users' progress to maintain credibility and utility.

In a related study, Zainuddin and Mohamad (2024) examined the influence of the SpeechAce tool on ESL students' speaking skills. Their findings revealed that students found the tool both beneficial and user-friendly. Participants demonstrated a positive attitude toward using SpeechAce, and teachers observed noticeable improvements in students' pronunciation. The tool's ability to deliver detailed, efficient feedback saved time and fostered learner autonomy by enabling its use outside the classroom. However, the study did not evaluate longitudinal changes in speaking skills or directly compare feedback from the tool with traditional assessments.

Hanna et al. (2022) compared the impact of ELSA and Duolingo on students' speaking abilities. Involving 30 participants divided into two groups, the study found that students using ELSA demonstrated slightly better speaking skills than those in the control group. Similarly, Mohammadkarimi (2024) examined AI's role in improving English pronunciation among 78 elementary and pre-intermediate learners, alongside 19 experienced teachers. Pre- and post-test results showed significant pronunciation accuracy improvements in the experimental group. Participants expressed positive attitudes toward AI-driven tools, citing enhanced pronunciation, increased confidence, and heightened engagement. Nonetheless, concerns emerged about feedback interpretation and the tools' sensitivity to subtle pronunciation differences.

Tai and Chen (2024) and Jayasinghe (2024) evaluated the effectiveness of generative AI (GAI) chatbots in improving EFL speaking skills. Their study involved 85 students who were divided into three groups: individual interaction with the coolE bot, paired interaction with the bot, and traditional teacher-led classroom interaction. Results indicated positive outcomes for all groups using the coolE bot, whether individually or in pairs. Students appreciated the tool's relevance to their interests, its motivating nature, and its ability to create a supportive, anxiety-free environment. The tool fostered rapport, boosted confidence, and reduced speaking-related anxiety. Similarly, Kim et al. (2021) reported that AI chatbots improved speaking proficiency compared to face-to-face instruction. Despite challenges such as misunderstandings caused by unfamiliar vocabulary, students valued the opportunity for low-pressure practice with AI, likening it to conversing with a native speaker.

The potential of AI-assisted language learning applications, such as Duolingo, was also explored by Qiao and Zhao (2023). Their study on Chinese learners revealed that the experimental group using AI tools showed significant improvements in speaking skills compared to the control group. The authors called for further research to investigate the long-term effects and underlying mechanisms contributing to these improvements.

The impact of ELSA on pronunciation skills was independently studied by Alwin et al. (2024) and Al-Shallakh (2024). Both studies concluded that ELSA effectively enhanced pronunciation by delivering detailed feedback for accurate sound production, reinforcing its value as a practical tool for language learning.

It can be concluded that AI speech evaluation tools significantly improve students' speaking fluency, pronunciation, and intonation. Participants expressed positive views, noting that these tools offer comprehensive feedback based on international standards and detailed reports on various speaking proficiency aspects. Furthermore, most practice sessions occurred outside the classroom, creating a stress-free environment.

This study utilized the ELSA-speech analyzer as a mobile app and desktop tool for assessing spontaneous English speech. It allows students to engage in activities like interviews and presentations while preparing for tests such as IELTS

(International English Language Testing System), TOEIC (Test of English for International Communication), or Test of English as a Foreign Language (TOEFL). Students can record their speeches for analysis, receiving personalized AI-driven feedback (Anguera et al., 2023).

This tool has been selected because of its support of non-native speakers, especially learners of English as a foreign language. The ELSA speech analyzer's automatic speech recognition engine achieves low word error rates for non-native and low-proficiency speakers. It also provides a speaking score aligned with International English Language Testing System (IELTS) and Test of English as a Foreign Language (TOEFL) exam scales. The overall score combines various aspects of communication, such as pronunciation, intonation, fluency, grammar, and vocabulary. Users receive feedback to improve their speaking skills, and a customized learning program addresses specific weaknesses. The tool's engagement is enhanced by human-like voices that ask questions. Likewise, Rudolph et al. (2023a) suggested [rephrase] that teachers employ AI applications to reduce their workloads, facilitate innovation in classroom, and the tools are designed to assist teachers by automating assessment and feedback mechanisms to provide students with further insights about the opportunities of developing their skills.

Despite the promising potential of artificial intelligence (AI) speech evaluation tools for enhancing students' speaking proficiency, there is a pressing need for large-scale empirical studies to comprehensively assess their effectiveness in the context of English as a Foreign Language (EFL) learning. These tools offer students the advantage of receiving immediate feedback and targeted pronunciation practice. However, EFL learners may perceive the evaluation process as inequitable if they receive low scores, which can be attributed to the tools' heightened sensitivity to the speech patterns of native speakers (Belda-Medina & Calvo-Ferrer, 2022). This situation underscores the need for a more in-depth examination of the evaluation process and the acceptance of its stringent nature when assessing learners. Wu (2024) has underscored this issue, highlighting the significance of students' educational levels in moderating the impact of AI tools on learning outcomes. Furthermore, Wu (2024) found that students who utilized AI tools did not demonstrate superior learning outcomes compared to their peers who did not employ such tools. Consequently, the uncertainty surrounding the influence of AI tools on students' speaking proficiency represents a critical area that warrants further investigation.

This study seeks to address the identified gaps in the existing literature by comparing the speaking proficiency outcomes of two distinct groups of students. One group received instruction and assessment through traditional evaluation methods, while the other group utilized AI speech evaluation tools. The analysis was conducted using the reports generated by the AI speech evaluation. The motivation for this research arises from the limitations observed in prior studies, which failed to incorporate feedback reports from these tools and did not compare them with traditional assessments conducted by educators. To ensure consistency, both groups were evaluated according to the same speaking

proficiency standards. The primary objective of this study is to assess the impact of the ELSA speech analyzer application on students' speaking skills. Accordingly, this research aims to address the following research questions:

- How is the ELSA speech analyzer application different from rubrics in terms of assessment approach?
- Is there a statistically significant difference between the speaking skill means of students who were instructed using ELSA speech analyzer application and those instructed using traditional approaches to teaching speaking skills?

## Method

### The design of the study

A quasi-experimental design was employed in this study. It is based on an independent variable, which employs an ELSA speech analyzer as an AI-assisted language learning tool during teaching and assessing the participants in the study while teaching speaking, and the dependent variable, which is EFL students' speaking skills.

### The participants of the study

The participants in the current study were 34 female students in the first year of their enrollment at universities in Jordan; they were purposefully selected from some private universities. Their age ranged from 18 to 19 years old. 17 of them were randomly assigned to the intervention group, and the other 17 students were designated to the control group. Their language proficiency placement test scores were taken into account by random distribution into the two groups. The same EFL tutor, with five years of experience, taught them.

### The data collection procedures

To answer the research questions, the researcher designated some speaking topics embedded in the communication skills course, such as emotional intelligence, future career, and protecting data. A quasi-experiment was conducted, and two groups were randomly assigned. The experiment took place from April to August 2024. The intervention followed the following procedures:

1. The general speaking proficiency level for both groups was determined based on the results placement exam conducted by the university, which showed that all students' speaking proficiency ranged from middle to low level. Speaking topics were selected from the assigned learning outcomes of the English communication course, there was no need to establish its validity, as there are juries of specialized experts who developed it.

2. The experimental group and its tutor have been trained on how to employ the ELSA speech analyzer application. This application uses AI and ELSA stands for English Language Speech Assistant. It listens to the learners' spontaneous speech and provides immediate feedback on pronunciation, fluency, grammar, and vocabulary. It also indicates the possible score they would obtain in major English-speaking exams and is available on mobile devices and via web browsers.
3. The sampled students were asked to speak about the different topics of speaking to ensure the reliability of the AI tool and the rubric. Thus, Cronbach alpha coefficient was 0.89, and it was appropriate for the purpose of this study.
4. The EFL tutor received training on utilizing the ELSA speech analyzer application. This AI-powered application offers multiple functions to improve English speaking skills by providing a real-time transcription of a speech, detailed analysis of criteria like pronunciation, intonation, pace, and grammar, opportunities to practice speaking for presentations, meetings, interviews, and through self-assessments, support for group conversations and online meetings, and user-friendly interface by simply turning on microphone and start recording speech.
5. The tutor created an account in the application and trained students to create their own accounts. He then explained to them how to use the application to practice speaking for presentations and meetings. Then, he started recording and checking the detailed feedback against each speaking standard, and proposals to improve students' performance.
6. The tutor created a WhatsApp app group to listen to students' comments about their use of the ELSA Speak application.
7. When students engaged with speaking topics on their individual accounts and reviewed the detailed feedback provided, the (EFL) tutor recorded the speaking performance of the experimental group for the assigned tasks. In contrast, the control group was instructed to discuss the same speaking topics and was evaluated using a speaking rubric. Rubrics serve as one of the assessment tools employed to evaluate students' performance through structured observation. The rubric encompasses criteria that tutors utilize to assess students' progress in achieving their respective proficiency levels (Dawson, 2017). The application of the rubric in this study was aligned with the ELSA Speak standards, which include pronunciation, intonation, fluency, grammar, and vocabulary.

8. Reports were extracted from the tool, and the differences in speaking skills between the experimental and control groups were analyzed.

## Data collection instruments

### ELSA Speak application

This AI-powered application is utilized to evaluate the speaking skills of students in the experimental group during both the pre-test and post-test phases. Students were encouraged to use the application while practicing their speaking skills prior to submitting their recordings for final assessment. This approach allows them to benefit from the comprehensive feedback provided by the application, which addresses aspects such as pronunciation, intonation, fluency, vocabulary, and grammar. The application offers tutorials tailored to students' proficiency levels for each standard; it not only assesses students but also aids in their development and practice of speaking skills according to their current capabilities. Furthermore, it is user-friendly and provides an overall assessment in various international grading systems, including the International English Language Testing System (IELTS) and the Test of English as a Foreign Language (TOEFL). Consequently, this application enables tutors to allocate more time to delivering innovative instruction rather than merely evaluating students' speaking abilities. Figure 1 illustrates the general template of results generated by the ELSA Speak application (Anguera et al., 2023; Alwin et al., 2024).

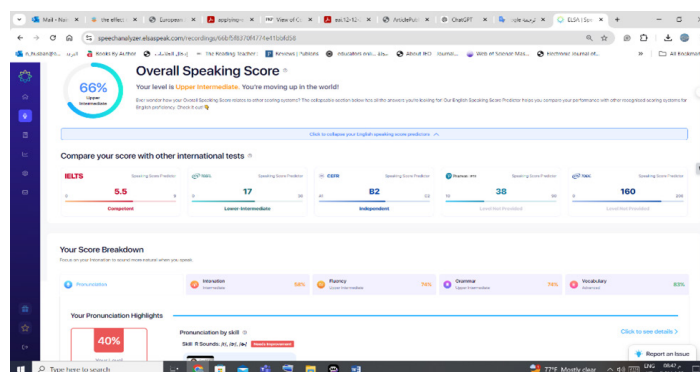


Figure 1. The standard template of the ELSA speak–speech analyzer.

To validate the tools, a rater reviewed the reports generated by the application. Initially, the rater manually assessed the students' speaking skills, which had been recorded using the ELSA speech analyzer application. Subsequently, the results of the human assessment were compared with the detailed feedback generated by the application. The agreement coefficient between the rater's two assessments was calculated to be 0.836, which is considered appropriate for this study and ensures reliable results, according to Wang et al. (2020).

The speaking skill assessment rubric was designed by reviewing widely recognized standards in language proficiency and assessment, such as Teaching English to Speakers of Other Languages (TESOL). It was specifically aligned with the standards that ELSA Speak focuses on,



which include pronunciation, intonation, fluency, grammar, and vocabulary. A group of experts in TEFL validated the rubric and provided inputs that were incorporated into it. The human assessment rubric for speaking skills was formulated to determine the effectiveness of AI assessment compared to human assessment on students' speaking performance.

## Data analysis

A descriptive and inferential analysis was conducted to investigate the effect of delivering speaking instruction through the ELSA speech analyzer application on the speaking skills of EFL students. The Statistical Package for the Social Sciences (SPSS) was used, along with detailed feedback from the ELSA speech analyzer application used in this study. Descriptive statistics were presented, including percentages, frequencies, means, and standard deviations. As this study utilized a quasi-experimental design, an Analysis of Covariance (ANCOVA) was employed as an inferential statistic to determine if there were significant differences in the mean scores between the experimental and control groups.

## Results

### Question one

To answer research question number one, how is the ELSA speech analyzer application different from the rubric in terms of assessment approach?

In this section, two tools were employed to evaluate the proficiency of students in the primary speaking skills standards. For the control group, a speaking skills rubric was adopted, which aligned with the established benchmarks in language proficiency and assessment, including Teaching English to Speakers of Other Languages (TESOL). As part of the manipulation, the students were furnished with the rubric to ensure their comprehension of the criteria used for assessing their speaking abilities. Table 1 provides a comprehensive breakdown of the anticipated proficiency levels for each standard, ranging from one to four.

The tutor instructed the students to discuss the previously assigned tasks. Following this, students were given feedback on their current performance levels for each standard, as outlined in the rubric. Due to time constraints, there was no opportunity for additional practice or detailed feedback on each standard.

In contrast, the ELSA speech analyzer application provided students in the experimental group with various engaging speaking activities. For instance, the speech analyzer feature allowed students to record their speech about the task, which the tutors explained to them at any time. In addition to detailed assessments, grades, and feedback on each standard, the application also provided performance highlights for each sound pronounced. Furthermore, students were given access to transcripts and extra practice materials to help improve their pronunciation. For example, Figure 2 illustrates the overall grade of students in fluency

Table 1. Speaking assessment rubric based on reviewing widely recognized standards in language proficiency and assessment like Teaching English to Speakers of Other Languages (TESOL).

Standard	Exceed expectations 4	Meet expectations 3	Need improvement 2	Dissatisfied 1
<b>Pronunciation</b>	Pronunciation is clear and accurate, with native-like accuracy.	Pronunciation is generally clear, with minor errors that do not impede understanding.	Pronunciation is sometimes unclear, with noticeable errors that occasionally impede understanding.	Pronunciation is unclear, with frequent errors that significantly impede understanding.
<b>Intonation</b>	Uses varied intonation effectively to convey meaning and emotion.	Uses appropriate intonation with minor lapses that do not affect overall communication.	Uses limited intonation, affecting the expressiveness and engagement of the speech.	Uses flat or inappropriate intonation, affecting clarity and engagement.
<b>Grammar</b>	Demonstrates strong command of grammar with few or no errors.	Demonstrates good command of grammar with occasional errors.	Demonstrates some command of grammar but with frequent errors.	Demonstrates limited command of grammar with pervasive errors.
<b>Vocabulary</b>	Uses a wide range of vocabulary accurately and effectively.	Uses a good range of vocabulary, with minor inaccuracies.	Uses limited vocabulary, with frequent inaccuracies.	Uses very limited vocabulary, with frequent inaccuracies and misuse.
<b>Fluency</b>	Speaks fluently with natural pacing and minimal hesitation.	Speaks fluently with occasional pauses or hesitations.	Speaks with noticeable pauses and hesitations that affect the flow.	Speaks with frequent pauses and hesitations, significantly affecting the flow.
<b>20</b>				

assessment, along with detailed feedback. Additionally, the application provided students with information on their pace, pausing, and hesitations and the accompanying recording script revealed any unacceptable pauses made.

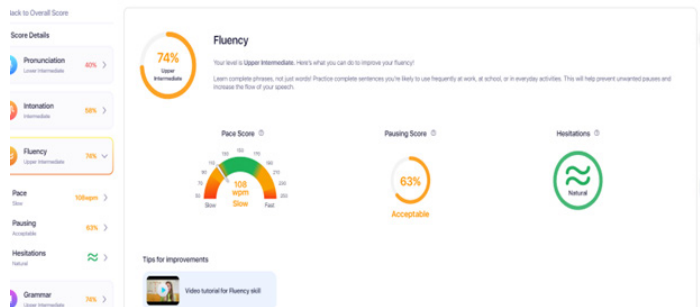


Figure 2. The feedback elements of fluency standards as displayed in the ELSA speech application.

In intonation, the application analyzed students' recordings and showed them their pitch variation, volume variation, and word prominence with a detailed explanation of the level the students are placed, using each criterion, as shown in Figure 3.

In grammar, the application determines all the grammatical errors made by the students in the transcript. Mistakes are highlighted in red, corrections are provided in green, and detailed feedback is given explaining why the error occurred and how to avoid making it in the future, as shown in Figure 4.

Whereas, in terms of vocabulary standards, the application provided AI recommendations that described the students' strengths and weaknesses. It identified areas for



Figure 3. The feedback elements of intonation standards as displayed in the ELSA speech application.

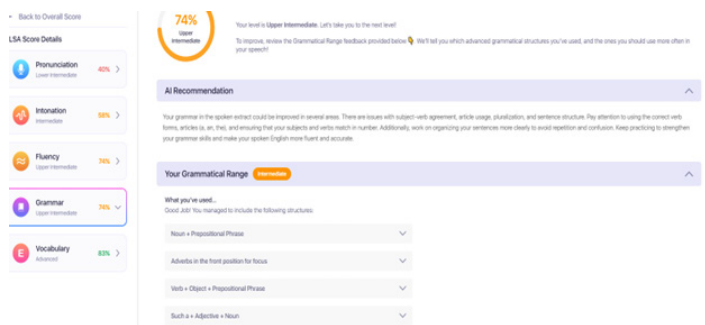


Figure 4. The feedback elements of grammar standards as displayed in the ELSA speech application.

improvement and expanded their vocabulary by offering more advanced alternatives to their current choices. Additionally, the application offered tutorials to enhance the students' vocabulary and other areas, as illustrated in Figure 5.

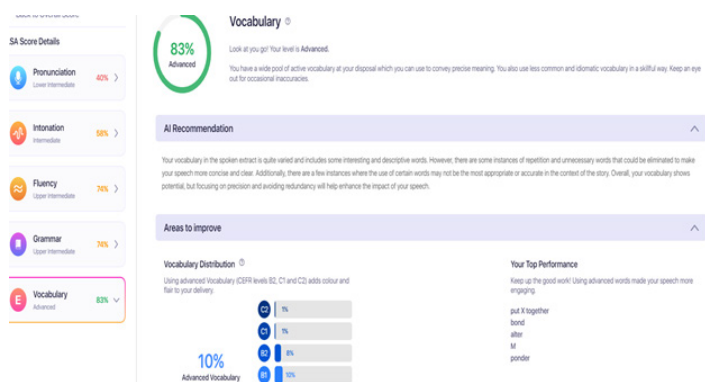


Figure 5. The feedback elements of vocabulary standards as displayed in the ELSA Speech application.

The tutor assisted students in creating their own accounts using their Gmail, either on their laptops or mobiles, and showed them the tools and activities that the applications provided students. The teacher also modelled how they could use it to practice IELTS speaking skills and self-assess their speaking before sending their final attempt to the tutor. In addition to that, the application provides challenging exercises in all the speaking standards to leverage students' speaking levels, all exercises and activities are engaging. As a person asks questions, the students record their answers, and at the end, the application provides each

student with a thorough report with feedback and detailed recommendations on how to correct their mistakes or develop their pronunciation and intonation. All of these points are not available while assessing students using rubrics. Students in the control group had one chance to speak; then the tutor showed him his performance level in the rubric from 4 (Exceed expectations) to 1 (Dissatisfied), as Table 1 shows.

Based on the general description of the nature of applying each assessment tool, it is important to investigate the effect of these tools on the performance of students in each standard. Table 2 shows the descriptive statistics displaying the differences between the two groups in their performance in each standard in the post-assessment.

Table 2. The descriptive statistics of EFL students' speaking skills performance in experimental and control groups in all standards.

Speaking skills standards	Group	Samples	mean	Standard deviation
Pronunciation	Experimental	17	3.84	0.24
	Control	17	2.88	0.33
Intonation	Experimental	17	3.61	0.47
	Control	17	2.65	0.49
Fluency	Experimental	17	3.51	0.51
	Control	17	2.58	0.51
Vocabulary	Experimental	17	3.57	0.51
	Control	17	2.60	0.51
Grammar	Experimental	17	3.64	0.24
	Control	17	3.10	0.43
Total	Experimental	17	18.17	0.44
	Control	17	13.81	0.56

As shown in Table 2, the overall mean of the experimental group outperformed the mean of the control group by 18.17 to 13.81, respectively. Likewise, the experimental group has higher mean scores in all the speaking standards, namely, pronunciation, intonation, fluency, vocabulary, and grammar. This consistency in improving all speaking skill standards implies the effectiveness of the intervention of using ELSA speech analyzer application on improving EFL student. Furthermore, it is apparent that students developed their speaking skills in pronunciation, intonation, and vocabulary more than grammar because traditional instruction focused mainly on structural delivery, and the main approach implemented is a grammar-translation approach while teaching, whereas pronunciation and intonation instruction received less attention by tutors because they need much time and experience.

## Question two

A statistical test was implemented using statistical Package for Social Sciences (SPSS 28). Thus, we conducted a descriptive and inferential analysis to investigate the impact of delivering speaking skills instruction through ELSA speech analyzer application on EFL students' speaking skills. The author used Statistical Package for the Social Sciences (SPSS) and data employing the speaking rubric and the ELSA speech analyzer application. Descriptive statistics, such as percentages, frequencies, means, and standard deviations, were presented. Since this study employed a quasi-experimental design, we employed Analysis of Covariance (ANCOVA) as an inferential statistic to determine if there were significant differences in the mean scores between the

experimental and control groups.

Table 3. Means and standard deviation for the experimental and control groups on speaking skills.

Group	Pre-test			Post-assessment		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Experimental	17	12.6	0.94	17	18.17	0.44
Control	17	12.	1.12	17	13.81	0.56
Total	34			34		

As shown in Table 3, the means of the experimental and control groups in the previous assessment of speaking skills were not significantly different from each other. On the other hand, after the manipulation, the mean of the experimental group was 18.17, with a standard deviation of 0.44. The mean of the control group, on the other hand, was 13.81, with a standard deviation of 0.56. This indicates that there was a significant difference in the mean scores between the experimental group and the control group on the post-assessment. To examine if the means differences between the experimental and control groups were statistically significant, analysis of covariance (ANCOVA) was computed. The results are delivered in Table 4.

Table 4. Analysis of covariance (ANCOVA) for the differences in speaking skills performance between the experimental and control groups.

		Levene's Test for Equality of Variances		T-test for Equality of Means						
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
test	Equal variances assumed	838.858	.000	-6.452	33	.000	0.256	.65644	-6.47213	-5.50374
	Equal variances not assumed			-6.452	25.746	.000	212.500	.77644	-7.28427	-4.09073

\* Significant level at  $\alpha = 0.05$

Table 4 unveils that there were statistically significant differences between the experimental and the control groups in the EFL students' speaking skills performance at ( $\alpha = 0.05$ ), since (F) value was (838.858) with statistically significant level (0.000) which is significant at ( $\alpha = 0.05$ ).

In order to determine the favor of differences between the experimental and control group, adjusted means for both the experimental and control groups in the post-test were calculated as shown in Table 5.

Table 5. The adjusted means and standard deviations for both the experimental and control groups in the post-test.

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	18.17	0.31	13.4	13.5
Control	13.81	0.28	9.6	9.8

As Table 5 shows, the adjusted mean of the experimental group in the post-test was (18.17) out of (20), and it is higher than the adjusted mean of the control group in the post-

test which was (13.81) out of (20). Thus, the null hypothesis "there are no statistically significant differences at ( $\alpha = 0.05$ ) in the mean scores of EFL students' speaking skills between the experimental group and the control group attributed to the use of ELSA speech analyzer application and the conventional ones" was rejected. Instead, the alternative hypothesis was accepted, which refers to existing statistically significant differences at ( $\alpha = 0.05$ ) to the effectiveness of the use of ELSA speech analyzer application on female EFL students' speaking skills in favor of the experimental group. These findings indicate insights for educators and policymakers in higher education who are seeking further context for implementing the integration of AI-assisted language learning with language instruction. Specifically, all universities have strategic outcomes aimed at producing fluent graduates who are ready to engage in the labor market.

Furthermore, the application in this study did not enforce specific topics, but rather the tutor had the flexibility to adapt the speaking topics in their course while utilizing the target tool. As a result, individual differences could be guaranteed because the tool suggests a remedial program for each student based on their individual feedback report.

## Discussion and implications

This study investigates the impact of the ELSA speech analyzer application, an AI-assisted tool, on improving speaking skills among language learners. Drawing on the psycholinguistic theory proposed by Huettig et al. (2022), which suggests that speakers of second or foreign languages must develop cognitive abilities to generate languages, predict and anticipate the flow of conversation, and employ social conversational skills, this research explores the potential of AI tools to enhance these competencies. The theory supports the use of AI-assisted language tools in teaching and assessing speaking skills, given that traditional methods for speaking improvement often require extensive time and effort.

A quasi-experimental design was employed to collect and analyze data. The findings revealed a significant effect of the ELSA speech analyzer application on students' speaking skill development. The experimental group showed substantial improvement, with mean scores rising from 12.6 out of 20 in the pre-assessment to 18.17 out of 20 in the post-assessment. Additionally, students exhibited marked progress in pronunciation, intonation, and vocabulary, with mean improvements of 3.84, 3.61, and 3.557, respectively, whereas grammar showed comparatively less improvement. These findings suggest that the manipulation played a significant role in enhancing students' speaking skills. The manipulation involved providing students with detailed information about their current level of proficiency, as determined by internationally recognized English language assessment tests such as the International English Language Testing System (IELTS) and the Test of English as a Foreign Language (TOEFL). This information motivated students to regularly utilize the application, as it offered a clear indication of their proficiency level based on a highly regarded assessment test.

Furthermore, the application provided students with tailored activities related to the topics they were discussing. It also offered a series of materials for English exam preparation, aimed at improving students' vocabulary, fluency, and accuracy. As a result, students' confidence in dealing with speaking exams grew. The application also facilitated engagement in interactive activities with an artificial intelligence system in a stress-free environment. This allowed students to feel at ease while speaking, recording their responses, and receiving feedback on their pronunciation. The feedback included specific information on mispronounced letters and targeted videos to address specific areas of concern, such as intonation, fluency, and word choice. The application also provided extra practice exercises to help students improve in these areas.

In contrast, students in the control group were instructed to speak about the same topics as the experimental group students but were only provided with a rubric to assess their performance level. The rubric did not provide specific guidance on how to improve pronunciation, intonation, fluency, grammar, or vocabulary. Additionally, students in the control group felt a sense of apprehension due to the fear of making mistakes. Consequently, they did not engage in sufficient practice, despite being provided with the rubric in advance to familiarize themselves with the assessment standards.

These findings are consistent with previous studies conducted by Isaacs (2018) and Gu et al. (2021), which demonstrated the effectiveness of automatic speech analysis in enhancing speaking skills. Additionally, this study aligns with the research of Zou et al. (2024), which highlighted the benefits of AI-assisted language learning tools, such as the ELSA speech analyzer application, in providing personalized feedback, adaptive learning experiences, and interactive assessments to improve speaking skills. Hana et al. (2022) compared ELSA to Duolingo and found ELSA to be superior due to its ability to make learning enjoyable, adaptability to curriculum, and suitability for students of all speaking levels. Mohammadkarimi (2024) found that ELSA was effective in improving pronunciation and saving time by providing detailed feedback. Furthermore, the studies conducted by Chen (2024), Kim et al. (2021), Qiao and Zhao (2023), Alwin et al. (2024), and Al-shallakh (2024) demonstrated the significant impact of AI tools on the development of students' speaking skills. What sets this study apart from previous ones is its focus on comparing the effect of ELSA with traditional rubric-based methods for teaching and assessing students' speaking skills.

Unlike previous studies, which only focused on one or two standards, such as Al-shallakh (2024), and Wu (2024), this study examines all speaking skills standards. The selection of university students as participants addresses challenges identified in previous research, such as the failure to recognize the sounds of EFL speakers by the application (Zou et al., 2024; Kim et al., 2021), which leads to inauthentic evaluation. By exposing this sample of students to the nature of the program and providing them with opportunities for practice, the study allows for constructive feedback that accurately reflects their performance. Additionally, the students are not discouraged when they receive low grades, as they have

the ability to repeat the assessments multiple times. The focus of this study is on learning and improvement, rather than grades alone. Using an AI-assisted language learning program enables students to access all of their recordings, allowing them to track their progress in each standard and practice speaking continuously.

As a result, this study provides evidence that students in foreign or second language contexts can benefit from AI-assisted language learning in the same way native English speakers do. Given the high sensitivity of English language accents, EFL students have the potential to speak like native speakers if they practice and address their weaknesses.

These significant results should serve as motivation for EFL tutors to familiarize themselves with various AI-assisted language tools. Such tools can support tutors in efficiently and effortlessly conducting speaking skills assessments on a regular basis. Furthermore, tutors can encourage and guide EFL students to engage in independent practice using AI tools during their free time. This approach reduces the time-consuming of conducting speaking skill assessments in the classroom, while also minimizing subjectivity in assessment. These platforms offer EFL teachers valuable constructive feedback based on standardized assessments. With the assistance of AI platforms, teachers can implement remedial programs to address students' weaknesses and focus on improving specific speaking problems. In summary, the findings of this study have important implications for both EFL teachers and students, highlighting the potential impact of AI platforms on language teaching and learning.

The study recommends that EFL students embrace AI platforms as a valuable resource to motivate their development of speaking skills. It is essential to strategically incorporate these platforms within the course description, rather than treating them as optional. These engaging and motivating platforms empower students to learn, providing continuous feedback without causing any anxiety or concern about low performance. This allows students to feel in control of their learning and fosters a sense of autonomy. AI has proved to be a valuable tool for enhancing speaking skills, especially in the areas of speech recognition and pronunciation feedback.

AI-powered speech recognition technology accurately analyzes learners' spoken English, offering instant feedback on pronunciation accuracy, intonation, fluency, vocabulary, and grammar. Through identifying specific errors, learners receive individualized feedback and insights on how to improve. This real-time feedback increases learners' awareness of their speaking performance and helps them make the necessary adjustments to sound more natural and fluent. Similarly, EFL tutors can incorporate AI platforms into their instructional process. By using the data provided by these tools, tutors can effectively tailor their instruction to address specific language learning challenges, differentiating their teaching strategies to meet the diverse needs of their students providing that students are aware of how these tools could be used appropriately and specifically outside classrooms (Broadhead, 2024) and at the same time, tutors and teachers employ it as an assistant and try to preserve the students' critical thinking skills while developing any skill

(Rudolph et al., 2023b).

It can be deduced that integrating AI into language teaching and learning processes opens up opportunities for innovation in teaching and assessment. This integration has the potential to help students achieve desired learning outcomes. Further research could explore the effects of AI tools in different contexts, with varied samples and skills. Additionally, studies could focus on the long-term impact of AI on students' learning and the effects of professional development programs that incorporate AI on tutors' proficiency in using these tools.

## Conclusion

The present study examined the impact of the ELSA speech analyzer application on the speaking abilities of English as a Foreign Language (EFL) students. The results indicated that the use of the ELSA speech analyzer application significantly improved the speaking skills of the EFL students. Specifically, the experimental group demonstrated superior performance compared to the control group in terms of pronunciation, intonation, vocabulary, and grammar.

The students found the AI application to be engaging and motivating, as it allowed them to conveniently practice speaking topics and integrate it with their course materials. Consequently, teachers were able to allocate more time to teach essential aspects of the language due to the accurate feedback and analysis provided by the AI platform. This facilitated both students and teachers in identifying areas for improvement and addressing them. The study offers valuable insights into the integration of AI-assisted language learning tools to enhance language programs with the guidance of tutors.

Despite the study's significant contribution to the field of technology-supported English language instruction, particularly regarding the development of speaking skills, as well as its potential novelty within the region, it is important to recognize the limitations associated with the interpretation of the results. Notably, the study utilized a quasi-experimental design, which may constrain the generalizability of the findings to broader contexts.

To enhance external validity, future research should include a more diverse sample of EFL students, encompassing individuals from various disciplines and educators. By doing so, researchers can gain a comprehensive understanding of the issues addressed in the study and facilitate a more thorough analysis. Furthermore, a recent study conducted by Ogunleye et al. (2024) cautioned against the inappropriate use of artificial intelligence (AI) bots in higher education, as their misuse may impede the learning process. Specifically, AI applications should be employed to enhance speaking skills rather than for assessment purposes. When evaluating non-native speakers with accents, AI systems may render biased evaluations, potentially demotivating students from pursuing further language acquisition. Additionally, Al-Awawdeh et al. (2023) noted the limited integration of AI in higher education, particularly in the context of teaching English as a foreign language in course descriptions as well

as in the learning management system (LMS). This situation places an additional burden on universities in the region to provide professional development for academic staff on the effective integration of AI-assisted language learning applications in both teaching and assessment processes, as these tools have become integral to the educational landscape in the current era.

It can be highlighted in this context that the findings of this study hold considerable significance for the field of language acquisition. That is, the results reinforce prominent theories like the psycholinguistic theory that emphasizes generating languages, predicts and anticipates the flow of conversation, and employs social conversations. The effect of AI-powered tools, such as ELSA, in developing speaking skills calls for the development of new theoretical frameworks that account for the role of AI in language learning.

## References

- Al-Awawdeh, N., Al-shaboul, I. A., & Khasawneh, M. A. S. (2023). Advancing foreign language teaching with AI-assisted models; insights from lecturers and university administrators. *Journal of Namibian Studies: History Politics Culture*, 33, 1491-1506. <https://doi.org/10.59670/jns.v33i.798>
- Al-Shallakh, M. A. I. (2024). Embedding artificial intelligent applications in higher educational institutions to improve students' pronunciation performance. *Theory and Practice in Language Studies*, 14(6), 1897-1906. <https://doi.org/10.17507/tpls.1406.31>
- Alwin, W. R., Manurung, K., Lebagi, D., & Mukrim, M. (2024). The use of English Language Speech Assistant (ELSA) speak application to improve pronunciation. *Jurnal Onoma: Pendidikan, Bahasa, dan Sastra*, 10(3), 2880-2887. <https://doi.org/10.30605/onoma.v10i3.3926>
- Anguera, X., Proença, J., Gulordava, K., Tarján, B., Parslow, N., Dobrovolskii, V., & Girard, R. (2023). ELSA speech analyzer: English communication assessment of spontaneous speech. *Proceedings of 9th workshop on Speech and Language Technology in Education (SLaTE)* (pp. 95-96)
- Belda-Medina, J., & Calvo-Ferrer, J. R. (2022). Using chatbots as AI conversational partners in language learning. *Applied Sciences*, 2(17). <https://doi.org/10.3390/app12178427>
- Broadhead, L. A. (2024). Insidious chatter versus critical thinking: Resisting the Eurocentric siren song of AI in the classroom. *Journal of Applied Learning and Teaching*, 7(2), 28-37. <https://doi.org/10.37074/jalt.2024.7.2.9>
- Dai, Y., & Wu, Z. (2023). Mobile-assisted pronunciation learning with feedback from peers and/or automatic speech recognition: A mixed-methods study. *Computer Assisted Language Learning*, 36(5-6), 861-884. <https://doi.org/10.1080/09588221.2021.1952272>
- Dawson, P. (2017). Assessment rubrics: Towards clearer and more replicable design, research and practice. *Assessment &*

- Evaluation in Higher Education, 42(3), 347-360. <https://doi.org/10.1080/02602938.2015.1111294>
- De Jong, N. H. (2023). Assessing second language speaking proficiency. *Annual Review of Linguistics*, 9(1), 541-560. <https://doi.org/10.1146/annurev-linguistics-030521-052114>
- Fan, J., & Yan, X. (2020). Assessing speaking proficiency: a narrative review of speaking assessment research within the argument-based validation framework. *Frontiers in Psychology*, 11, 330. <https://doi.org/10.3389/fpsyg.2020.00330>
- Fulcher, G. (2015). Assessing second language speaking. *Language Teaching*, 48(2), 198-216. <https://doi.org/10.1017/S0261444814000391>
- Gamage, K. A., Dehideniya, S. C., Xu, Z., & Tang, X. (2023). ChatGPT and higher education assessments: More opportunities than concerns?. *Journal of Applied Learning and Teaching*, 6(2). <https://doi.org/10.37074/jalt.2023.6.2.32>
- Gu, L., Davis, L., Tao, J., & Zechner, K. (2021). Using spoken language technology for generating feedback to prepare for the TOEFL iBT® test: A user perception study. *Assessment in Education: Principles, Policy & Practice*, 28(1), 58-76. <https://doi.org/10.1080/0969594X.2020.1735995>
- Hanna, A. N., Harmayanthi, V. Y., & Astuti, S. (2022). The effect of ELSA speak app towards students' speaking skill. *Proceeding of international conference on education-01, 01* (pp. 16-20). <https://doi.org/10.37640/ice.01.240>
- Huetting, F., Audring, J., & Jackendoff, R. (2022). A parallel architecture perspective on pre-activation and prediction in language processing. *Cognition*, 224, 105050. <https://doi.org/10.1016/j.cognition.2022.105050>
- Isaacs, T. (2016). Assessing speaking. In D. Tsagari & J. Banerjee (Eds.), *Handbook of second language assessment* (pp. 131-46). Berlin: DeGruyter Mouton. <https://doi.org/10.1515/9781614513827-011>
- Jayasinghe, S. (2024). Promoting active learning with ChatGPT: A constructivist approach in Sri Lankan higher education. *Journal of Applied Learning and Teaching*, 7(2), 141-154. <https://doi.org/10.37074/jalt.2024.7.2.26>
- Jeon, J., Lee, S., & Choe, H. (2023). Beyond ChatGPT: A conceptual framework and systematic review of speech-recognition chatbots for language learning. *Computers & Education*, 206, 104898. <https://doi.org/10.1016/j.compedu.2023.104898>
- Kim, H. S., N, Kim & Y, Cha (2021). Is it beneficial to use AI chatbots to improve learners' speaking performance?. *Journal of Asia TEFL*, 18(1), 161-178. <http://dx.doi.org/10.18823/asiatefl.2021.18.1.10.161>
- Kholis, A. (2021). Elsa speak app: Automatic speech recognition (ASR) for supplementing English pronunciation skills. *Pedagogy: Journal of English Language Teaching*, 9(1), 01-14. <https://doi.org/10.31849/elsya.v6i1.18727>
- Mills, A., Bali, M., & Eaton, L. (2023). How do we respond to generative AI in education? Open educational practices give us a framework for an ongoing process. *Journal of Applied Learning and Teaching*, 6(1), 16-30. <https://doi.org/10.37074/jalt.2023.6.1.34>
- Mohammadkarimi, E. (2024). Exploring the use of artificial intelligence in promoting English language pronunciation skills. *LLT Journal: A Journal on Language and Language Teaching*, 27(1), 98-115. <https://doi.org/10.24071/llt.v27i1.8151>
- Ogunleye, B., Zakariyyah, K. I., Ajao, O., Olayinka, O., & Sharma, H. (2024). Higher education assessment practice in the era of generative AI tools. *Journal of Applied Learning and Teaching*, 7(1), 46-56. <https://doi.org/10.37074/jalt.2024.7.1.28>
- Popenici, S. (2023). The critique of AI as a foundation for judicious use in higher education. *Journal of Applied Learning and Teaching*, 6(2), 378-384. <https://doi.org/10.37074/jalt.2023.6.2.4>
- Qiao, H., & Zhao, A. (2023). Artificial intelligence-based language learning: Illuminating the impact on speaking skills and self-regulation in Chinese EFL context. *Frontiers in Psychology*, 14, 1255594. <https://doi.org/10.3389/fpsyg.2023.1255594>
- Rudolph, J., Tan, S., & Tan, S. (2023a). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?. *Journal of Applied Learning and Teaching*, 6(1), 342-363. <https://doi.org/10.37074/jalt.2023.6.1.9>
- Rudolph, J., Tan, S., & Tan, S. (2023b). War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *Journal of Applied Learning and Teaching*, 6(1), 364-389. <https://doi.org/10.37074/jalt.2023.6.1.23>
- Tagg, C. (2020). English language and social media. In S. Adolphs & D. Knight (Eds.), *The Routledge handbook of English language and digital humanities* (pp. 568-586). Routledge.]
- Tai, T. Y., & Chen, H. H. J. (2024). Navigating elementary EFL speaking skills with generative AI chatbots: Exploring individual and paired interactions. *Computers & Education*, 105112. <https://doi.org/10.1016/j.compedu.2024.105112>
- Tan, S. (2020). Artificial Intelligence in education: Rise of the Machines. *Journal of Applied Learning and Teaching*, 3(1), 129-133. <https://doi.org/10.37074/jalt.2020.3.1.17>
- Wang, W., Lin, N., Oberhaus, J. D., & Avidan, M. S. (2020). Assessing method agreement for paired repeated binary measurements administered by multiple raters. *Statistics in Medicine*, 39(3), 279-293. <https://doi.org/10.1002/sim.8398>
- Winaryo, S., & Gusdian, R. I. (2021). Measuring English language education department students' speaking fluency

level. *Wanastra: Jurnal Bahasa dan Sastra*, 13(1), 13-18. <https://doi.org/10.31294/w.v13i1.9812>

Wu, X. Y. (2024). Exploring the effects of digital technology on deep learning: A meta-analysis. *Education and Information Technologies*, 29(1), 425-458. <https://doi.org/10.1007/s10639-023-12307-1>

Zainuddin, N. M., & Mohamad, M. (2024). Utilising Speechace to enhance speaking skills among English as a second language pre-university students. *International Journal of Academic Research in Progressive Education and Development*, 13(2), 1206 – 1219. <http://dx.doi.org/10.6007/IJARPED/v13-i2/21458>

Zou, B., Du, Y., Wang, Z., Chen, J., & Zhang, W. (2023). An investigation into artificial intelligence speech evaluation programs with automatic feedback for developing EFL learners' speaking skills. *Sage Open*, 13(3), 1-9. <https://doi.org/10.1177/21582440231193818>

Zou, B., Liviero, S., Hao, M., & Wei, C. (2020). Artificial intelligence technology for EAP speaking skills: Student perceptions of opportunities and challenges. In M. R. Freiermuth & N. Zarrinabadi (Eds.), *Technology and the psychology of second language learners and users. new language learning and teaching environments*. Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-030-34212-8\\_17](https://doi.org/10.1007/978-3-030-34212-8_17)

Copyright: © 2024. Naima Ahmad Al-husban. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



---

## Battle of AI chatbots: Graduate students' perceptions of ChatGPT versus Gemini for learning purposes in Egyptian higher education

---

Abu Elnasr E. Sobaih<sup>A</sup>                      A                      *Professor, Management Department, College of Business Administration, King Faisal University, Al-Ahsaa, Saudi Arabia; Hotel Management Department, Faculty of Tourism and Hotel Management, Helwan University, Cairo, Egypt*

Ahmed E. Abu Elnasr<sup>B</sup>                      B                      *Associate Professor, Higher Institute for Specific Studies, Future Academy, Cairo, Egypt*

---

### Keywords

AI chatbots;  
AI use;  
artificial intelligence;  
ChatGPT;  
Egypt;  
Gemini;  
generative AI;  
graduate students;  
universities;  
UTAUT.

### Abstract

The rapid developments of AI chatbots since the inauguration of ChatGPT in November 2022 have had significant impacts on higher education. The war between various AI chatbots is growing with many consequences on students' learning journey. This study delves into this battle of AI chatbots in higher education and examines graduate students' perceptions of ChatGPT versus Gemini, the most commonly used AI chatbots, for learning purposes. The research undertook a sequential mixed method approach with two stages of study. The first stage adopted a pretested survey using the UTAUT framework to explore graduate students' perceptions of ChatGPT versus Gemini for learning purposes in a sample of Egyptian higher education institutions. The results informed the second stage of a qualitative study, which included in-depth interviews with a sample of graduate students who completed the survey to probe their answers and delve into the differences between these AI chatbots. Statistical SEM results using AMOS software (version 25) showed positive perceptions among graduate students' of ChatGPT and Gemini, which significantly affected their behavioral intention and actual usage of both AI chatbots for learning purposes. However, the results of Gemini's structural model showed more acceptance; hence, higher intention and usage than those of ChatGPT. The results of interviews showed more acceptance of Gemini over ChatGPT among graduate students with some reasons specific to the Egyptian context. Students confirmed a lack of institutional support to integrate AI for learning reasons and confirmed that their use of AI chatbots is their own choice and responsibility with informal support from their tutors. The findings of this study suggested some implications for academics and policymakers in the higher education context in order to best use these AI tools in education.

---

### Correspondence

asobaih@kfu.edu.sa <sup>A</sup>

---

### Article Info

Received 23 July 2024  
Received in revised form 18 October 2024  
Accepted 16 December 2024  
Available online 3 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.7>



## Introduction

The technological innovations associated with digital revolutions have led to notable changes in many aspects of life. Education is one of the most important aspects of life and has been influenced by this evolution (Ifelebuegu, 2024). In this regard, multiple studies (e.g. Kasneci et al., 2023; Hasanein & Sobaih, 2023; Calonge et al., 2023; Sobaih et al., 2024; Hasanien et al., 2024) confirmed that the rapid incorporation of artificial intelligence (AI) into education has significantly affected higher education institutions. These studies focused on drivers of AI use in education and the consequences of its use for educational purposes either positively or negatively. In this vein, Imran and Almusharraf (2024) indicated that AI chatbots supported both students and faculty members in achieving their educational goals. The integration of AI chatbots in education is moving forward rapidly, with major players led by ChatGPT, Gemini, and Copilot. AI chatbots, whether Gemini or ChatGPT, are powered by natural language processing (NLP) to generate immediate responses. Since the launch of AI chatbots, they have gained great attention and interest from scholars, educators, and policymakers in the education system in many countries worldwide (Kouam & Muchowe 2024; Lo, 2023). Earlier studies (e.g., Rudolph et al., 2023; Hasanien & Sobaih, 2023; Xames & Shefa, 2023; Ifelebuegu et al., 2023) have indicated that the incorporation of AI chatbots into the education environment will lead to massive changes in higher education. These chatbots can be used in higher education for multiple purposes, such as manuscript preparation, literature review, academic writing, language translation, language editing, and statistical and data analysis (Hasanien & Sobaih, 2023; Joseph et al., 2024; Van Dis et al., 2023).

In 2018, OpenAI in San Francisco developed the Generative Pre-trained Transformer (GPT) model, which later led to the creation of chatbots like ChatGPT, a type of Large Language Model (LLM) designed to imitate human language processing abilities (OpenAI, 2022). According to Sullivan et al. (2023), ChatGPT uses sophisticated algorithms and advanced AI technology to perform various language tasks, such as answering questions, generating texts, and translating content. Notably, in 2018, OpenAI in San Francisco developed the Generative Pre-trained Transformer (GPT) model, which later led to the creation of chatbots like ChatGPT which can grasp the context of a situation to respond like humans. In November 2022, OpenAI developed the language model family ChatGPT-3.5, and in March 2023, ChatGPT-4 was released. End users can use the conversational beta version of ChatGPT-3.5 free of charge or with \$20 monthly for ChatGPT-4 (OpenAI, 2023) or the most recent version of ChatGPT-4o (Pang et al., 2024). Remarkably, ChatGPT has a million users in the first five days of its launch and, over 100 million users in a few months. Sobaih et al. (2024) indicated that ChatGPT has become the fastest technology emerging in history.

In December 2023, Google launched Gemini, an extended module for its old version of Bard, as a cutting-edge AI model to compete with ChatGPT. Gemini was developed in three versions: Nano, Pro, and Ultra. This multimodal tool, powered by DeepMind's Visual Language Model

(VLM) technology, goes beyond text, incorporating visual understanding for a more comprehensive approach (Coles, 2023; Perera & Lankathilaka, 2023). In this regard, Portakal (2023) and Koubaa et al. (2023) stated that Gemini, in opposition to ChatGPT, has multi-modal capabilities. Gemini can deal with all kinds of colloquial input data like audio and video data. Additionally, multiple studies (such as Imran & Almusharraf, 2024; Nyaaba, 2023; Saeidnia, 2023; Perera & Lankathilaka, 2023; Knight, 2023) reported that Gemini encompasses multiple features such as better understanding across modalities and versatility in communication with advanced performance. Hence, Nyaaba, (2023) indicated that Gemini, a versatile AI tool, could function as a valuable resource in the education field by utilizing its advanced GenAI features. Gemini can assist in generating educational content, organizing study materials, developing lesson plans, incorporating visual elements, and producing a wide range of teaching resources, e.g., puzzles, worksheets, and creative concepts (Nyaaba, 2023). Rudolph et al. (2023) predicted a "war of the chatbots" in the upcoming years and anticipated to have a noteworthy impact on higher education.

The incorporation of AI chatbots in higher education is growing rapidly. Therefore, there is a growing body of studies investigating the perceptions of faculty members and students concerning the incorporation of chatbots for academic purposes in higher education (Van Wyk, 2024; Alafnan et al., 2023; Rahman & Watanobe, 2023; Hasanein et al., 2024). Other studies (e.g., Hasanien & Sobaih, 2023; Ifelebuegu et al., 2023; Nyaaba, 2023; Sobaih, 2024; van Dis et al., 2023) have discussed the key benefits, opportunities, challenges, and ethical considerations of using AI chatbots in higher education. Strzelecki (2023) identified a research gap concerning students' acceptance and use of chatbots in educational settings. In this regard, some studies were recently undertaken to bridge this gap in knowledge regarding students' perceptions of ChatGPT usage in education (e.g. Sobaih et al., 2024; Elshaer et al., 2024) or students' perceptions of Gemini usage in education (e.g. Hasanein et al., 2024).

ChatGPT and Gemini are the most popular chatbots that have been incorporated deeply into education settings and are widely used by higher education students for academic purposes (Hasanein et al., 2024; Rudolph et al., 2023; Sobaih et al., 2024; Strzelecki, 2023). There is a growing body of studies (e.g., Rudolph et al., 2023; Waisberg et al., 2023; Ram & Verma, 2023; Cheong et al., 2023; Aiumtrakul et al., 2023; Sobaih et al., 2024; Hasanein et al., 2024) addressing the use of different AI chatbots, i.e. ChatGPT, Gemini, Copilot, Claude, Quillbot and Baidu's Ernie, in education. However, none of these studies undertook a comparison between these AI tools based on students' learning experiences. As such, this paper represents one of the first efforts to compare ChatGPT with Gemini, two of the most powerful and widely used chatbots among higher education students. This study specifically focuses on students' perceptions, including their acceptance and use of AI chatbots, particularly ChatGPT versus Gemini in the context of Egyptian higher education. Moreover, the current study investigates the factors that influence graduate students' usage of these chatbots (Gemini versus ChatGPT). The guiding research questions for this research were as follows:

1. To what extent do graduate students in Egyptian higher education rely on Gemini versus ChatGPT for learning purposes, especially for teaching and learning reasons?
2. Are there any differences in graduate students' experiences in relation to using ChatGPT versus Gemini for learning purposes?
3. What were the implications for academics, decision-makers, and university teachers regarding using ChatGPT and Gemini for learning purposes?

## Literature review

### The use of ChatGPT and Gemini in higher education

Kasneji et al. (2023) described ChatGPT as an innovative, transformative, and flexible source of AI educational tools for faculty members and students alike in a dynamic learning environment. Kouam and Muchowe (2024) indicated that students gain multiple benefits from ChatGPT's abilities by offering immediate clarification on unclear concepts, learning support, and access to abundant information and enriching educational journeys. Likewise, Rasul et al. (2023) demonstrated that ChatGPT is recognized as a valuable educational resource that can enhance the education journey, improve efficiency, and prepare students to meet the needs of a knowledge-driven educational environment. A study conducted by Hasanein and Sobaih (2023) indicated positive sequences of incorporating ChatGPT into the education setting for students, such as saving time, offering immediate responses for complex concepts, anxiety reduction, improving language skills, boosting self-confidence, and improving time management skills.

Regarding faculty, ChatGPT enhances the education environment by automating administrative tasks, providing personalized feedback, and analyzing data to understand student needs. Consequently, this gives faculty members more space and time to focus on other aspects such as teaching approaches and fostering creativity in curriculum design (Lim et al., 2023). Furthermore, Dwivedi et al. (2023) argued that educators could employ ChatGPT to generate syllabus content for particular modules, design education material and activities (e.g. promoting self-learning), conduct evaluations and assessments, and facilitate the writing of the research process. Nevertheless, there are worries and concerns about incorporating ChatGPT into education in terms of developing critical skills and academic integrity. Therefore, educational institutions should guide proper use while highlighting the significance of critical thinking (Rasul et al., 2023). Furthermore, Alafnan et al. (2023) argued that incorporating ChatGPT into higher education could decrease the need for a faculty environment, thus decreasing human interaction and personal connections. As a result, higher education institutions should seek the proper methods to incorporate AI into their education system, recognizing its potential to transform traditional teaching methods, enhance student interaction, and establish a new learning environment (Tlili et al., 2023).

Gemini uses an optimized variant of Language Models for Dialogue Applications (LaMDA), pre-trained on a broad spectrum of publicly available resources. Gemini provides training data that encompasses archives of multiple resources, supporting more than 40 languages, and allowing it to understand and process web searches with ease (Imran & Almusharraf, 2024). GenAI's most innovative creation, Gemini, breaks new ground in the AI landscape with its extensive feature set (Imran & Almusharraf, 2024). These features for Gemini versions include multimodal capabilities, versatility in communication, and advanced performance (Imran & Almusharraf, 2024; Nyaaba, 2023). In terms of multimodal capabilities and versatility in communication, Lee et al. (2023) indicated that one of Gemini's most powerful features is its ability to work with different kinds of data, such as text, pictures, sounds, PDFs, and videos. In this vein, Portakal (2023) argued that through a powerful mix of audio, video, image, and text, Gemini fosters immersive learning environments.

Standing out in the competitive landscape of AI education, ChatGPT and Gemini have the ability to comprehend and process diverse data formats. This unique strength for Gemini represents a powerful contender in delivering personalized, accessible, and dynamic learning experiences (Perera & Lankathilaka, 2023). Regarding the third feature, "advanced performance", Nyaaba (2023) demonstrated that Gemini excels in a wide range of tasks, like text analysis, programming, logical reasoning, reading comprehension, and solving math problems. Furthermore, Gemini is specifically trained to minimize the generation of harmful responses (Imran & Almusharraf, 2024).

A key advantage of Gemini over other AI models is its ability to stay up-to-date. Unlike prior models that rely on static datasets, Gemini can access and process real-world information through Google Search (Portakal, 2023). This allows it to provide more relevant and current responses to end-user queries. Since the launching time, one of the significant differences between ChatGPT and Gemini was that ChatGPT's responses were not up-to-date and limited to information available up to 2021, while Gemini utilized recent information (Rane et al., 2024). In terms of feedback assessment, a study conducted by Saeidnia (2023) suggested that Gemini works as a bridge between various learning communities, fostering knowledge exchange and communication. This, in turn, promotes a collaborative learning environment. Gemini 1.5 Pro is developed to tackle problem-solving, particularly challenges within massive blocks of code. Google Team (Team et al., 2023) reported that it could analyze 100,000 lines of code, offering reasonable solutions, modifications, and sufficient explanations. Furthermore, Aydin and Karaarslan (2023) indicated that Gemini could be used in scientific research, particularly in generating a literature review with better paraphrasing and a low similarity index score in terms of plagiarism.

Challenges of incorporating AI chatbots in higher education Hasanein and Sobaih (2023) identified six challenges for incorporating ChatGPT into education. These challenges are overreliance on AI, academic integrity, lack of accuracy and quality, concerns with learning outcomes, potential bias, and students' social skills. Earlier studies (Rasul et al., 2023;

Hasanein & Sobaih, 2023) emphasized that depending heavily on chatbots for academic purposes negatively influences students' ability to engage in critical thinking and problem-solving. Concerning academic integrity, chatbots can be improperly used by learners for unethical purposes, such as cheating or plagiarism (Sullivan et al., 2023). Regarding plagiarism, Chaka (2023) indicated that the content generated by chatbots might probably bypass identification by traditional plagiarism detection systems.

Regarding accuracy and quality, Lo et al. (2023) and Limna et al. (2023) stated that accuracy and reliability are the main challenges when incorporating AI-generated content in education-al settings. Challenges related to reliability include relying on biased information and lack of up-to-date information (Sullivan et al., 2023; Rasul et al., 2023; Calonge et al., 2023). AI chatbots could provide fake/inaccurate information (Tlili et al., 2023). By the same train of thought, Sullivan et al. (2023) and Yu (2023) indicated that the improper use of information introduced by AI-generated content might lead to copyright violations.

Hasanein and Sobaih (2023) argued that when students rely on chatbots as a primary source of assistance and teaching, social interaction and communication skills could be decreased. According to earlier studies (Imran & Almusharraf, 2024; Rasul et al., 2023), continuous reli-ance on chatbots for academic purposes negatively affects students' skill sets because it might hinder the development of the required skills. In terms of potential bias, Hasanein and Sobaih (2023) indicated that chatbot feedback is introduced based on certain data used during the development of chatbots. They can be unintentionally perpetuated in chatbot interactions with users. Bias can be evident in different forms, such as racial, cultural, and gender bias. It can generate improper or discriminatory feedback, reinforcing prejudices or stereotypes.

To conclude, utilizing chatbots in educational settings raises many ethical concerns (Van Wyk, 2024). Hence, some higher education institutions have implemented full or partial limitations to the utilization of AI chatbots for learning (Alafnan et al., 2023; Rahman & Watanobe, 2023), while other institutions permitted the usage of AI tools and support the incorporation by creating use guidelines properly and ethically (Neumann et al., 2023).

### **Students' acceptance of ChatGPT/Gemini, and behavioral intentions**

The UTAUT was employed as the theoretical framework as it offers an in-depth context for understanding the use of technology and AI in various contexts, particularly in education (Venkatesh et al., 2003; Venkatesh, 2022). According to Shahsavar and Choudhury (2023) employing the UTAUT framework to incorporate AI chatbots, like Gemini and ChatGPT into educational settings offers a well-structured approach to understanding students' behavioral intentions (BIs) related to the advanced language model. In that sense, Venkatesh et al. (2003) identified four key factors that influence user intention and usage behavior namely, performance expectancy (PE), social influence (SI),

effort expectancy (EE), and facilitating conditions (FCs). Concerning PE, it was employed to assess students' beliefs about how using AI platforms, such as ChatGPT and Gemini, could enhance their academic achievements (Brachten et al., 2021). In terms of SI, earlier studies (Venkatesh et al., 2003; García-Peñalvo, 2024), indicated that students' perceptions of AI platforms are shaped by their teachers' and peers' attitudes and behaviors. This influence is evident in how students adopt the attitudes and behaviors of others regarding the use of Gemini/ChatGPT in the education setting (Venkatesh, 2022). Several studies (e.g., Menon & Shilpa, 2023) have reported that when peers use Gemini for learning, it has the ability to affect other students' BI performance. In this regard, research findings of Menon and Shilpa (2023) indicated that when peers utilize ChatGPT/ Gemini for educational purposes, it could enhance the BI of other students. EE reflects students' perceptions of the ease or difficulty of using the technology. Students find AI platforms such as ChatGPT/ Gemini to be user-friendly, intuitive, and easy to integrate into routine activities, which in turn boosts their BI (Menon & Shilpa, 2023). Given that utilizing AI platforms like ChatGPT/Gemini requires little effort, it increases the chances that students will integrate it into their regular learning practices (Hasanein & Sobaih, 2023; Wang & Zhao, 2023; Tian et al., 2024). FC considers the accessibility of resources required for the effective use of AI in education (Venkatesh et al., 2003). This component includes aspects such as technical accessibility, availability of suitable guidance and tools, and extensive incentive programs for integration (Strzelecki, 2023; Menon & Shilpa, 2023). A study conducted by Strzelecki (2023) indicated that FC displayed no significant impact on BI in the use of ChatGPT in education. Similarly, the study findings of Hasanein et al. (2024) showed that FC failed to positively affect BI. While the study results of Sobaih et al. (2024) confirmed that FC has a negative significant impact on BI to use ChatGPT in education, particularly among Saudi Arabia students. BI reflects students' intention to use AI learning platforms like Gemini or ChatGPT. BI is significantly influenced by students' perceptions that the learning environment provides the necessary resources and support for effective implementation (Ha-sanein & Sobaih, 2023; Sevnarayan & Potter, 2024). Based on this discussion, we are formulating the following hypotheses.

- H1: PE positively impacts BI to use both ChatGPT and Gemini.
- H2: EE positively impacts BI for both ChatGPT and Gemini.
- H3: SI positively impacts BI for both ChatGPT and Gemini.
- H4: FC positively impacts BI for both ChatGPT and Gemini.

### **Students' acceptance to use ChatGPT/Gemini and actual usage**

Several studies (e.g., Cheong et al., 2023; Asrif & Fatmi, 2024; Ashrafimoghari et al., 2024; Sobaih et al., 2024; García-Peñalvo, 2024; Hasanein et al., 2024), have explored how PE, including factors like accessibility for educational chatbots,

and EE, such as clarity and compatibility with students' needs, predict students use of chatbots in education, including ChatGPT and Gemini. In this regard, ample studies (e.g., Hasanein et al., 2024; Venkatesh, 2022; Terblanche & Kidd, 2022) confirmed the importance of BI when adopting new technology. Chang and Park's study (2024) indicated that the adoption of AI chatbots like ChatGPT/Gemini can be heavily impacted by positive social signals from peers within a user's social network who are actively using or promoting the technology. Additionally, a study conducted by Tian et al. (2024) indicated that students' choices to incorporate technology into their everyday educational activities, like using ChatGPT/Gemini for their learning tasks, can be significantly impacted by the encouragement, recommendations, or/and positive experiences shared by others. Furthermore, earlier studies (e.g., Menon & Shilpa, 2023; Chan & Zhou, 2023; Duong et al., 2023) emphasized the significant impact of FC on both the adoption and actual usage of AI chatbots in educational settings. Regarding FC, it encompasses all necessary infrastructure and support for the effective use of AI platforms within an educational context (Menon & Shilpa, 2023). As a result, we could suggest the following hypothesize:

- H5: PE positively influences the usage of ChatGPT and Gemini.
- H6: EE positively influences the usage of ChatGPT and Gemini.
- H7: SI positively influences the usage of ChatGPT and Gemini.
- H8: FC positively influences the usage of ChatGPT and Gemini.

### BI and use of ChatGPT/Gemini

The relationship between students' BI to use ChatGPT/Gemini and its actual use is a key factor in adoption and implementation of the technology (Hasanein et al., 2024). Users' BI indicates their willingness to accept and adopt innovative technologies, such as AI platforms (Venkatesh et al., 2003). By the same train of thought, several studies (e.g., Menon & Shilpa, 2023; Duong et al., 2023; Chaka, 2023) demonstrated that the positive BI towards students' usage of AI applications for educational purposes is considered a crucial motive for their actual usage in their daily educational tasks. According to Chan and Zhou (2023), there is a strong positive relationship between students' BI and the actual use of AI in an educational context due to the critical help needed to complete their educational activities. Likewise, Sobaih et al. (2024) confirmed that there is a positive relationship between student BI and the use of ChatGPT in the education setting of Saudi Arabia. Additionally, the recent study conducted by Hasanein et al. (2024) confirmed that there is a positive correlation between student BI and the use of Google Gemini in the education setting of Saudi Arabia. Therefore, based on these insights, we are formulating this hypothesis.

- H9: Students' BI positively influences the use of ChatGPT/Gemini.

### The role of BI in the link between students' acceptance and usage of ChatGPT/Gemini

Many studies (e.g., Yeadon & Hardy, 2024; García-Peñalvo, 2024; Sobaih et al., 2024; Tian et al., 2024) have examined the relationship between students' acceptance, BI, and use of ChatGPT/Gemini for educational purposes. However, there is a lack of research focusing on the mediating role of BI between acceptance and use of Gemini versus ChatGPT. This study addresses this gap by employing the UTAUT model and proposes the following hypotheses:

- H10: BIs mediate the relationship between PE and the Use of ChatGPT/Gemini.
- H11: BIs mediate the link between EE and the Use of ChatGPT/Gemini.
- H12: BIs mediate the link between SI and the Use of ChatGPT/Gemini.
- H13: BIs mediate the link between FC and Use of ChatGPT/Gemini.

### Method

#### Research design

This research undertook a sequential mixed methods study (Creswell, 2021). This research approach has two stages. The first stage is a quantitative study using a self-administered survey given to graduate students in public Egyptian institutions. The survey form included three parts. The first introduces the study and explains its purposes. The second part of the survey asked participants to fill in their profile, e.g. age, gender, appliance used to connect, frequency of using AI chatbots for learning purposes, and their experience with AI chatbots. The third and fourth parts investigate students' perceptions of Gemini and ChatGPT for learning purposes. Parts Three and Four included 22 pre-tested items assessed with a five-point Likert scale ranging from strongly agree "5" to strongly disagree "1". These items come under six main variables namely: performance expectancy (four items), effort expectancy (five items), social influence (three items), facilitating condition (four items), behavioral intention (three items), and actual usage (three items). The scales were adapted from earlier studies by Strzelecki (2023) and Strzelecki and ElArabawy (2024) and originally from the UTAUT framework by Venkatesh et al. (2003). The scale of behavioral intention variables was adapted from Ajzen and Fishbein (1972) and the use Gemini/ChatGPT variable developed by Venkatesh et al. (2003). The second stage of this research adopted a qualitative study using in-depth semi-structured interviews with a sample of graduate students who filled out the survey to probe their answers and follow up on the survey results.

#### Population, sampling, and procedures

This study is concerned with graduate students, mainly those studying master's degree, in public institutions in Egypt who utilized these AI chatbots, i.e. Gemini and ChatGPT,

for learning purposes. These institutions offer tourism and hospitality majors. Graduate students from six institutions, universities, and locations were contacted to participate in the study voluntarily. These six institutions were a part of Alexandria University (North), Helwan University (Capital), South Valley University (South), Sadat University (Urban), Minia University (South), and Suez Canal University (Canal). The sample employed in this study is a convenience sampling method. Approximately 90 graduate students from each university were invited to participate. Among 550 questionnaires distributed, 450 were returned, while 410 were completed and valid for analysis with a good response rate of 74.5%. This sample size was considered sufficient for data analysis. It showed a favorable comparison with earlier samples from related studies (Hasanien et al., 2024; Elshaer et al., 2024). Gathering of data collection took 40 days, which was ongoing from the beginning of April 2024. The data collected showed that male students' participation (54%) was slightly higher than females' (46%). The majority of participants were in the age group of 20-30 (47%), followed by students in the age group between 30 and 40 years old (45%), and the rest (8%) were above 40 years old. The vast majority of students confirmed that they are using AI chatbots for academic purposes on a daily basis (62%) or at least on a weekly basis (32%), whereas a very slight proportion (7%) used them every month. The surveyed students used different devices to utilize AI chatbots - 53% of students preferred to use their smartphones, whereas 31% used their laptops, and the rest of the students used their desktops or iPads/tablets (8%).

Following the data collected from the survey, a sample of graduate students was interviewed to follow up on the survey results and gain more insights from graduate students. The number of interviewees, a total of 42, was derived after data saturation was achieved. The interviews were conducted one-on-one with graduate students who participated voluntarily after obtaining their consent. Interviews were conducted at a convenient place at each university with assistance from colleagues working at these institutions. Interviews were recorded and transcribed for data analysis after gaining consent from interviewees.

### Data analysis

This study employed two software applications, the Statistical Package for Social Science (SPSS) and Analysis of Moment Structures (AMOS), version 25. Participant profiles were analyzed using frequency distributions and percentages. Descriptive statistics, including mean and standard deviation, were employed to summarize the data. To ensure the reliability of the measurement scales, we calculated Cronbach's Alpha, finding values above 0.7 for all variables, which aligns with the proposition of Peterson (1994). The research team also assessed both convergent and discriminant validity to confirm the robustness of our constructs. AMOS was employed to develop structural models for ChatGPT and Gemini, allowing for a comparative analysis of the two AI chatbots. Additionally, qualitative data collected from interviews were analyzed using qualitative content analysis to provide deeper insights into participants' perceptions.

## Results of the study

### Convergent and discriminant validity

We checked for convergent validity to determine whether all the variables in our two models (ChatGPT vs Gemini) convey the phenomenon in question. To do this, the CR "composite reliability" has to be higher than 0.7 and the AVE "Average Variance Extracted" should be higher than 0.5. As Tables 1 and 2 show, our results indicate that all the variables have convergent validity (Hair et al., 2014). In addition, we tested their discriminant validity to ensure that all the variables in the two models were truly distinct. To do this, we checked the square root of the AVE, which has to be higher than the association it shares with other factors. The results in Tables 1 and 2 for both models (ChatGPT vs Gemini) indicate that all the variables demonstrated discriminant validity as suggested by Hair et al. (2014).

Table 1. ChatGPT's convergent and discriminant validity.

Variables	F.L.	CR	AVE	MSV	1	2	3	4	5	6
Performance expectancy		0.808	0.585	0.656	<b>0.764</b>					
PE1CGPT	0.70									
PE2CGPT	0.78									
PE3CGPT	0.81									
Effort expectancy		0.893	0.677	0.722		<b>0.822</b>				
EE1CGPT	0.79									
EE2CGPT	0.85									
EE3CGPT	0.85									
EE5CGPT	0.80									
Social influence		0.835	0.629	0.792			<b>0.793</b>			
SI1CGPT	0.73									
SI2CGPT	0.89									
SI3CGPT	0.75									
Facilitating condition		0.897	0.686	0.765				<b>0.828</b>		
FC1CGPT	0.79									
FC2CGPT	0.83									
FC3CGPT	0.87									
FC4CGPT	0.82									
Behavioral intention		0.798	0.569	0.624					<b>0.754</b>	
BI1CGPT	0.71									
BI2CGPT	0.76									
BI3CGPT	0.79									
Actual use		0.817	0.598	0.640						<b>0.773</b>
AU1CGPT	0.75									
AU2CGPT	0.77									
AU3CGPT	0.80									

Note: "F.L. = Factor loading; CR = Composite reliability; AVE = Average Variance Extracted; MSV = Maximum Shared Value; Bold Items are square roots of AVE". Items (PE4CGPT and EE4CGPT) were eliminated because their factor contributions were less than 0.4.

Table 2. Gemini's convergent and discriminant validity.

Variables	F.L.	CR	AVE	MSV	1	2	3	4	5	6
Performance expectancy		.918	.736	0.828	<b>0.857</b>					
PE1GIM	0.83									
PE2GIM	0.86									
PE3GIM	0.91									
PE4GIM	0.83									
Effort expectancy		.877	0.587	0.624		<b>0.766</b>				
EE1GIM	0.75									
EE2GIM	0.77									
EE3GIM	0.78									
EE4GIM	0.79									
EE5GIM	0.74									
Social influence		0.760	0.514	0.562			<b>0.716</b>			
SI1GIM	0.75									
SI2GIM	0.70									
SI3GIM	0.70									
Facilitating condition		0.897	0.686	0.739				<b>0.828</b>		
FC1GIM	0.85									
FC2GIM	0.81									
FC3GIM	0.79									
FC4GIM	0.86									
Behavioral intention		0.822	0.608	0.756					<b>0.779</b>	
BI1GIM	0.70									
BI2GIM	0.76									
BI3GIM	0.87									
Actual use		0.869	0.689	0.722						<b>0.830</b>
AU1GIM	0.81									
AU2GIM	0.85									
AU3GIM	0.83									

Note: "F.L. = Factor loading; CR = Composite reliability; AVE = Average Variance Extracted; MSV = Maximum Shared Value; Bold Items are Square roots of AVE".

### Structural equation modeling results

We used structural equation modeling (SEM) to test the influence of performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating condition (FC) on whether to apply ChatGPT or Gemini for learning purposes (USE) through student behavioral intention (BI). The results showed a Chi-square related to its degree of freedom (2.604) for ChatGPT and (2.006) for Gemini. The results were acceptable as the values were less than 3. In addition, the RMSEA indices had the following values respectively (0.067) and (0.022); hence, close to zero, indicating a satisfactory outcome. Respectively, the NFI = (0.982, 0.988), TLI = (0.987, 0.988), and CFI = (0.986, 0.989) values were also acceptable offering a fitness of the model. The standardized RMRs, SRMR= (0.0547, 0.0328) were excellent, being very close to zero. All the hypotheses for the first ChatGPT model were examined confirming significant relationships ranging from  $p < 0.001$  to  $p < 0.05$  (Table 3, Figure 1). More specifically, PE and EE and SI and FC have significantly and positively influence BI ( $\beta = 0.289, p = 0.042 < 0.05$ ;  $\beta = 0.479, p = 0.049 < 0.05$ ;  $\beta = 0.520, p = 0.012 < 0.05$ ;  $\beta = 0.390, p = < 0.001$  respectively) and significantly influence USE of ChatGPT for learning ( $\beta = 0.310, p = < 0.001$ ;  $\beta = 0.669, p = 0.039 < 0.05$ ;  $\beta = 0.320, p = < 0.001$ ;  $\beta = 0.110, p = < 0.001$  respectively). Additionally, BI significantly and positively influences USE ( $\beta = 0.590, p = 0.039 < 0.05$ ). The results indicated that hypotheses (H1, H2, H3, H4, H5, H6, H7, H8) were confirmed concerning the impacts of ChatGPT. Furthermore, the results confirmed that PE, EE, SI, and FC significantly influence BI, which in turn significantly influences the actual use. Additionally, the results showed a significant and positive relationship between BI and the use of ChatGPT that supports H9.

Regarding the second model that involved Gemini's choice, all relationships were tested and showed significant relationships with  $p < 0.001$  (Table 3, Figure 2). More specifically, PE, EE, SI, and FC have significant and positive influences on BI ( $\beta = 0.379, p = < 0.001$ ;  $\beta = 0.593, p = < 0.001$ ;  $\beta = 0.319, p = < 0.001$ ;  $\beta = 0.469, p = < 0.001$ ) and a significant and positive effect on USE ( $\beta = 0.422, p = < 0.001$ ;  $\beta = 0.610, p = < 0.001$ ;  $\beta = 0.649, p = < 0.001$ ;  $\beta = 0.290, p = < 0.001$ ). Furthermore, BI was found to significantly and positively influence the USE of Gemini for learning ( $\beta = 0.661, p = < 0.001$ ). The results indicated that hypotheses (particularly H1; H2; H3; H4) were confirmed concerning Gemini. These hypotheses suggested that PE, EE, SI, and FC would have a significant positive effect on BI. The results showed that hypotheses related to the use of Gemini (H5, H6, H7, H8, H9) were supported. This suggests that PE, EE, SI, and FC have a significant positive effect on the use of Gemini. Additionally, the study results showed a significant positive relationship between BI and the use of Gemini that supports H9.

The robustness of the structural model was confirmed by the two significant coefficients of ( $R^2 = 0.469$ ) for ChatGPT and ( $R^2 = 0.712$ ) for Gemini (see Table 3 and Table 4). In this study, the ratio of USE is explained by BI, PE, EE, SI, and FC in the regression model. In fact, by applying BI, PE, EE, SI, and FC, we can explain around 47% of the variance in USE for ChatGPT and 71% of the variance in USE for Gemini. For the sake of methodological rigor, we have used the methodology of Baron and Kenny (1986) to verify and approve the mediating role of BI in the relationship between (PE, EE, SI, FC) and USE for ChatGPT. We are going to do the same for the choice of Gemini. This approach involves a succession of four sequential steps. Firstly, we confirmed that the relationship between (PE, EE, SI, FC) and USE is significant for potential mediation. The model shows that (PE, EE, SI, FC) have significant and positive effects on USE ( $\beta = 0.310, p = < 0.001$ ;  $\beta = 0.669, p = 0.039 < 0.05$ ;  $\beta = 0.320, p = < 0.001$ ;  $\beta = 0.110, p = < 0.001$ ) respectively. Concerning the Gemini model, it displays the following results which are significantly better than the former ( $\beta = 0.422, p = < 0.001$ ;  $\beta = 0.610, p = < 0.001$ ;  $\beta = 0.649, p = < 0.001$ ;  $\beta = 0.290, p = < 0.001$ ). Secondly, we demonstrated that (PE, EE, SI, FC) have a significant influence on the mediation construct, in this case, BI. The ChatGPT model shows that (PE, EE, SI, FC) respectively have a significant and positive effect on BI ( $\beta = 0.289, p = 0.042 < 0.05$ ;  $\beta = 0.479, p = 0.049 < 0.05$ ;  $\beta = 0.520, p = 0.012 < 0.05$ ;  $\beta = 0.390, p = < 0.001$ ). Additionally, the Gemini model displays the following results ( $\beta = 0.379, p = < 0.001$ ;  $\beta = 0.593, p = < 0.001$ ;  $\beta = 0.319, p = < 0.001$ ;  $\beta = 0.469, p = < 0.001$ ). Once again, the results of the second model outperform those of the first. Thirdly, we confirmed that the relationship between the mediating construct and USE is significant. The results showed that BI significantly and positively influences USE for ChatGPT ( $\beta = 0.590, p = 0.039 < 0.05$ ). For Gemini, it was more significant and positive ( $\beta = 0.661, p = < 0.001$ ). To conclude, the study results support hypotheses (H10, H11, H12, and H13) and confirm that BI mediates the relationship between the predictor variables (PE, EE, SI, FC) and the USE (use of ChatGPT or Gemini). This means that the predictor variables influence USE not only directly but also indirectly through their impact on BI.

Fourthly, we checked the type of mediation by applying the bootstrapping technique, offered to us by AMOS. This shows in Table 4 that the links between (PE, EE, SI, FC) and USE remained significant after adding BI as a mediating variable, respectively ( $\beta = 0.543, p = 0.045 < 0.05$ ;  $\beta = 0.674, p = 0.037 < 0.05$ ;  $\beta = 0.429, p = 0.016 < 0.05$ ;  $\beta = 0.241, p = 0.022 < 0.05$ ) supporting H10, H11, H12 and H13. Thus, we find that mediation by BI is partial between (PE, EE, SI, FC) and USE. According to Table 4, the Gemini model shows a non-significant link between (PE, EE, SI, FC) and USE after adding BI as a mediator ( $\beta = 0.622, 0.060 > 0.05$ ;  $\beta = 0.650, 0.051 > 0.05$ ;  $\beta = 0.531, 0.062 > 0.05$ ;  $\beta = 0.678, 0.074 > 0.05$ ) supporting H10, H11, H12, and H13. This confirms the mediating role of BI is perfect between (PE, EE, SI, FC) and the USE of such chatbot. To that end, the study results suggest that BI partially mediates the relationship between PE, EE, SI, FC, and USE. This indicates that both direct and indirect factors influence students' use of ChatGPT and Gemini.

Table 3. Results of the structural model.

Hypotheses	Direct paths	ChatGPT			Gemini				
		$\beta$	C-R T-value	R <sup>2</sup>	Result	$\beta$	C-R T-value	R <sup>2</sup>	Result
H1	PE → BI	0.289**	5.742		Supported	0.379**	6.694		Supported
H2	EE → BI	0.479**	3.299		Supported	0.593**	2.175		Supported
H3	SI → BI	0.520**	3.217		Supported	0.319**	2.327		Supported
H4	FC → BI	0.390***	8.313		Supported	0.469**	9.421		Supported
H5	PE → USE	0.310***	7.211		Supported	0.422**	9.943		Supported
H6	EE → USE	0.669**	8.041		Supported	0.610**	7.467		Supported
H7	SI → USE	0.320***	4.026		Supported	0.649**	3.655		Supported
H8	FC → USE	0.110***	7.229		Supported	0.290**	8.018		Supported
H9	BI → USE	0.590**	7.212		Supported	0.661**	8.057		Supported
	USE Through BI			0.469				0.712	

ChatGPT Model fit: ( $\chi^2(50, N = 410) = 130.222, p < 0.001, \text{normed } \chi^2 = 2.604, \text{RMSEA} = 0.067, \text{RMR} = 0.092, \text{SRMR} = 0.0547, \text{GFI} = 0.955, \text{AGFI} = 0.951, \text{CFI} = 0.986, \text{TLI} = 0.987, \text{NFI} = 0.982, \text{IFI} = 0.989, \text{PCFI} = 0.726, \text{PNFI} = 0.742, p < 0.001$ ).  
 Gemini Model fit: ( $\chi^2(45, N = 410) = 90.304, p < 0.001, \text{normed } \chi^2 = 2.006, \text{RMSEA} = 0.022, \text{RMR} = 0.098, \text{SRMR} = 0.0328, \text{GFI} = 0.987, \text{AGFI} = 0.981, \text{CFI} = 0.989, \text{TLI} = 0.988, \text{NFI} = 0.988, \text{IFI} = 0.990, \text{PCFI} = 0.719, \text{PNFI} = 0.787, p < 0.001$ ).

Table 4. Types of BI mediation.

Hypo	Indirect paths	ChatGPT					Gemini						
		Estimate	Lower	Upper	P	Mediation	Result	Estimate	Lower	Upper	P	Mediation	Result
H10	PE → BI → USE	0.543	0.322	0.570	0.045	0.045-0.05 Partial Mediation	Supported	0.622	0.555	0.689	0.060	0.060-0.05 Full Mediation	Supported
H11	EE → BI → USE	0.674	0.512	0.703	0.037	0.037-0.05 Partial Mediation	Supported	0.650	0.412	0.766	0.051	0.051-0.05 Full Mediation	Supported
H12	SI → BI → USE	0.429	0.420	0.460	0.016	0.016-0.05 Partial Mediation	Supported	0.531	0.465	0.577	0.062	0.062-0.05 Full Mediation	Supported
H13	FC → BI → USE	0.241	0.144	0.250	0.022	0.022-0.05 Partial Mediation	Supported	0.678	0.539	0.690	0.074	0.074-0.05 Full Mediation	Supported

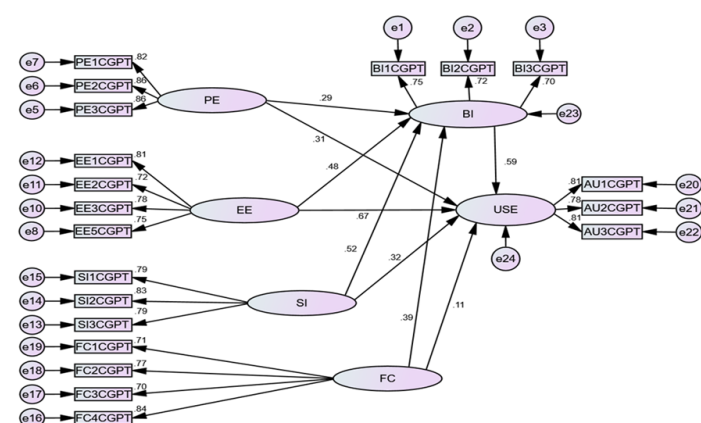


Figure 1. ChatGPT's structural model.

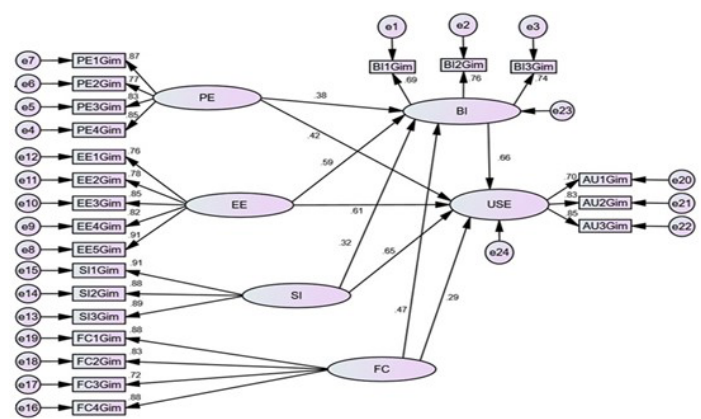


Figure 2. Gemini's structural model.

### The results of the interviews

As discussed earlier in the Methods section, interviews were conducted to probe the results of the questionnaire. The interviewees confirmed that incorporating AI tools into educational settings has become a "today's learning method", "essential tool", and "necessary tool". They argued that chatbots give improbable assistance in quick and easy steps, particularly in-home tasks, assignments, individual and group projects, and research tasks. There was an agreement among the majority of participants that Gemini and ChatGPT are the most widely used chatbots among them.

Concerning performance expectancy, all interviewees perceived both chatbots as valuable tools and believed that utilizing them for academic purposes would enrich their academic performance. However, most of them believe that Gemini is more valuable than ChatGPT. They added that Gemini is more accurate than ChatGPT in text generation and gives up-to-date information. Furthermore, the majority of students agreed that both chatbots can handle complex tasks, but they preferred Gemini, especially with large attachments. Below is one of the student's comments:

Both tools are pretty good, but I preferred Gemini because it can summarize large files perfectly. Additionally, Gemini is really good at finding relevant sources from the web. The presented results from Gemini are more organized with clear headings followed by bullet points and a summary [GS14].

There was consent among the interviewees that Gemini and ChatGPT are effortless, user-friendly, and easier to use. They added that the platforms for both chatbots can be used by anyone even those who are not tech-savvy. Participants added that Gemini and ChatGPT support the Arabic language, which makes them easier to use. Notably, many participants preferred Gemini to ChatGPT in the area of effort expectancy. A key reason for this is that the interface of Gemini is well organized and straightforward. Below is one of the student's comments:

Logging into Gemini just requires a Google account and I have a good experience with the Google search engine. Personally, I found it easier to use Gemini than ChatGPT [GS02].

The interviewed students confirmed that their decision to use AI chatbots is influenced by their social circle, e.g. peers, friends, family, and educators. Consequently, students acknowledged receiving recommendations from their peers to utilize AI chatbots for academic purposes. While some students expressed a preference for ChatGPT based on feedback from friends who preferred its quicker results presentation, the majority received recommendations for Gemini over ChatGPT. Supporters of Gemini argued that ChatGPT is relatively less known than Gemini in their network, leading to more support for Gemini's use. Additionally, students noted that Gemini, developed by Google, enjoys widespread usage, adding to its credibility. Further evidence supporting these perspectives is provided below:

Google has good word-of-mouth and popularity so my instructor advised me to use Gemini for handling my research assignment [GS32].

Interviewees agreed that there is a lack of facilities that support the utilization of AI chatbots from their institutions. Students indicated that they had not received support or training to demonstrate the proper use of chatbots in academic settings. Additionally, there is no support from their institution leaders or the IT technical desk to empower the use of AI chatbots. They may receive guidance or support from some of their tutors. One more piece of evidence could be seen in the following comment:

Utilizing AI chatbots requires support such as a computer or AI lab, good internet access, technical support, training, and guidance on proper use. However, all of these resources do not exist or are unavailable [GS37].

Students argued that there is a "digital gap" between them and some of their instructors and institutions. They are keen to use AI chatbots to support their learning. However, they are not encouraged by their institutions to do this due to limited digital resources in public Egyptian higher education institutions to support digital transformation. There is no clear policy for integrating AI in education, despite the tourism industry being one of the industries that adopt technological innovations in many aspects to enhance customer experiences. This adds to the gap between graduates' skills shortage and gaps in relation to AI adoption skills required by industry. The absence of policies and guidelines on AI use for learning raises some ethical concerns about the responsible use of AI chatbots for learning.

Concerning graduate students' behavioral intention to use Gemini and/or ChatGPT for learning, interviewees reported positive intention to use both chatbots in academic settings. Participants explained that Gemini and ChatGPT provide instant assistance in handling complex tasks, unclear topics, and translation, summarizing books and articles, generating literature reviews, analyzing data, or writing parts of their research. They added that such tasks became easier with quality outputs. This efficiency can lead to better time management and improved academic performance, as they believe. Nevertheless, one of the interviewed students disagreed with their colleagues and commented that:

The regular usage of chatbots for education purposes will decrease some important skills, such as critical and writing skills. Additionally, the chatbot results are not adequate 100% and sometimes give fake citations [GS09].

However, students are using both chatbots in their studies and research process. This is because they have recognized the learning opportunities provided by these chatbots. Interviewees believed that they gained skills through Gemini or ChatGPT which benefit their education journey and lead to long-term success by enhancing their understanding of educational issues and improving their writing proficiency. A further explanation is in the following comment:

I frequently use these AI tools, whether Gemini or ChatGPT, for academic purposes. Certainly, I acquired valuable skills and knowledge every single minute of my usage. This will certainly enhance my academic success [GS11].

## Discussion

This research is among the first studies that explore graduate students' perceptions of AI chatbots' use for learning purposes in public Egyptian higher education institutions. The re-sults of statistical data using SPSS and AMOS showed a positive significant influence of per-formance expectancy, effort expectancy, and social influence on graduate students' behavior-al intention and their actual usage of both ChatGPT and Gemini. This means that graduate students perceived both AI chatbots Gemini and ChatGPT positively; hence, they use them extensively in their academic lives. These findings are aligned with the UTAUT framework and previous studies (e.g. Strzelecki, 2023; Sobaih et al., 2024; Hasanein et al., 2024). Effort expectancy had the highest influence among the four dimensions of UTAUT on students' BI and actual use of AI chatbots for learning reasons. Graduate students found AI chatbots easy to use and user-friendly; hence, they developed high intentions and extensively used them for learning purposes, which supported previous research findings (Menon & Shilpa, 2023). Stu-dents are encouraged by their peers and some instructors informally to use these AI tools for learning purposes. These findings are aligned with previous studies (e.g., Strzelecki, 2023; Sobaih et al., 2024; Hasanein et al., 2024), which found that social influence affects students' intention and their actual use of AI chatbots for learning purposes. In contrast to the UTAUT framework (Venkatesh et al., 2003), and previous studies (e.g., Strzelecki, 2023) that found no significant direct effect of FC on BI to use ChatGPT in education. In addition to the re-cent research by Hasanein et al. (2024) that found a significant negative influence of FC on BI to use Gemini among Saudi Arabian students, the recent study has confirmed that FC pos-itively impacts students' BI to use AI chatbots for their learning. This can be attributed to the fact that this study involves graduate students in Egyptian higher education institutions, who often own smartphones and other smart devices that facilitate access to AI, compensating for the inadequate IT infrastructure at their institutions. This directly affected their BI to use AI for learning purposes.



The results of SEM showed that graduate students have more positive acceptance of Gemini over ChatGPT regarding all variables of the UTAUT framework. The interview results explained why graduate students prefer Gemini over ChatGPT in public Egyptian higher education institutions. They argued that Gemini has more free features and generates more accurate and up-to-date information than ChatGPT. Agreeing with Imran and Almusharraf (2024), the result of interviews with graduate students indicated that Gemini could deal with diverse data input, generate various content types, and deal with large size of attachments. Graduate students often favor Gemini over ChatGPT due to the simplicity of Gemini's interface, which makes it more user-friendly with well-organized presentation of results. This supports previous studies (e.g. Hasanein et al., 2024), which found that AI platforms like Gemini make information highly accessible to students. Reflecting on the work of Hasanein et al. (2024) and Sobaih et al. (2024), students confirmed that they are highly influenced by their surroundings; hence, they favor Gemini over ChatGPT. This could be due to the popularity and the image of Google products over OpenAI products among students. This also could be because students in Egypt often use free or unpaid versions of chatbots and hence they found the free version better than those of ChatGPT.

Despite graduate students utilizing AI chatbots on a daily basis for learning, the study results confirmed that public Egyptian higher institutions are not adequately prepared to support students' utilization of AI tools in the academic setting due to the absence of policy and poor digital infrastructure. The primary obstacle is the lack of technological infrastructure such as unavailability of computer labs, quick internet connections, and IT support. This result aligns with Sobaih et al. (2020) that Egyptian higher education institutions lack proper IT infrastructure and provide poor IT Support. Furthermore, the results indicated that incorporating AI chatbots requires a level of digital literacy among faculty members. However, it was gathered from students during the interviews that faculty members may suffer from a digital gap and limited knowledge about AI adoption for learning. This finding concurs with the work of Divino (2024), who states that the proper time to utilize AI in an education setting is when both faculty members and students are digitally literate.

The study results revealed a gap between graduate students and their institutions on the incorporation of AI chatbots in Egyptian higher education. Students demonstrate a strong desire to leverage AI chatbots for academic purposes and to enhance their academic performance. Conversely, policymakers have not embraced AI integration for academic purposes nor are there clear guidelines for their use or nonuse. This result aligns with Rudolph et al.'s (2023) findings that indicate that universities have a slow response toward the adoption of AI tools. In the Egyptian context, the public higher institutions lack the necessary IT infrastructure to facilitate this transition (Sobaih et al., 2020). Furthermore, policymakers and faculty members such as professors and their assistants did not pay sufficient attention to ethical concerns raised during AI chatbot use for learning.

As a result, students may engage in 'irresponsible usage' of AI chatbots. For example, a student might use a chatbot to generate text for research without the faculty possessing adequate AI detection software due to the unavailability of such software in public institutions (see Sobaih, 2024). Furthermore, the irresponsible usage of AI chatbots will contribute to a short-age of students' skills in the long run. This is especially true for tourism and hospitality careers, which require certain skills, such as language proficiency, interpersonal communication, and critical thinking. In the end, tourism and hospitality-related careers depend heavily on lever-aging new technology, such as AI. Hence, the policymakers in the colleges of tourism and hotel management should prioritize integrating technology-focused learning to equip their students with the skills required for their future careers. This requires a clear policy on AI use for learning.

Although the results confirmed that the students have high intent to use both AI chatbots, Gemini is more favorable for the students since they believe that Gemini is an integral tool for their academic endeavors. Additionally, the results confirmed that students had translated their intention into extensive usage of AI chatbots, especially Gemini. They argued that AI Chatbots provide them with required skills that enhance their academic performance. This result does not support the study finding of Hasanein et al. (2024), which indicates it is uncertain about the extent Gemini influences student academic performance. Reflecting previous studies (e.g., Kouam & Muchowe, 2024; Van Wyk, 2024; Sobaih, 2024), the results demonstrated that graduate students are increasingly employing AI chatbots in their daily academic tasks such as research assistance, generating text like literature review, proper translations, convert the text into PowerPoint presentations, and lesson summarizing. Notably, Gemini has emerged as a preferred choice for paraphrasing text among graduate students.

The study results send important messages to scholars, policymakers in public Egyptian higher education, faculty members, and students alike. Earlier studies (e.g., Hasanein et al., 2024, Sobaih, 2024; Kouam & Muchowe, 2024; Van Wyk, 2024) have confirmed that AI chatbots are widely used by higher education students for different purposes and anticipated a continuous war between AI chatbots with significant impacts on education (Rudolph et al., 2023). The current study adds to this debate on the battle of AI chatbots in the higher education context. The results of this study showed that BI has a partial mediation influence on the link between the four dimensions of UTAUT and the actual use of ChatGPT for learning purposes. However, it has a perfect mediation in the link between the four dimensions of UTAUT and the actual use of Gemini for learning purposes. This means that BI could change the relationship between the four dimensions of UTAUT and the actual use of Gemini for learning reasons. Hence, positive BI among graduate students should be ensured to enhance the actual use of AI chatbots for learning purposes.

## Conclusion

This study responds to the extensive utilization of AI chatbots by students of higher education for learning purposes. The study compares the most popular chatbots, ChatGPT and Gemini, among graduate students in higher education institutions in Egypt. The study results confirmed that students perceive Gemini and ChatGPT as valuable tools that positively enhance their performance and productivity. Furthermore, they found both chatbots to be user-friendly and easy to learn. The study's statistical results show that graduate students have more positive acceptance and use of Gemini than ChatGPT. The interview with students showed that students are using both chatbots but prefer to utilize Gemini because they believe it is easier to use than ChatGPT, is more organized, tags along the popularity of Google, and has more free features. The results also showed that student decisions to use chatbots were often impacted by recommendations from their social circles, with Gemini standing out as a more widely known and endorsed option. Albeit the lack of adequate facilities and formal support for utilizing AI chatbots in their higher education environment, students are inclined to incorporate both Gemini and ChatGPT for academic purposes. Students expressed a strong intention to continue using chatbots extensively. They believed that leveraging Gemini and ChatGPT not only supports handling complex tasks but also acquires valuable skills that contribute to long-term educational success. The results confirm that the war on AI chatbots is at a growth stage and has not yet reached its maturity, confirming that it will continue to grow extensively in the next few years. This requires quick responses from decision-makers to better integrate these AI tools for learning.

This study focused on graduate students in public Egyptian higher institutions providing tourism and hospitality disciplines which are classified as a social science. Hence, results cannot be widespread to other disciplines or sciences without further investigation. Students in other sciences, such as medicine, engineering, and agricultural sciences, might have different perceptions, as Elshaer et al. (2024) found that study discipline could moderate students' use of AI tools in their learning. This study did not examine the role of gender, age, and experience in the findings, which could also have an effect on the results, albeit this is worth further investigation in future research. Future studies could examine student real experience with AI adoption in their learning journey, such as their engagement, knowledge construction, and critical reflection and its linkage with their overall academic performance. Future studies could build on current study findings by exploring how students in other disciplines (rather than tourism and hospitality), such as medicine, engineering, and agricultural sciences, perceive and utilize these AI chatbots. Understanding these distinct perspectives could provide valuable insights into how different fields may adapt AI technology to enhance learning outcomes. Based on the recent study findings, the study offers the following recommendations for policymakers in higher education institutions and educators, whether in the Egyptian context or at the global level.

Recommendations for policymakers in higher education institutions:

1. Facilitating multi-stakeholder discussions involving students, teaching and learning experts, faculty members, IT professionals, and industry professionals to explore all aspects of integrating AI chatbots in education, and translate the outcomes of these discussions into actionable regulations, guidelines, and handouts (Gimpel et al., 2023).
2. Encouraging IT professionals and faculty members to offer proper and up-to-date training matching the rapid development of AI chatbots to students (e.g., toolkit, guidebook) on the responsible use of AI chatbots for educational purposes.
3. Organizing dialogue sessions and training workshops for students that focus on academic integrity and ethical considerations concerning the use of AI chatbots, such as Gemini and ChatGPT.
4. Updating academic integrity policies and honor codes to incorporate the use of AI tools such as chatbots, and establish clear, accessible guidelines for employing language models in teaching and learning. These guidelines should outline appropriate usage and specify the consequences of academic cheating (Rudolph et al., 2023).
5. Promoting and facilitating research among academic staff on the effective integration of AI tools in the education field and overcoming the disadvantages of these tools (Rudolph et al., 2023).
6. Equipping higher education institutions with adequate and robust IT infrastructure (such as IT support units, computer labs, and Wi-Fi), particularly in developing countries like Egypt.
7. Enhancing the digital literacy of academic staff through targeted training programs and resources that focus on technology integration. This will enable educators to confidently incorporate digital tools into their educational approach and stay updated on emerging technologies, ultimately fostering a more engaging learning environment for students.

Recommendations for educators:

1. It is crucial for educators to have a balanced blend of automation and the human touch in education. While chatbots can simplify tasks, and duties and provide feedback, educators must remain vital in offering emotional support (Sobaih & Gharbi, 2024), guidance, and mentorship, which are irreplaceable by AI systems.

2. Educators may include AI tools in class discussions and assignments and teach their students how to use chatbots responsibly, in addition to highlighting the advantages and disadvantages of these tools.
3. Educators should teach students to critically assess the information provided by AI chatbots. Highlighting the limitations of these tools will help students develop better analytical skills when using AI-generated content.
4. Because students highly intend to use both chatbots for academic purposes, educators should develop innovative assessment strategies that focus on evaluating learning processes instead of simply measuring outcomes.
5. Educators should familiarize themselves with various AI chatbots, such as ChatGPT and Gemini, as these tools can significantly enhance teaching and learning experiences. Given that students are increasingly familiar with these AI technologies, educators need to maintain a higher level of proficiency and expertise. This is because of the digital divide between students and their educators in their adoption of technology (Sobaih et al., 2016).

Funding: This work was supported by the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia, Project number KFU241422.

## References

Aiumtrakul, N., Thongprayoon, C., Suppadungsuk, S., Krisanapan, P., Miao, J., Qureshi, F., & Cheungpasitporn, W. (2023). Navigating the landscape of personalized medicine: The relevance of ChatGPT, BingChat, and Bard AI in nephrology literature searches. *Journal of Personalized Medicine*, 13(10), 1457. <https://doi.org/10.3390/jpm13101457>

Ajzen, I., & Fishbein, M. (1972). Attitudes and normative beliefs as factors influencing behavioral intentions. *Journal of personality and social psychology*, 21(1), 1. <https://psycnet.apa.org/doi/10.1037/h0031930>

Alafnan, M. A., Dishari, S., Jovic, M., & Lomidze, K. (2023). ChatGPT as an educational tool: Opportunities, challenges, and recommendations for communication, business writing, and composition courses. *Journal of Artificial Intelligence and Technology*, 3(2), 60-68. <http://dx.doi.org/10.37965/jait.2023.0184>

Ashrafimoghari, V., Gürkan, N., & Suchow, J. W. (2024). *Evaluating large language models on the GMAT: Implications for the future of business education*. arXiv preprint. <https://doi.org/10.48550/arXiv.2401.02985>

Asrif, Y., & Fatmi, H. (2024). *A cognitive revolution: Generative artificial intelligence in higher education*. arXiv preprint.

<https://doi.org/10.48550/arXiv.2401.02985>

Aydin, Ö., & Karaarslan, E. (2023). Is Chatgpt leading generative AI? What is beyond expectations?. Academic Platform. *Journal of Engineering and Smart Systems*, 11(3), 118-134. <https://dx.doi.org/10.2139/ssrn.4341500>

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of per-sonality and social psychology*, 51(6), 1173. <http://dx.doi.org/10.1037//0022-3514.51.6.1173>

Brachten, F., Kissmer, T., & Stieglitz, S. (2021). The acceptance of chatbots in an enterprise context – a survey study. *International Journal of Information Management*, 60, 102375. <https://doi.org/10.1016/j.ijinfomgt.2021.102375>

Calonge, D. S., Smail, L., & Kamalov, F. (2023). Enough of the chit-chat: A comparative analysis of four AI chatbots for calculus and statistics. *Journal of Applied Learning and Teaching*, 6(2), 346-357. <https://doi.org/10.37074/jalt.2023.6.2.22>

Chaka, C. (2023). Generative AI chatbots - ChatGPT versus YouChat versus Chatsonic: Use cases of selected areas of applied English language studies. *International Journal of Learning, Teaching and Educational Research*, 22(6), 1-19. <https://doi.org/10.26803/ijlter.22.6.1>

Chan, C. K. Y., & Zhou, W. (2023). *Deconstructing student perceptions of Generative AI (GenAI) through an Expectancy Value Theory (EVT)-based instrument*. arXiv preprint. <https://doi.org/10.48550/arXiv.2305.01186>

Chang, W., & Park, J. (2024). A comparative study on the effect of ChatGPT recommenda-tion and AI recommender systems on the formation of a consideration set. *Journal of Retail-ing and Consumer Services*, 78, 103743. <https://doi.org/10.1016/j.jretconser.2024.103743>

Cheong, R. C. T., Unadkat, S., Mcneillis, V., Williamson, A., Joseph, J., Randhawa, P., An-drews, P., & Paleri, V. (2023). Artificial intelligence chatbots as sources of patient education material for obstructive sleep apnoea: ChatGPT versus Google Bard. *European Archives of Oto-Rhino-Laryngology*, 281, 985–993. <https://doi.org/10.1007/s00405-023-08319-9>

Coles, G. (2023). *Google DeepMind Gemini AI release date: The world's new most powerful language model*. PCguide.com. <https://www.pcguide.com/apps/google-deepmind-gemini-release-date>

Creswell, J. W. (2021). *A concise introduction to mixed methods research* (2nd ed.). SAGE Publications, Inc.

Divino, S. B. S. (2014). Hey, ChatGPT: How should we teach law to Generation AI?. *Journal of Applied Learning and Teaching*, 7(2), 1-6. <http://dx.doi.org/10.37074/jalt.2024.7.2.6>

Duong, C. D., Vu, T. N., & Ngo, T. V. N. (2023). Applying a modified technology ac-ceptance model to explain higher education students' usage of ChatGPT: A serial multiple

- mediation model with knowledge sharing as a moderator. *The International Journal of Management Education*, 21(3), 100883. <https://doi.org/10.1016/j.ijme.2023.100883>
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koochang, A., Raghavan, V., Ahuja, M., ... Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>
- Elshaer, I. A., Hasanein, A. M., & Sobaih, A. E. E. (2024). The moderating effects of gender and study discipline in the relationship between university students' acceptance and use of ChatGPT. *European Journal of Investigation in Health, Psychology and Education*, 14(7), 1981-1995. <https://doi.org/10.3390/ejihpe14070132>
- García-Peñalvo, F. J. (2024). Generative artificial intelligence in higher education: A 360 per-spective [Conference Presentation]. In *IFE conference special event: Artificial intelligence in education summit*. Tecnológico de Monterrey, Monterrey, México. <https://bit.ly/48W0GNX>
- Gimpel, H., Hall, K., Decker, S., Eymann, T., Lämmermann, L., Mädche, A., Röglinger, R., Ruiner, C., Schoch, M., Schoop, M., Urbach, N., & Vandirk, S. (2023, March 20). *Unlocking the power of generative AI models and systems such as GPT-4 and ChatGPT for higher education: A guide for students and lecturers*. University of Hohenheim. <http://dx.doi.org/10.13140/RG.2.2.20710.09287/2>
- Hair, J., Sarstedt, M., Hopkins, L., & Kuppelwieser. (2014). Partial least squares structural equation modeling (PLS-SEM): An emerging tool for business research. *European Business Review*, 26(2), 106-121. <http://dx.doi.org/10.1108/EBR-10-2013-0128>
- Hasanein, A. M., & Sobaih, A. E. E. (2023). Drivers and consequences of ChatGPT use in higher education: Key stakeholder perspectives. *European Journal of Investigation in Health, Psychology and Education*, 13(11), 2599-2614. <https://doi.org/10.3390/ejihpe13110181>
- Hasanein, A. M., Sobaih, A. E. E., & Elshaer, I. A. (2024). Examining Google Gemini's acceptance and usage in higher education. *Journal of Applied Learning and Teaching*, 7(2), 1-9. <https://doi.org/10.37074/jalt.2024.7.2.5>
- Ifelebuegu, A. O. (2024). Rise of the robots: What it means for educators. *Journal of Applied Learning and Teaching*, 7(1), 413-420. <https://doi.org/10.37074/jalt.2024.7.1.16>
- Ifelebuegu, A. O., Kulume, P., & Cherukut, P. (2023). Chatbots and AI in Education (AIED) tools: The good, the bad, and the ugly. *Journal of Applied Learning and Teaching*, 6(2), 332-345. <https://doi.org/10.37074/jalt.2023.6.2.29>
- Imran, M., & Almusharraf, N. (2024). Google Gemini as a next generation AI educational tool: A review of emerging educational technology. *Smart Learning Environments*, 11(1), 22. <https://doi.org/10.1186/s40561-024-00310-z>
- Joseph, O. U., Arikpo, I. M., Victor, O. S., Chidirim, N., Mbua, A. P., Ify, U. M., & Diwa, O. B. (2024). Artificial Intelligence (AI) in academic research. A multi-group analysis of students' awareness and perceptions using gender and programme type. *Journal of Applied Learning and Teaching*, 7(1), 1-17. <https://doi.org/10.37074/jalt.2024.7.1.9>
- Kasneci, E., Sebler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gaseer, U., Groh, G., Gunnemann, S., Hullermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., ... & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274. <https://doi.org/10.1016/j.lindif.2023.102274>
- Knight, W. (2023). *Google just launched Gemini, its long-awaited answer to ChatGPT*. <https://www.wired.com/story/googlegemini-ai-model-chatgpt>.
- Kouam, A. W. F., & Muchowe, R. M. (2024). Exploring graduate students' perception and adoption of AI chatbots in Zimbabwe: Balancing pedagogical innovation and development of higher-order cognitive skills. *Journal of Applied Learning and Teaching*, 7(1), 65-75. <https://doi.org/10.37074/jalt.2024.7.1.12>
- Koubaa, A., Boulila, W., Ghouti, L., Alzahem, A., & Latif, S. (2023). Exploring ChatGPT capabilities and limitations: A survey. *IEEE Access*, 11, 118698-118721. <https://doi.org/10.1109/ACCESS.2023.3326474>
- Lee, G. G., Shi, L., Latif, E., Gao, Y., Bewersdorf, A., Nyaaba, M., ... & Zhai, X. (2023). *Multimodality of AI for education: Towards artificial general intelligence*. arXiv preprint. <https://doi.org/10.48550/arXiv.2312.06037>
- Li, Z. (2022). Factors influencing students' continuous willingness to use e-learning platforms in higher education. *International Journal of Information and Communication Technology Education (IJICTE)*, 18(3), 1-11. <https://doi.org/10.4018/IJICTE.313424>
- Lim, W. M., Gunasekara, A., Pallant, J. L., Pallant, J. I., & Pechenkina, E. (2023). Generative AI and the future of education: Ragnarök or reformation? A paradoxical perspective from management educators. *The International Journal of Management Education*, 21(2), 100790. <https://doi.org/10.1016/j.ijme.2023.100790>
- Limna, P., Kraivanit, T., Jangjarat, K., Klayklung, P., & Chocksathaporn, P. (2023). The use of ChatGPT in the digital era: Perspectives on chatbot implementation. *Journal of Applied Learning and Teaching*, 6(1), 64-74. <https://doi.org/10.37074/jalt.2023.6.1.32>
- Lo, C. K. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, 13(4), 410. <https://doi.org/10.3390/educsci13040410>
- Menon, D., & Shilpa, K. (2023). "Chatting with ChatGPT":

- Analyzing the factors influencing users' intention to use the Open AI's ChatGPT using the UTAUT model. *Heliyon*, 9(11), <https://doi.org/10.1016/j.heliyon.2023.e20962>
- Neumann, M., Rauschenberger, M., & Schön, E. M. (2023). "We need to talk about ChatGPT": The Future of AI and Higher Education. In *Proceedings of the 2023 IEEE/ACM 5th international workshop on software engineering education for the next generation (SEENG)*. Melbourne, Australia. <http://dx.doi.org/10.25968/opus-2467>
- Nyaaba, M. (2023). *Comparing human and AI's (GPT-4 and Gemini) understanding of the nature of science*. <https://doi.org/10.2139/ssrn.4661602>
- OpenAI. (2022, November 30). *ChatGPT: Optimizing language models for dialogue*. <https://openai.com/blog/chatgpt>
- OpenAI. (2023). *GPT-4 is OpenAI's most advanced system, producing safer and more useful responses*. <https://openai.com/product/gpt-4>
- Pang, S., Nol, E., & Heng, K. (2024). *ChatGPT-4o for English language teaching and learning: Features, applications, and future prospects*. <http://dx.doi.org/10.2139/ssrn.4837988>
- Perera, P., & Lankathilaka, M. (2023). Preparing to revolutionize education with the multi-model GenAI tool Google Gemini? A journey towards effective policy making. *Journal of Advances in Education and Philosophy*, 7(8), 246–253. <http://dx.doi.org/10.36348/jaep.2023.v07i08.001>
- Peterson, R. A. (1994). A meta-analysis of Cronbach's coefficient alpha. *Journal of Consumer Research*, 21(2), 381–391. <http://dx.doi.org/10.1086/209405>
- Portakal, E. (2023). *Google's Gemini AI review*. Textcortex.com. <https://textcortex.com/post/gemini-ai-review>
- Rahman, M. M., & Watanobe, Y. (2023). ChatGPT for education and research: Opportunities, threats, and strategies. *Applied Sciences*, 13(9), 5783. <https://doi.org/10.3390/app13095783>
- Ram, B., & Verma, P. (2023). Artificial intelligence AI-based Chatbot study of ChatGPT, Google AI Bard and Baidu AI. *World Journal of Advanced Engineering Technology and Sciences*, 8(01), 258–261. <https://doi.org/10.30574/wjaets.2023.8.1.0045>
- Rane, N., Choudhary, S., & Rane, J. (2024). Gemini versus ChatGPT: Applications, performance, architecture, capabilities, and implementation. *Performance, Architecture, Capabilities, and Implementation* (February 13, 2024). <https://dx.doi.org/10.2139/ssrn.4723687>
- Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., ... & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching*, 6(1), 41–56. <https://doi.org/10.37074/jalt.2023.6.1.29>
- Rudolph, J., Tan, S., & Tan, S. (2023). War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *Journal of Applied Learning and Teaching*, 6(1), 364–389. <https://doi.org/10.37074/jalt.2023.6.1.23>
- Saeidnia, H. R. (2023). *Welcome to the Gemini era: Google DeepMind and the information industry*. Library. Hi Tech News. <https://doi.org/10.1108/LHTN-12-2023-0214>
- Sevnarayan, K., & Potter, M. A. (2024). Generative artificial intelligence in distance education: Transformations, challenges, and impact on academic integrity and student voice. *Journal of Applied Learning and Teaching*, 7(1), 104–114. <https://doi.org/10.37074/jalt.2024.7.1.41>
- Shahsavari, Y., & Choudhury, A. (2023). User intentions to use ChatGPT for self-diagnosis and health-related purposes: Cross-sectional survey study. *JMIR Hum Factors*, 10, e47564. <https://doi.org/10.2196/47564>
- Sobaih, A. E. E. (2024). Ethical concerns for using artificial intelligence chatbots in research and publication: Evidence from Saudi Arabia. *Journal of Applied Learning and Teaching*, 7(1), 93–103. <https://doi.org/10.37074/jalt.2024.7.1.21>
- Sobaih, A. E. E., Elshaer, I. A., & Hasanein, A. M. (2024). Examining students' acceptance and use of ChatGPT in Saudi Arabian higher education. *European Journal of Investigation in Health, Psychology and Education*, 14(3), 709–721. <https://doi.org/10.3390/ejihpe14030047>
- Sobaih, A. E. E., & Gharbi, H. (2024). Do my teachers treat me fairly? Examining the mediating effect of emotional support in the link between distributive justice and students' academic performance. *Journal of Applied Learning and Teaching*, 7(2), 1–11. <https://doi.org/10.37074/jalt.2024.7.2.19>
- Sobaih, A. E. E., Hasanein, A. M., & Abu Elnasr, A. E. (2020). Responses to COVID-19 in higher education: Social media usage for sustaining formal academic communication in developing countries. *Sustainability*, 12(16), 6520. <https://doi.org/10.3390/su12166520>
- Sobaih, A. E. E., Moustafa, M. A., Ghandforoush, P., & Khan, M. (2016). To use or not to use? Social media in higher education in developing countries. *Computers in Human Behavior*, 58, 296–305. <https://doi.org/10.1016/j.chb.2016.01.002>
- Strzelecki, A. (2023). To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology. *Interactive learning environments*, 1–14. <http://dx.doi.org/10.1080/10494820.2023.2209881>
- Strzelecki, A., & ElArabawy, S. (2024). Investigation of the moderation effect of gender and study level on the acceptance and use of generative AI by higher education students: Comparative evidence from Poland and Egypt. *British Journal of Educational Technology*, 55(3), 1209–1230. <https://doi.org/10.1111/bjet.13425>
- Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching*,

6(1), 31-40. <https://doi.org/10.37074/jalt.2023.6.1.17>

Team, G., Anil, R., Borgeaud, S., Wu, Y., Alayrac, J. B., Yu, J., & Ahn, J. (2023). *Gemini: A family of highly capable multimodal models*. arXiv preprint. <https://doi.org/10.48550/arXiv.2312.11805>

Terblanche, N., & Kidd, M. (2022). Adoption factors and moderating effects of age and gender that influence the intention to use a non-directive reflective coaching chatbot. *SAGE Open*, 12(2), <https://doi.org/10.1177/21582440221096136>

Tian, W., Ge, J., & Zheng, X. (2024). AI chatbots in Chinese higher education: Adoption, perception, and influence among graduate students—an integrated analysis utilizing UTAUT and ECM models. *Frontiers in Psychology*, 15, 1268549. <https://doi.org/10.3389/fpsyg.2024.1268549>

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., & Agyemang, B. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. *Smart Learning Environment*, 10(15). <https://doi.org/10.1186/s40561-023-00237-x>

Van Dis, E. A. M., Bollen, J., Zuidema, W., van Rooij, R., & Bockting, C. L. (2023). ChatGPT: Five priorities for research. *Nature*, 614(7947), 224-226. <https://doi.org/10.1038/d41586-023-00288>

Van Wyk, M. M. (2024). Is ChatGPT an opportunity or a threat? Preventive strategies employed by academics related to a GenAI-based LLM at a faculty of education? *Journal of Applied Learning and Teaching*, 7(1), 35-45. <https://doi.org/10.37074/jalt.2024.7.1.15>

Venkatesh, V. (2022). Adoption and use of AI tools: A research agenda grounded in UTAUT. *Annals of Operations Research*, 308, 641-652. <https://doi.org/10.1007/s10479-020-03918-9>

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478. <https://doi.org/10.2307/30036540>

Waisberg, E., Ong, J., Masalkhi, M., Zaman, N., Sarker, P., Lee, A. G., & Tavakkoli, A. (2023). Google's AI chatbot "Bard": A side-by-side comparison with ChatGPT and its utilization in ophthalmology. *Eye*, 1-4. <https://doi.org/10.1038/s41433-023-02760-0>

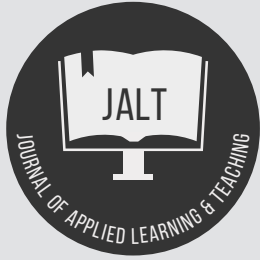
Wang, Y., & Zhao, Y. (2023). *Gemini in reasoning: Unveiling commonsense in multimodal large language models*. arXiv preprint. <https://doi.org/10.48550/arXiv.2312.17661>

Xames, M. D., & Shefa, J. (2023). ChatGPT for research and publication: Opportunities and challenges. *Journal of Applied Learning & Teaching*, 6(1), 390-395. <https://doi.org/10.37074/jalt.2023.6.1.20>

Yeadon, W., & Hardy, T. (2024). The impact of AI in physics education: A comprehensive review from GCSE to university levels. *Physics Education*, 59(2), 025010. <https://doi.org/10.1088/1361-6552/ad1fa2>

Yu, H. (2023). Reflection on whether ChatGPT should be banned by academia from the per-spective of education and teaching. *Frontiers in Psychology*, 14, 1181712. <https://doi.org/10.3389/fpsyg.2023.1181712>

Copyright: © 2025. Abu Elnasr E. Sobaih and Ahmed E. Abu Elnasr. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

## The impact of artificial intelligence use on students' autonomous writing

Ebrahim Mohammad Karimi<sup>A</sup>     *A*     *Language and Development Center, University of Raparin, Kurdistan, Iraq*

Bawar Muhammed Qadir<sup>B</sup>     *B*     *Bayan University, Kurdistan, Iraq*

### Keywords

Artificial Intelligence;  
autonomous;  
creativity;  
Likert-scale questionnaire;  
motivation;  
writing.

### Abstract

This research investigates the impact of Artificial Intelligence (AI) tools on students' independent writing skills, specifically in preparing for the IELTS test in Iran, in light of the growing reliance on artificial intelligence in education. This study employs a mixed-methods research design, supplementing quantitative data from a 29-item Likert-scale questionnaire targeting 103 students with qualitative data from semi-structured interviews with 23 students and 11 teachers. The results indicate that, although artificial intelligence tools contribute largely to the organization, creativity, and self-confidence of the students' writing, most still depend on the teachers for the content. The students have demonstrated increased motivation and versatility in their thinking, with artificial intelligence serving as both an enhancement of their writing skills and a potential threat in the form of unfair criticism or over-reliance. Clearly, teachers can effectively and ethically integrate artificial intelligence into writing instruction to maximize its benefits and minimize its drawbacks. This, in turn, enhances the understanding and appreciation of the potential applications of artificial intelligence in education.

### Correspondence

[Ebrahim.karimi@uor.edu.krd](mailto:Ebrahim.karimi@uor.edu.krd) <sup>A</sup>

### Article Info

Received 24 August 2024

Received in revised form 12 December 2024

Accepted 30 December 2024

Available online 27 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.14>

## Introduction

In contemporary society, artificial intelligence has permeated almost everything, including the construction of our entertainment and healthcare systems. Education has not been left behind in this global technological change (Mohammadkarimi, 2024; Rudolph et al., 2023). Technology, especially AI, is transforming the way people learn languages and even write. Several AI-focused technologies and tools, including grammar-checking software, writing assistant tools, and AI tutors, are becoming common in schools and even among self-learners. As much as most of these tools are for the good of the students, the debates on whether they are encouraging or undermining the students' autonomous writing skills continue (Nazari et al., 2021).

The ability to engage in autonomous writing is a key component that assists students in making sense of the content without writing incoherent, unclear, and ineffective ideas. It is made up of many different cognitive processes, like critical cognitive processes and creative and problem-solving activities (Toufaha, 2024). The concern is that while it is beneficial for students to use these tools, particularly in areas like grammar and style, over-reliance could hinder their ability to develop their own writing voice, a crucial skill in critical thinking (Cardon et al., 2023; Ogunleye et al., 2024; Washington, 2023).

This study employs a mixed-methods research design to explore how AI tools impact students' independent writing skills, particularly in preparation for the IELTS test in Iran. Quantitative data were collected through a 29-item Likert-scale questionnaire completed by 103 students, complemented by qualitative insights from semi-structured interviews with 23 students and 11 teachers. The findings suggest that AI tools enhance students' writing organization, creativity, and self-confidence while exposing a reliance on teacher input for content. Moreover, AI tools foster student motivation and versatile thinking but also pose risks such as over-reliance and susceptibility to unfair criticism.

However, the research acknowledges limitations, including its focus on a single educational context (IELTS preparation in Iran) and reliance on self-reported data, which may affect the generalizability of findings. Despite these constraints, the study contributes to understanding the balance needed to integrate AI tools into writing instruction effectively. By maximizing the benefits of AI while minimizing its drawbacks, this research aims to guide educators and policymakers in leveraging AI for educational advancement.

## Research questions

1. How do students perceive the impact of AI tools on their ability to write autonomously in academic settings?
2. What are students' perceptions of how AI-based writing tools influence their confidence and motivation in developing independent writing skills?

3. According to students, to what extent does the integration of AI in the writing process affect their critical thinking and creativity during autonomous writing tasks?
4. What challenges and limitations do students perceive when using AI tools for autonomous writing instruction?

## Literature review

The use of AI in education and its various dimensions has become one of the issues attracting attention and debates. One domain, which even more recently has shown the importance and power of AI, is in literary and writing skills. One aspect, however, that has raised concern is the emergence of collateral technologies that assist in writing, such as grammar checkers, writing assistants, and even AI tutors, and how they will affect students' ability to write independently (Laredj & Mebarek, 2024).

In looking at the evidence on the influence of AI tools on writing, the findings have not been conclusive. Indeed, several other authors (Lee et al., 2024; Marzuki et al., 2023; Wei et al., 2023) have demonstrated that such tools help develop students' grammar, punctuation, and writing skills. For example, students can use grammar checkers, which help monitor the changes and errors in their writing and give them feedback on the mistakes at each stage. Moreover, AI-based applications that assist in writing can provide guidance on how to rephrase a sentence, use better words, or write more coherently.

A number of other research papers (Osasona et al., 2024; Stahl et al., 2023; Wach et al., 2023) have expressed some skepticism regarding the implications of increasing dependency on AI tools. It is feared, for instance, that such students will use less and less of their own brains and critical thinking skills in coming up with ideas (Malik et al., 2023). Other scholars (e.g. Barrot, 2023; Mohammadkarimi, 2023) also point out that such tools as AI might have limitations in that it might not be able to structure the language as finely as a human can write, thereby defeating the purpose of improving students' writing.

In addition, sometimes the effectiveness of AI tools is determined by a more complex set of variables, such as the tool itself, its appropriateness to the students, and the purposes of using the tools. For instance, students who are experiencing challenges with the use of basic grammar and punctuation might benefit from the aid of AI tools in their written compositions; however, for students wanting to advance to a higher level where they can integrate writing style with logical argumentation, these tools might not be very helpful (Alshumaimeri & Alshememry, 2024; Grájeda et al., 2024; Owan et al., 2023).

As much as the tools are likely to boost the students' writing abilities, they may also affect other aspects, such as the students' writing motivation as well as engagement. According to some researchers (Huang et al., 2023; Silitonga et al., 2023; Song & Song, 2023), the AI tools were found to be helping students motivationally and the formation of self-



confidence through instant stimulation and reinforcement. In contrast, other studies (Ivanov, 2023; Parsakia, 2023) have shown that overuse of AI tools results in demotivation and diminish the creativity of the students as they depend too much on the props' recommendations and feel inactive in the creation process.

To add, there have been conversations on the ethics of educational tools that employ artificial intelligence (Klimova et al., 2023; Kooli, 2023). It has been argued that such tools may facilitate bias and discrimination, especially when the materials used to train them are unbalanced across genders and ethnic groups (Farahani & Ghasemi, 2024; Roshanaei, 2024). In addition, using artificial intelligence devices in learning environments creates issues such as compromised privacy and security of students' information and data (Konidena et al., 2024; Li, 2024; Modi, 2023).

A sizable body of literature has emerged on using AI writing applications in learning English, examining the quality of writing, the degree of autonomy, and academic dishonesty tendencies (e.g. Ahmad et al., 2024; Sullivan et al., 2023; Van Wyk, 2024). Marzuki et al. (2023) investigated QuillBot and Chat-GPT as AI writing tools for EFL learners and found that content and organization improved substantially. This study also reinforced the positive view of these tools when it comes to the enhancement of student autonomy. It seemed that AI could assist in self-learning by encouraging doing away with teachers for simple writing tasks. Alharbi (2023), on her part, performed a meta-analysis of AI writing applications and examined different classes of these applications, including feedback-based and text-generation applications. While AI tools provide gains, Alharbi highlighted some mixed pictures in the literature, especially about the impact of AI on students' self-sufficiency and analytical skills in the long run.

Conversely, Gayed et al. (2022) deliberated on the cognitive challenges encountered by EFL learners in the course of writing. They demonstrated how their AI tool, named "AI KAKU", enabled students to free their minds and concentrate on higher-order cognitive tasks such as looking for information and structuring it, which facilitates independent writing. Similar sentiments focused on cognitive relief were captured by Nazari et al. (2021), who carried out a randomized trial with postgraduate students in which it was shown that writing processes when enhanced by AI tools, improved behaviour and cognition engagement. These findings were important in showcasing the beneficial role of AI with regard to self-efficacy among students, as it enabled them to write without external assistance.

Nevertheless, even with all these, apprehensions are raised about the excessive dependence on AI tools and how it may affect the creativity and critical thinking of the students. Godwin-Jones (2022) expressed the potential ethical concerns regarding employing AI to produce textual content automatically, as such a task could diminish the requirement for inventiveness and original thought in discovering solutions and writing assignments. His observations explained why the use of AI tools needed to be managed by the instructor so that the students do not completely depend on technology in their interaction with

the information.

Furthermore, Mohammadkarimi (2023) elaborated on some of these ethical issues, particularly those regarding AI-written papers and the propensity for academic misconduct. However, his investigation into teachers' views on the integration of AI in education showed ambivalence with suspicions that AI could facilitate cheating and mushroom the problem of students' disengagement with scholarly activities. It was noticed by teachers that the use of AI writing support systems is convenient but has every prospect of complicating the issue of plagiarism detection and the concept of students' free will in writing in the first place. In this regard, it was noted that the very resolution of ethical concerns is largely dependent on teachers, but also their proper training and availability of anti-plagiarism software for effective integration of AI are essential.

Responding to these concerns, Liu et al. (2023) proposed the model of a reflective thinking promotion mechanism to be integrated into AI writing supportive tools so as to promote cognitive engagement among users. A quasi-experiment performed by their team indicated that environments that allow for AI-assisted writing can also enhance one's capacity for self-directed learning without over-exerting the mental effort, hence stimulating creativity and critical analysis as long as there are teaching methods in place intended for the learners on the utilization of AI tools.

There are many studies that have explored the intersection of writing and artificial intelligence, but not much attention is drawn to the effect that the use of AI tools over time has on students' ability to write autonomously. The research works focused on such tools demonstrated their efficiency in improving students' writing performance. However, this performance-enhancing approach needs more longitudinal studies that focus on the impact of the tools over time. Lastly, there is a need to conduct more research addressing how effective writing instruction and AI-based scarce resources can work in developing independent writers.

## Methodology

### Research design

This study employs a mixed-methods approach, combining both quantitative and qualitative methods to gather a comprehensive understanding of the impact of AI tools on students' autonomous writing abilities. The quantitative aspect involves a Likert-scale questionnaire to assess students' perceptions of AI's effect on their writing, confidence, motivation, critical thinking, and creativity. The qualitative component includes semi-structured interviews with both students and teachers to explore their experiences with AI tools in writing instruction more deeply. The combination of quantitative and qualitative data offers both broad insights and deep personal experiences, contributing to the growing field's role in education.

## Participants

The research includes 103 students from six classes and 19 instructors at an IELTS training center in Iran. The learners were enrolled in an IELTS course. Convenience sampling has been used to choose participants based on their accessibility and desire to engage in the research. It is noteworthy that certain learners had previously undertaken the IELTS examination, while others had not. They are categorized into three categories according to their prior IELTS examinations or institutional placement tests. Tables 1 and 2 provide more information on these individuals.

Table 1. Learners' demographic information.

No	Male	Female	IELTS bound	Age (average)
103	44	59	4-5= 29 5-6= 41 6-6.5= 33	29 years

Table 2. Teachers' demographic information.

No	Female	Male	Age (average)	Teaching experience (average)
19	11	8	35	12

## Data collection

The participant students received a Likert-scale questionnaire with 29 items in both English and Persian, their first language. The questionnaire was designed by the researcher, and its reliability was 0.86, which was identified by Cronbach's Alpha measure. The questionnaire addresses aspects such as the impact of AI on students' independent writing abilities, motivation, confidence, critical thinking, and creativity. The procedure for distributing and collecting the questionnaire took about two weeks. Respondents were presented with several statements about their use of AI tools in writing and asked to rate their level of agreement on a 5-point Likert scale ranging from strongly disagree to strongly agree. A purposive sampling of 23 students and 11 teachers conducted semi-structured interviews. For low-level students (based on their exam levels), the Persian language was used, while other interviews were conducted in English. The interviews probed the experiences of the participants with autonomous writing using AI tools: in particular, problems, advantages, and scope of use. The semi-structured format permitted the inclusion of responses to oral questions as well as essays, including questions on the exploration of the effects of AI tools.

## Data analysis

In order to give a general overview of the students' responses, trends about their opinions on AI and self-writing tendencies among students were described using descriptive statistics for the Likert-scale questionnaire data collected. Interview transcripts were reviewed and analyzed according to thematic analysis. The core themes discovered in the analysis were centered on the impact of AI tools on automatic writing, the enhancement of critical and creative

thinking skills, and the issues, if any, concerning the students and the educators. Coding was employed to manage identical responses, leading to a deeper insight into the use of AI writing among the users.

## Ethical considerations

Participation in the study was voluntary, and informed consent was obtained from all participants. Students and teachers were assured that their responses would remain anonymous and confidential. Participants had the right to withdraw from the study at any point without penalty. Additionally, ethical approval was sought from the institution before data collection began.

## Results

### Questionnaire

Table 3. AI tools and autonomous writing ability.

Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. I rely less on my teacher for writing support when I use AI tools.	6%	9%	2%	52%	31%
2. AI tools help me structure my writing independently.	20%	39%	0%	39%	2%
3. The use of AI tools allows me to generate original content without external help.	22%	52%	2%	24%	0%
4. I feel more comfortable tackling writing assignments on my own due to AI feedback.	46%	52%	0%	4%	0%
5. AI has made me more independent in revising and editing my work.	46%	54%	0%	2%	0%
6. I often find it hard to write without using AI tools after relying on them for a while.	7%	17%	0%	63%	13%

Based on Table 3, the results of the "AI Tools and Autonomous Writing Ability" section indicate that while AI tools enhance students' ability to structure, generate content, and revise independently, a significant number still rely on teacher support (83% either disagree or strongly disagree). Most students (around 70%) find AI beneficial for structuring their work and generating original content, and nearly all feel more comfortable and independent with assignments due to AI feedback. However, despite these gains, students do not feel overly dependent on AI, with most able to continue writing without its help (76% disagree with reliance concerns).

The results from Table 4 reveal that AI tools have a positive impact on students' confidence and motivation. A significant majority (85%) report increased confidence in their writing skills, with a similar percentage (91%) feeling more motivated to improve their writing when using AI tools. AI feedback also boosts self-esteem for 85% of students and enhances confidence in self-editing for 87%. Additionally, 74% feel encouraged to take on more challenging writing tasks due to AI, although a small minority remains neutral or disagrees with this point.

Table 4. AI tools and student confidence and motivation.

7. AI tools have increased my confidence in my writing skills.	24%	61%	2%	11%	2%
8. I feel more motivated to improve my writing when using AI tools.	28%	63%	0%	9%	0%
9. Receiving feedback from AI tools boosts my self-esteem as a writer.	24%	61%	2%	11%	2%
10. I am more confident in my ability to self-edit because of AI feedback.	24%	63%	0%	11%	2%
11. AI-based writing tools encourage me to take on more challenging writing tasks.	17%	57%	9%	13%	4%

Table 5. AI integration and critical thinking/creativity.

12. AI tools help me think critically about the structure of my writing.	26%	63%	0%	7%	4%
13. The use of AI tools has enhanced my ability to analyze arguments in my writing.	26%	61%	2%	7%	7%
14. AI-based suggestions inspire me to be more creative in my writing.	24%	61%	2%	11%	2%
15. The feedback from AI tools challenges me to think deeper about the content of my writing.	26%	65%	0%	7%	2%
16. AI tools encourage me to explore new and creative ideas in my writing assignments.	26%	63%	2%	11%	0%
17. AI tools help me identify flaws or weaknesses in my arguments during writing.	24%	63%	2%	9%	2%

The results from Table 5 show that AI tools positively impact students' ability to think critically and creatively during the writing process. A majority of students (89%) feel that AI helps them think critically about their writing structure, and 87% believe AI enhances their ability to analyze arguments. Additionally, AI-based suggestions inspire creativity for 85% of respondents, with 91% stating that AI feedback encourages deeper thought about content. Moreover, 89% of students report that AI tools help them identify weaknesses in their arguments, further supporting critical thinking development. These findings suggest that AI tools not only improve the technical aspects of writing but also foster higher-order thinking skills, such as critical analysis and creativity.

Table 6. Challenges and limitations of AI tools in writing.

18. I sometimes feel too reliant on AI tools for writing feedback.	39%	54%	0%	7%	0%
19. AI tools often fail to understand the deeper context of my writing.	13%	22%	13%	39%	13%
20. AI feedback is sometimes too generic to address the specific issues in my writing.	11%	28%	7%	35%	19%
21. I have experienced difficulty adapting AI suggestions into my personal writing style.	2%	15%	4%	70%	9%
22. AI tools limit my ability to experiment with creative writing approaches.	0%	11%	7%	63%	19%
23. I worry that using AI too much will reduce my ability to write without assistance.	13%	15%	7%	46%	19%
24. I worry that using AI tools might affect my long-term writing skills negatively.	13%	15%	7%	46%	19%

The results from Table 6 highlight several key concerns students face when using AI tools. A large proportion (93%) feel somewhat reliant on AI for feedback, and 35% believe AI often fails to grasp deeper context, indicating limitations in understanding complex or nuanced writing. Around

39% find AI feedback too generic for specific issues, while 70% have little difficulty adapting AI suggestions to their writing style. Most respondents (63%) disagree that AI limits creativity, but some (28%) worry that over-reliance on AI may negatively affect long-term writing skills. This indicates that while AI tools are helpful, students are concerned about dependency and the tools' contextual limitations.

Table 7. General perceptions of AI in writing.

25. AI tools make the writing process faster and more efficient.	22%	74%	0%	4%	0%
26. I find AI feedback more objective than feedback from human instructors.	19%	56%	13%	15%	7%
27. AI tools have positively impacted my overall writing experience.	54%	46%	0%	0%	0%
28. I believe AI tools are useful, but they should not replace teacher feedback.	20%	56%	0%	13%	11%
29. AI feedback helps me better understand grammatical and stylistic mistakes.	28%	70%	0%	2%	0%

According to Table 7, the results from the "General Perceptions of AI in Writing" section indicate that students have a positive view of AI tools. A significant majority (96%) feel that AI makes the writing process faster and more efficient, while 72% believe that AI feedback is more objective than human instructors, although a minority (22%) prefer human feedback. All respondents agree that AI has positively impacted their overall writing experience, but 76% believe AI should complement rather than replace teacher feedback. Additionally, 98% found AI helpful for identifying grammatical and stylistic mistakes. Overall, AI is seen as beneficial, though not a replacement for human input.

## Interviews

The interview questions aligned with the study's key research questions, particularly the impact of AI tools on students' autonomous writing. The responses demonstrate a wide range of experiences, which indicate different levels of reliance on AI for autonomy.

For instance, Student 19 stated that while AI simplified the process of organizing essays, it still made them dependent on teachers for in-depth assessment: "I'm more independent, but not entirely." In the same vein is Student 2, who talked of being more independent with the use of AI: "I feel more confident writing on my own ever since I started using AI, more so in organizing ideas." While these advancements promoted self-efficacy in the learners, the teachers presented slightly different views. Teacher 4 observed that "There is less teacher reliance on the part of the student for grammatical correctness, but they still seek guidance for deeper content." This observation highlights that AI has the potential to enhance learning, albeit to a limited degree, which could potentially benefit students. Teacher 9 echoed this, believing that while AI assisted students in achieving some degree of independence in their revision, the teacher's input was still necessary for writing, which is both creative and analytical.

These instances highlight a bimodal phenomenon. As previously mentioned, AI does not completely remove the teacher's role in guiding students through intricate tasks. Such enabling conditions existed, but they lacked the lived experience necessary for complete autonomy.

In terms of AI's influence on motivation and confidence, all students generally reported positive experiences. Student 3 added, "I positively receive AI feedback because it helps me locate errors quicker and I become confident." In the same way, Student 18 reported motivation to engage in difficult challenges as a result of the AI improving her task performance almost instantly. Teachers also reported similar results, with Teacher 11 stating that while students had increased confidence, they remained cautious when faced with more challenging tasks. Teacher 5 elaborates on this, suggesting that relying on AI for credentials could potentially degrade the quality of written work, posing a challenge in promoting self-directed writing.

The use of AI in the enhancement of reasoning and creativity tendencies was received rather differently. For instance, while Student 10 was a fan of AI help with essay outlines, "the suggestions are too brief and common, which almost inhibits creativity." However, Student 6 asserts that while AI tools encourage the use of imagination, crafting arguments outside of their context is necessary. For instance, Teacher 8 observed that students using AI improved their critical thinking skills, but some students became so creative that they forgot discipline. Teacher 1 made the same note, explaining that students "obey the instructions of AI authors too well," which stifles any creative processes.

Student 7, in turn, spoke about challenges and limitations, presenting the concern of possible excessive dependence on AI, which creates a situation where one cannot effectively write without external help: "It's difficult to strike a balance." Also, Student 16 pointed out that the feedback from AI lacks a personal touch, stating, "It is difficult to convert AI ideas into my own style." Teachers, too, pointed out some challenges associated with AI; Teacher 6, for instance, said that "AI lacks the appreciation of the context that is more profound."

In this regard, there is a constructive appreciation of the advantages of AI tools: they offer clear benefits, particularly in terms of independence, self-assurance, and analytical skills, but they also come with drawbacks such as dependency, a lack of creative expression, and a lack of context understanding. However, teachers must address these issues to foster a more balanced approach to writing with AI tools.

## Discussion

It is undeniable that the introduction of various artificial intelligence tools in educational settings, especially in boosting students' skills in writing, has both advantages and disadvantages. The current study aimed at examining the extent to which students' capacity for writing—that is, their level of ability to put down their thoughts independently, their confidence and motivation, the effects on their level of

critical thinking and creativity, and the possible difficulties involved concerning teaching writing with the help of AI—is affected by AI technologies. Employing a mixed-methods methodology that consisted of a survey and interview, aspects concerning the extent to which the use of AI technology affects students' writing experience were discussed.

The first research question was directed at finding out the effect of using AI tools on students' writing independence in academic contexts. The findings pointed out that students' writing performance improved significantly, especially in organizing and composing their pieces of work. Agreed by most students, several tools, such as grammar checkers and writing help apps, facilitated idea organization, which is similar to the results of Marzuki et al. (2023), who showed that EFL students' use of AI tools had beneficial results on content organization. Many of the students, however, confessed that a large portion of them still needed teacher support for better content backing than that offered by fellow students. This phenomenon means that there is a degree of independence that is fostered, but it also means that it is not all the time that one can do without the instructor.

Interestingly, the feedback from teachers also confirms this finding, as a great number of them noted higher levels of independence from the learners while using AI for revision or grammar check. Teacher responses pointed out that in as much as students' technical writing skills are supplemented by the use of AI tools, the students still want the instructors either to engage them critically or assist them in creative writing. This relates to the wider argument in the literature, which argues that there is potential for the use of AI to promote self-directed learning; however, there should be a healthy ratio of technology and human being management (Lee et al., 2024; Godwin-Jones, 2022). The varied 'I can' statements about the use of AI tools reinforce the argument for a way of teaching that positions AI as an adjunct for use by students who are active in the making of texts and are able to be sustained as active writers free from intervention. The second research question focused on how the use of AI-based writing tools contributes to the students' self-efficacy and writing motivation to produce written work autonomously. The current data in his study revealed that most participants declared enhancement of their confidence and motivation through the use of AI tools. For example, many students said that due to the speed at which they could get any correction through AI tools, they became more confident in identifying their errors. This is in line with a study by Huang et al. (2023), which implies that students are likely to write more and better with less time between the task and the feedback.

In addition, the interviews showed that, in the opinion of the students, completing the difficult writing tasks was easier with the use of the AI tools. At the same time, some of the teachers also indicated that even if the students are encouraged to write by the use of AI applications, the latter does not completely dispel the fright that students experience when faced with high order writing tasks. This observation poses an interesting dilemma, which is, how to provide timely guidance without undercutting the students' readiness to work on difficult writing tasks on their own.

The implication of the overall findings is that AI instruments are useful in boosting students' morale and encouraging them to write. However, this finding also suggests the danger of over-reliance on such tools, which may hamper writing progress for the learners. For instance, Ivanov (2023) posits that students lose their writing competence because they have gotten accustomed to using AI to enhance their work and provide feedback without mastering the skills. This necessitates a writing curriculum that incorporates the use of these AI tools strategically to enhance students' writing while also aiming to build coping skills and confidence in the students.

The third research question sought to explore how far the inclusion of AI in the writing process enhances or inhibits students' creativity and critical thinking while doing the writing task on their own. The findings showed that the use of AI tools was positively correlated with the critical thinking skills of students. A number of students stated that they thought more about the organization of their writing and the arguments they made, thanks to AI tools. Nonetheless, negative aspects were also mentioned in regard to AI sources, especially in terms of the worries that some students had regarding the limits of AI inputs, which they believed were too basic and not challenging enough.

This supports the findings of Godwin-Jones (2022), who noted that while the use of AI tools may aid the critical thinking processes of individuals, it can also kill their creative faculties, especially when students become dependent on unsolicited input. Teachers were also concerned, arguing that while such AI aids are meant to help students with the analysis of their writing, some students might be losing creative engagement as a risk of following the advice of AI. This suggests that such tools must be used with the understanding that AI feedback is only a surface-level understanding of that portion of the essay or work that needs attention and more needs to be done instead of just incorporating it.

In addition, the reactions show that AI applications should assist proper writing by the students but not completely take over the creative dimension of writing. Educators will be very important in this respect, as they will motivate and encourage students to be wary of AI tools, even as they employ technology to enhance creativity and critical thinking. These are very much in line with Liu and colleagues (2023), who described the importance of developing AI critical engagement teaching models.

The last research question examined the possible impediments and shortcomings of the adoption of AI tools in independent writing instruction. The results demonstrated the presence of a mix of apprehensions among the students and the teachers regarding the excessive use of AI tools. Several students pointed out that their occasional need for an AI tool affected their ability to create and edit written work independently, which represents a huge barrier to integrating new technologies in education. Additionally, a very real worry exists about the issue of dependability: in particular, how much AI technology can be used without compromising the independent writing of students.

Furthermore, both pupils and educators emphasized the disadvantages of AI tools in grasping the context and finer details associated with various forms of writing. A considerable number of students encountered problems with the AI appraisal as it was too standard for addressing individual writing preferences, thus making it difficult to make changes to their writing. This is consistent with previous findings that have expressed worries over the gap existing in the representation of languages by AI technologies (Klimova et al., 2023; Godwin-Jones, 2022). The educators pointed out that students tended to submit work devoid of substance as a result of the use of AI, hence the need to control the use of AI tools when teaching students how to write.

On the other hand, some instructors accepted that AI is beneficial in enhancing literacy skills development but cautioned that there is a need for continuous training of teachers so that they can teach with the application of AI effectively. This showcases how crucial the training of the teachers is when it comes to the challenges that the AI tools present and the use of such tools to facilitate the writing process instead of impeding it.

To conclude, this study demonstrates the multifaceted relationship that exists between the writing skills of students and AI tools. It can be argued that the use of AI tools can lead to improvements in technical writing skills, as well as increases in self-confidence and motivation. However, the downsides of this approach include overreliance and the challenges associated with independence. Moreover, the distinction between the students at different levels was not significant. This could be attributed to their similar assignments and goals. Hence, the policy should also look for an appropriate way to use AI to ensure that it does not interfere too much with conventional teaching approaches and still allows the students to write independently. In this regard, the present research contributes to the existing literature by discussing AI and education, opening a channel of comprehension for practitioners and scholars eager to understand the impending growth of AI in the context of language acquisition.

## **Conclusion and implications of the study**

### **Implications**

The results of the study regarding the use of AI and its effect on students' autonomous writing skills would be useful for educators and language curriculum policymakers. The implications are:

1. Integration of AI tools in curriculum: As the research shows, applications of AI writing tools enable students to write better and more confidently, and this has prompted an appeal to teachers to include them in the administration. However, such tools should be used alongside conventional methods, giving students the writing process as much focus as possible without the need to use them.
2. Balanced approach: There is no doubt that AI tools provide a shortcut route towards achieving

better writing standards for students. However, overdependence on such facilities may impede the growth of independent thinking among the students. Therefore, while it is possible to use AI so that students get feedback fast, teachers need to be careful to avoid situations where students do not internalize the writing process and practice autonomous writing. This means that students' levels of writing skills have to be continuously monitored.

3. Professional development for teachers: In this regard, the research calls for effective in-service training of teachers to understand the role of technology in teaching writing clearly. Programs offered should orient teachers on how to properly direct students in the use of AI tools to maintain their imagination and thinking. Most of this would be directed towards assisting the teachers to appreciate the role of AI and its limitations in ensuring a conducive environment for the students.
4. Promoting critical thinking and innovation: Since AI tools can sometimes avert creativity, leading to approximated responses, instructors need to stress the need for out-of-the-box thinking and creativity when it comes to writing. Rather, the use of AI in this process should be that of input which enhances critical thinking and creativity. This may come in the form of assignments that require students to disagree with the AI responses and build their own arguments.
5. Considering social responsibility: It is also important to address the social responsibility of the use of AI in education. The universities and the teachers have to discuss the problem of cheating and the way that artificial intelligence can encourage such activities. There is a need to ensure the responsible use of AI, and such measures may include discussions on the use of AI to commit plagiarism and training on the critical use of AI-created content by the users.
6. Directions for further research: In this respect, the study demonstrates all the gaps existing in the examined literature about the development of students' writing skills for the long-term period after the incorporation of AI tools into the learning process. Additional studies are necessary that will assess the long-term outcomes of the implementation of woven AI tools and strategies, focusing on different contexts and target students. Apart from that, if time-controlled research is performed, it might be feasible to comprehend which AI instruments are appropriate to increase independence in writing when learning processes are coupled with specific methodologies of work for the students.

7. Engaging students in evaluation: Finally, this would be the last consideration that students' engagement in the work related to the evaluation of the AI instruments and their role in improving writing would be beneficial. Gathering students' feedback on their use and perception of AI for writing instruction will help educators improve their methods and solve new issues as they arise. This will make the students active as well as give them that sense of ownership.

The findings of this research call for proper consideration and a strategic approach while designing curricula that more actively incorporate AI writing tools. Depending on the situation and by seeking student independence without losing the advantages of AI, it is possible to optimize the writing process for the students and further cultivate their critical and creative faculties.

### **Conclusion**

The present research has examined the role of space technology in facilitating autonomous writing among students, outlining the pros and cons of its use in education. The study shows that AI technologies are beneficial in improving writing abilities among students and building their self-esteem to take on more difficult assignments. At the same time, the results show that students also have a tendency to overuse such devices, which can be detrimental to their self-writing and analytical skills. It should be mentioned that there were no significant differences between the responses of the students at different levels.

The advantage is significant because algorithms are capable of assisting at almost every step of the writing endeavor, including formatting, editing, and composing. However, while students have largely claimed to have improved both the quality of their writing and the level of their participation, there are still concerns over AI's feedback, where it is often construed as bland and lacking recognition of subtle context. The inputs from the learners and teachers alike warrant careful consideration on the aspect of the use of AI, suggesting that it helps to enhance learning but cannot be used as a substitute for teaching where there is a need for creativity and critical thinking.

To these ends, the research also emphasizes the need for formulating pedagogical policies that will take into account the consequences of the use of artificial intelligence. In the process of using AI for teaching purposes, however, many educators are at a loss as to how to ensure that academic honesty is upheld and that students do not become dependent on technologies. It is important to provide teachers with training as part of their professional development in order to help them teach children how to use AI tools without suppressing autonomy and original thinking.

This study adds to the existing corpus of literature by examining the use of AI as a tool that can help students develop their writing abilities. It advocates for longitudinal studies focused on the use of AI tools and their remediation.

More specifically, the research indicates that there is a need for teaching approaches that consciously promote the students' growth as independent authors. Considering the strengths and weaknesses of AI tools, teachers will be in a better position to prepare the students for writing effectively in some time to come.

This research has multiple limitations, which will be worthwhile for further investigations. To begin with, the population size was small, comprising only 103 EFL learners from one IELTS training institute. In order to make the findings of the present research applicable in other settings, more varied sampling should be carried out in future studies from all groups in the educational spectrum. Participants should include different ages and levels of proficiency and, of course, races and ethnicities.

In addition, carrying out the research in such a short time or in a span limited the research to the short-term effects of AI tools on writing skills. It is suggested that longitudinal types of studies be carried out to look at the long-term effect of the AI tools; this will allow the researchers to go beyond the writing skills at a given time.

In addition to this, solutions for different writing challenges were discussed, which were limited to a few chosen AI writing tools; therefore, future studies could focus on many more tools to determine how effective and user-friendly they are. Including qualitative aspects such as classroom dynamics and the reactions of teachers will help provide better clarity of the application of AI tools in teaching writing.

Last but not least, an examination of training across schools regarding the use of AI tools is highly suggested. Teacher ideas and encounters about using AI tools could give perspective regarding AI tool use and its relation to students and their learning. These limitations and suggestions can be modified and adopted in future work to enhance the understanding of the role of technology in the autonomous writing of EFL students.

## References

Ahmad, M., Subih, M., Fawaz, M., Alnuqaidan, H., Abuejheisheh, A., Naqshbandi, V., & Alhalaiqa, F. (2024). Awareness, benefits, threats, attitudes, and satisfaction with AI tools among Asian and African higher education staff and students. *Journal of Applied Learning and Teaching*, 7(1), 57-64. <https://doi.org/10.37074/jalt.2024.7.1.10>

Alharbi, W. (2023). AI in the foreign language classroom: A pedagogical overview of automated writing assistance tools. *Education Research International*, 2023(1), 4253331. <https://doi.org/10.1155/2023/4253331>

Alshumaimeri, Y. A., & Alshememry, A. K. (2024). The extent of AI applications in EFL learning and teaching. *IEEE Transactions on Learning Technologies*, 17, 653-663. <https://doi.org/10.1109/tlt.2023.3322128>

Barrot, J. S. (2023). Using ChatGPT for second language writing: Pitfalls and potentials. *Assessing Writing*, 57, 100745.

<https://doi.org/10.1016/j.asw.2023.100745>

Cardon, P., Fleischmann, C., Aritz, J., Logemann, M., & Heidewald, J. (2023). The challenges and opportunities of AI-assisted writing: Developing AI literacy for the AI age. *Business and Professional Communication Quarterly*, 86(3), 257-295. <https://doi.org/10.1177/23294906231176517>

Farahani, M., & Ghasemi, G. (2024). *Artificial intelligence and inequality: Challenges and opportunities*. Qeios. <https://doi.org/10.32388/7HWUJ2>

Gayed, J. M., Carlon, M. K. J., Oriola, A. M., & Cross, J. S. (2022). Exploring an AI-based writing assistant's impact on English language learners. *Computers and Education: Artificial Intelligence*, 3, 100055. <https://doi.org/10.1016/j.caeai.2022.100055>

Godwin-Jones, R. (2022). Partnering with AI: Intelligent writing assistance and instructed language learning. *Language Learning & Technology*, 26(2), 5-24. <http://doi.org/10125/73474>

Grájeda, A., Burgos, J., Córdova, P., & Sanjinés, A. (2024). Assessing student-perceived impact of using artificial intelligence tools: Construction of a synthetic index of application in higher education. *Cogent Education*, 11(1), 2287917. <https://doi.org/10.1080/2331186X.2023.2287917>

Huang, A. Y., Lu, O. H., & Yang, S. J. (2023). Effects of artificial intelligence-enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. *Computers & Education*, 194, 104684. <https://doi.org/10.1016/j.compedu.2022.104684>

Ivanov, S. (2023). The dark side of artificial intelligence in higher education. *The Service Industries Journal*, 43(15-16), 1055-1082. <https://doi.org/10.1080/02642069.2023.2258799>

Klimova, B., Pikhart, M., & Kacetyl, J. (2023). Ethical issues of the use of AI-driven mobile apps for education. *Frontiers in Public Health*, 10, 1118116. <https://doi.org/10.3389/fpubh.2022.1118116>

Konidena, B. K., Malaiyappan, J. N. A., & Tadimarri, A. (2024). Ethical considerations in the development and deployment of AI systems. *European Journal of Technology*, 8(2), 41-53. <https://doi.org/10.47672/ejt.1890>

Kooli, C. (2023). Chatbots in education and research: A critical examination of ethical implications and solutions. *Sustainability*, 15(7), 5614. <https://doi.org/10.3390/su15075614>

Laredj, H., & Mebarek, F. N. E. (2024). *Investigating the dynamic interaction between human language and artificial intelligence tools: AI writing assistants as a case study* [Unpublished doctoral dissertation]. Ibn Khaldoun University-Tiaret.

Lee, Y. J., Davis, R. O., & Lee, S. O. (2024). University students' perceptions of artificial intelligence-based tools for English

- writing courses. *Online Journal of Communication and Media Technologies*, 14(1), e202412. <https://doi.org/10.30935/ojcm/14195>
- Li, Z. (2024). Ethical frontiers in artificial intelligence: Navigating the complexities of bias, privacy, and accountability. *International Journal of Engineering and Management Research*, 14(3), 109-116. <https://doi.org/10.5281/zenodo.12792741>
- Liu, C., Hou, J., Tu, Y. F., Wang, Y., & Hwang, G. J. (2023). Incorporating a reflective thinking promoting mechanism into artificial intelligence-supported English writing environments. *Interactive Learning Environments*, 31(9), 5614-5632. <https://doi.org/10.1080/10494820.2021.2012812>
- Malik, A. R., Pratiwi, Y., Andajani, K., Numertayasa, I. W., Suharti, S., & Darwis, A. (2023). Exploring artificial intelligence in academic essay: Higher education student's perspective. *International Journal of Educational Research Open*, 5, 100296. <https://doi.org/10.1016/j.ijedro.2023.100296>
- Marzuki, Widiati, U., Rusdin, D., Darwin, & Indrawati, I. (2023). The impact of AI writing tools on the content and organization of students' writing: EFL teachers' perspective. *Cogent Education*, 10(2), 2236469. <https://doi.org/10.1080/231186X.2023.2236469>
- Modi, T. B. (2023). Artificial intelligence ethics and fairness: A study to address bias and fairness issues in AI systems, and the ethical implications of AI applications. *Revista Review Index Journal of Multidisciplinary*, 3(2), 24-35. <https://doi.org/10.31305/rrijm2023.v03.n02.004>
- Mohammadkarimi, E. (2023). Teachers' reflections on academic dishonesty in EFL students' writings in the era of artificial intelligence. *Journal of Applied Learning and Teaching*, 6(2), 105-113. <https://doi.org/10.37074/jalt.2023.6.2.10>
- Mohammadkarimi, E. (2024). Exploring the use of artificial intelligence in promoting English language pronunciation skills. *LLT Journal: A Journal on Language and Language Teaching*, 27(1), 98-115. <https://doi.org/10.24071/llt.v27i1.8151>
- Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of artificial intelligence powered digital writing assistant in higher education: Randomized controlled trial. *Heliyon*, 7(5), e07014. <https://doi.org/10.1016/j.heliyon.2021.e07014>
- Ogunleye, B., Zakariyyah, K. I., Ajao, O., Olayinka, O., & Sharma, H. (2024). Higher education assessment practice in the era of generative AI tools. *Journal of Applied Learning and Teaching*, 7(2), 46-56. <https://doi.org/10.37074/jalt.2024.7.1.28>
- Osasona, F., Amoo, O. O., Atadoga, A., Abrahams, T. O., Farayola, O. A., & Ayinla, B. S. (2024). Reviewing the ethical implications of AI in decision making processes. *International Journal of Management & Entrepreneurship Research*, 6(2), 322-335. <https://doi.org/10.51594/ijmer.v6i2.773>
- Owan, V. J., Abang, K. B., Idika, D. O., Etta, E. O., & Bassey, B. A. (2023). Exploring the potential of artificial intelligence tools in educational measurement and assessment. *Eurasia Journal of Mathematics, Science and Technology Education*, 19(8), em2307. <https://doi.org/10.29333/ejmste/13428>
- Parsakia, K. (2023). The effect of chatbots and AI on the self-efficacy, self-esteem, problem-solving and critical thinking of students. *Health Nexus*, 1(1), 71-76. <https://doi.org/10.61838/hn.1.1.14>
- Roshanaei, M. (2024). Towards best practices for mitigating artificial intelligence implicit bias in shaping diversity, inclusion and equity in higher education. *Education and Information Technologies*, 29(14), 18959-18984. <https://doi.org/10.1007/s10639-024-12605-2>
- Rudolph, J., Tan, S., & Tan, S. (2023). War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *Journal of Applied Learning and Teaching*, 6(1), 364-389. <https://doi.org/10.37074/jalt.2023.6.1.23>
- Silitonga, L. M., Hawanti, S., Aziez, F., Furqon, M., Zain, D. S. M., Anjarani, S., & Wu, T. T. (2023, August). The impact of AI chatbot-based learning on students' motivation in English writing classroom. In *International Conference on Innovative Technologies and Learning* (pp. 542-549). Cham: Springer Nature Switzerland. [https://doi.org/10.1007/978-3-031-40113-8\\_53](https://doi.org/10.1007/978-3-031-40113-8_53)
- Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: Assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology*, 14, 1260843. <https://doi.org/10.3389/fpsyg.2023.1260843>
- Stahl, B. C., Antoniou, J., Bhalla, N., Brooks, L., Jansen, P., Lindqvist, B., ... & Wright, D. (2023). A systematic review of artificial intelligence impact assessments. *Artificial Intelligence Review*, 56(11), 12799-12831. <https://doi.org/10.1007/s10462-023-10420-8>
- Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching*, 6(1), 31-40. <https://doi.org/10.37074/jalt.2023.6.1.17>
- Toufaha, S. A. H. K. I. (2024). *The effect of automated error corrective feedback on the improvement of EFL learners' writing and autonomy* (Doctoral dissertation, University Kasdimerbahouargla). DSpace. <https://dspace.univ-ouargla.dz/jspui/handle/123456789/35662>
- Van Wyk, M. M. (2024). Is ChatGPT an opportunity or a threat? Preventive strategies employed by academics related to a GenAI-based LLM at a faculty of education. *Journal of Applied Learning and Teaching*, 7(1), 35-45. <https://doi.org/10.37074/jalt.2024.7.1.15>
- Wach, K., Duong, C. D., Ejdays, J., Kazlauskaitė, R., Korzynski, P., Mazurek, G., ... & Ziemba, E. (2023). The dark side of generative artificial intelligence: A critical analysis of

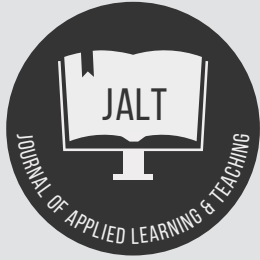


controversies and risks of ChatGPT. *Entrepreneurial Business and Economics Review*, 11(2), 7-30. <https://doi.org/10.15678/eber.2023.110201>

Washington, J. (2023). *The impact of generative artificial intelligence on writer's self-efficacy: A critical literature review*. SSRN Electronic Journal, 4538043. <https://dx.doi.org/10.2139/ssrn.4538043>

Wei, P., Wang, X., & Dong, H. (2023). The impact of automated writing evaluation on second language writing skills of Chinese EFL learners: A randomized controlled trial. *Frontiers in Psychology*, 14, 1249991. <https://doi.org/10.3389/fpsyg.2023.1249991>

Copyright: © 2025. Ebrahim Mohammad Karimi and Bawar Muhammed Qadir. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Assessing the role of AI technology in mitigating the equity gap in educational access in Zimbabwe: Barriers and implications

---

Arthur William Fodouop

A

*Assistant Professor, Sanya University*

Kouam<sup>A</sup>

Regis Misheal Muchowe<sup>B</sup>

B

*Zimbabwe Open University, Department of Business Management*

---

### Keywords

---

Accessibility;  
AI;  
artificial intelligence;  
chatbots;  
educational access;  
equity gap;  
generative artificial intelligence;  
higher education.

### Abstract

---

This study investigates the role of artificial intelligence (AI) technology in mitigating the equity gap in educational access in Zimbabwe. By exploring the potential benefits, limitations, and best practices of using AI technology, this research contributes to a deeper understanding of how AI can address the complex issue of equity in higher education. Data was collected from lecturers and students through interviews, revealing that AI technology offers affordable, independent, personalized learning experiences and student support, enabling vulnerable learners to access educational resources. However, challenges such as the high cost of premium AI platforms, internet accessibility issues, and potential social skills deficits were identified as limitations to widespread implementation. The study recommends developing AI policies, university subscriptions to premium AI technologies, and the rollout of AI chatbots to ensure equitable and accessible learning opportunities for all students. This research sheds light on the importance of leveraging AI technology to promote inclusive education systems and close the equity gap in educational access, offering valuable insights for educational institutions in Zimbabwe and beyond.

---

### Correspondence

willyfodouop@163.com<sup>A</sup>

---

### Article Info

Received 29 February 2024

Received in revised form 30 December 2024

Accepted 2 January 2025

Available online 28 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.15>

## Introduction

An equity gap refers to the disparity in academic achievement, access to resources, and opportunities for learning between students from low-income families and their more affluent peers. It is a persistent issue in higher education access, with the under-representation of disadvantaged groups remaining challenging (Parjanadze & Kapanadze, 2016). It is particularly evident in the lack of progress in improving access for low socio-economic backgrounds, with family income and cultural factors playing a significant role (Ajjawi et al., 2023). Despite efforts to expand access, there is a growing stratification in the quality and prestige of institutions, further exacerbating the equity gap (McCowan, 2016). The complex nature of this issue, which includes the failure of mass higher education systems and equity programs to address social stratification, underscores the need for a reconceptualization of equity in a globalized higher education environment (Baldwin & James, 2010).

Equity in higher education is multifaceted, encompassing both access and outcomes (Wang & Shulruf, 2013). Ling and Nasri (2019) identify key issues in achieving equity, including health equity, building relationships, and promoting a safe environment. Peercy and Svenson (2016) emphasize the role of tertiary education in promoting equitable human development, while Portus et al. (2024) raise critical questions about the definition and impact of equity gaps in education.

A range of factors contribute to the equity gap in higher education access. Government policies and financial support play a significant role, with social backing also crucial (Wanti et al., 2022). Family income and cultural factors, particularly for boys from blue-collar backgrounds, are critical determinants of this gap (Ajjawi et al., 2023). Affirmative action and financial aid programs have effectively promoted equity, but cultural and societal attitudes remain challenging (Kefalaki et al., 2022; Adoui, 2023). Furthermore, lack of information, responsibility, societal involvement, and inadequate state protection are additional barriers to equitable access (Parjanadze & Kapanadze, 2016).

Research offers various strategies to address the equity gap in higher education. Adoui (2023) highlights the effectiveness of affirmative action and financial aid programs but also emphasizes the need to address cultural and societal attitudes. McCowan (2007, 2016) discusses the expansion of access to higher education in Brazil and the UK, respectively, and the need for equitable expansion, including providing quality education. Ward (2006) underscores the importance of federal initiatives, such as GEAR UP, in improving equity and access for low-income and minority students.

Despite the efforts to address the equity gap in educational access, more than traditional approaches are needed to address this issue's complexity. One major limitation of previous studies (Chaudhry et al., 2023; Leenknecht et al., 2023) is their focus on individual-level factors, such as student motivation or teacher effectiveness, rather than systemic issues related to resource allocation or institutional policies.

Another limitation of previous studies is their reliance on static measures of academic achievement or resource allocation rather than dynamic measures that consider changes over time. Moreover, many studies (Chaudhry et al., 2023; Leenknecht et al., 2023) have focused on short-term outcomes rather than long-term impacts on student success or social mobility. In sum, the limitations of traditional approaches have become increasingly apparent. In recent years, there has been growing interest in the potential of artificial intelligence (AI) technology to mitigate the equity gap in educational access. Using AI in higher education, such as predictive modeling, can help identify and support underprivileged students (Cheddadi & Bouache, 2021).

In light of these limitations, this study aims to address the following research question: How can AI technology be used to mitigate the equity gap in educational access?

This study will explore the following research objectives to answer the research question:

- To identify the potential benefits of AI technology for mitigating the equity gap in educational access by addressing systemic issues related to resource allocation and institutional policies;
- To examine the limitations and challenges of using AI technology for this purpose; and
- To identify best practices for implementing AI technology in a way that is equitable and accessible for all students.

This study is significant because it addresses a critical education issue with substantial social and economic consequences. By exploring the potential benefits, limitations, and challenges of using AI technology to mitigate the equity gap in educational access, this study will contribute to understanding how AI can effectively address this issue. Moreover, by providing recommendations on how AI technology can be used equitably and accessibly for all students, this study will help ensure that AI-based interventions are socially responsible and beneficial for all members of society.

This paper is structured as follows: In the next section, we present a comprehensive literature review and the theoretical framework. The subsequent section outlines the research methodology, detailing the data collection and analysis methods employed to address the research objectives. We then present and discuss the findings, followed by a robust analysis and interpretation in the subsequent section. Finally, we conclude the paper with a summary of the key findings, insights, limitations, and directions for future research.

## Literature review and theoretical framework

Artificial intelligence technology in education has become increasingly prevalent due to the growing need for scalable, adaptive, and personalized learning experiences. Incorporating AI chatbots and software tools in higher education can enhance student learning experiences,

support educators and administrators in their tasks, and potentially mitigate the equity gap in educational access. However, while AI technology shows promise, addressing its potential limitations and unintended negative consequences is crucial to ensure that it is accessible and beneficial for all learners (Ahmad et al., 2024; Sevnarayan & Potter, 2024).

### **The advent of AI technology in the realm of education**

The rise of AI technology in education can be ascribed to the increasing need for scalable, personalized, and adaptive learning experiences. The implementation of chatbots in education has begun (Winkler & Söllner, 2018). According to Cunningham-Nelson et al. (2019), it has been argued that chatbots can provide and personalize many elements of education. Okonkwo and Ade-Ibijola (2021) assert that the utilization of chatbot technology exhibits the potential to provide effective and personalized services to individuals inside the educational sphere. Moreover, Groothuijsen et al. (2024) have posited that AI software tools could fundamentally transform the student experience. Multiple rationales exist for its incorporation within the educational domain. AI chatbots promote expanding higher-order cognitive skills by boosting test preparation, traditional lectures, and personalization (Kouam & Muchowe, 2024).

Moreover, the escalating prevalence of online learning and the desire for personalized and flexible learning experiences have stimulated the incorporation of AI technology in education. Sandu and Gide (2019) conducted a study focused on implementing AI chatbots into the higher education system in India. The authors emphasize the benefits of employing chatbots to enhance students' comprehensive learning experiences. Artificial intelligence chatbots provide students with timely feedback, answer their inquiries, and offer personalized recommendations. In addition, it has been argued that chatbots can provide information that circumvents the need for arduous and time-consuming searches while masking the intricate processes that underlie their functioning (Ondáš et al., 2019). The potential of chatbots to aid learning like human teachers has been highlighted in the research conducted by Pérez et al. (2020). Furthermore, Sung (2020) evaluates AI English-language chatbots and argues that they are expected to contribute substantially towards attaining competency standards in speaking and listening skills.

Furthermore, AI chatbots support educators and administrators in their daily tasks: assignment evaluation, student progress monitoring, and administrative support. Yang and Evans (2019) have shown that AI chatbots have demonstrated their efficacy in supporting various educational initiatives. Consequently, this technological advancement affords educators supplementary time to allocate toward activities requiring human engagement, such as student mentorship and support. Moreover, the research undertaken by Yang (2022) explores the viewpoints of preservice educators regarding integrating AI chatbots in the context of English language instruction. The author's research reveals the optimistic sentiments exhibited by these individuals on the effectiveness of AI chatbots as beneficial instruments for educational purposes. Furthermore, Labadze

et al. (2023) state that chatbots can be virtual instructional tools, relieving instructors of tedious tasks. Huang et al. (2019) conducted a study which revealed that using chatbots during the learning process has demonstrated the benefit of alleviating the feelings of loneliness commonly encountered by individuals engaged in e-learning.

However, it is imperative to enhance the level of understanding regarding AI technology within certain educational institutions. Adarkwah et al. (2023) conducted a study to investigate the extent of awareness and level of acceptance among academics in Ghana concerning ChatGPT and AI chatbots. The authors conclude that a considerable portion of the scholarly community could benefit from obtaining supplementary knowledge about ChatGPT and AI-driven chatbots. Furthermore, integrating AI into education presents both opportunities and challenges. Rudolph et al. (2024) highlight that while generative AI can enhance pedagogy, research, and student support, it also raises concerns regarding academic integrity, labor displacement, and embedded biases. Similarly, Popenici (2023) emphasizes the need to go beyond the hype surrounding AI, advocating for a critical examination of its risks and ethical implications.

### **Solving the equity gap in educational access: Benefits and limitations of AI**

Meyer et al. (2023) and Jurado de los Santos et al. (2020) emphasize the importance of addressing excellence gaps and the evolving understanding of equity in education. Meyer et al.'s review of interventions for reducing excellence gaps highlights the need for preparation, placement, evaluation, and adjustment. At the same time, Jurado de los Santos et al.'s bibliometric analysis underscores the shift from focusing on student diversity to specific aspects of equity, such as gender and race. Hoang (2019) contributes a model for classifying inequity and inequality, emphasizing the need to consider the individual and group/subgroup levels. Haxhiu (2022) underscores the potential of equity-based educational interventions, mainly when implemented with fidelity and supported by good leadership and a positive school culture. Bandyopadhyay and Subrahmanian (2008) highlight the need for enabling policies to improve the quality of schools and ensure better opportunities for girls at higher levels of education. Ross and Berger (2009) identify 16 research-based strategies for school leaders to promote equity, including curriculum interpretation, instruction, assessment, and community involvement. These studies underscore the complexity of the equity gap in education and the need for multifaceted interventions.

AI technology can reduce the equity gap in educational access by providing personalized learning experiences and addressing disparities in achievement (Holstein & Doroudi, 2021; Ahmad et al., 2021). However, there are concerns that AIED systems may inadvertently exacerbate existing inequities (Holstein & Doroudi, 2021). To mitigate this risk, designing AIED systems with equity in mind is crucial, ensuring that they are accessible and beneficial to all learners (Holstein & Doroudi, 2021; Ahmad et al., 2021). AI technology in education can potentially reduce the equity gap (Garcia & Lee, 2020), particularly in K-12 settings

(Zafari et al., 2022). However, this potential is contingent on addressing technology accessibility issues, particularly for disabled learners (Shaheen et al., 2019). In AI applications, strategies to improve equity include enhancing data quality and transparency, involving the community in development, and improving governance (Berdaahl et al., 2023). While AI has shown promise in various educational applications, including tutoring and learning support (Sidana, 2019), its potential to reduce the equity gap will depend on successfully implementing these strategies.

The use of AI technology to reduce the equity gap in educational access highlights several limitations. Lin et al. (2020) and Holstein and Doroudi (2021) both point out that AI interventions, while well-intentioned, can have unintended negative consequences and may amplify existing inequities. Murphy (2019) further underscores the lack of evidence supporting the usefulness of AI applications in K-12 education, suggesting a need for more rigorous evaluation.

In sum, previous studies addressing the equity gap in educational access have focused on individual-level factors and static measures of academic achievement rather than systemic issues related to resource allocation and institutional policies. Moreover, many studies have focused on short-term outcomes and have not considered the long-term impact on student success or social mobility (Chaudhry et al., 2023; Leenknicht et al., 2023). Therefore, there is a need for a reconceptualization of equity in a globalized higher education environment that feels like using AI technology to mitigate the equity gap. This study explores the potential benefits, limitations, and challenges of using AI technology to minimize the equity gap in educational access.

### **AI's technology potential in addressing educational equity: The Capability Approach (CA)**

The Capability Approach (CA) provides a comprehensive perspective on equity and social justice, applicable in various fields, including education. This approach argues that an individual's well-being or "capability" level is determined by multiple factors, including their access to resources and opportunities (Sen, 1979; Nussbaum, 2011). In education, the CA emphasizes providing all students with the necessary resources and opportunities to develop their capabilities to lead fulfilling lives.

The Capability Approach has been applied in various educational contexts, including social work (Slabbert, 2018), higher education (Ribeiro, 2015), and the use of ICT in schools (Chigona & Chigona, 2010). It effectively assesses clients' well-being in social work education (Slabbert, 2018) and identifies factors that hinder educators from using ICT in their pedagogy (Chigona & Chigona, 2010). However, the approach has also been critiqued for its operationalization difficulties (Ribeiro, 2015). Despite these challenges, the Capability Approach continues to gain momentum in educational contexts (Hart, 2012).

The Capability Approach, as discussed by Hart (2012), Broderick (2018), Campbell and McKendrick (2017), and Herguner (2012), offers a valuable lens for understanding and addressing the equity gap in educational access. It emphasizes the importance of not only providing access to education but also ensuring that individuals have the capabilities to make use of that education. This approach is particularly relevant in the context of the right to education for persons with disabilities (Broderick, 2018) and the under-representation of young people from deprived communities in higher education (Campbell & McKendrick, 2017). Herguner (2012) further highlights the potential of the Capability Approach in education projects, particularly in promoting social development and equity.

The CA also emphasizes the importance of individual agency, which asserts that individuals should be allowed to exercise their autonomy in defining their capabilities and pursuing their goals. Therefore, it emphasizes the importance of empowerment and social justice as essential components of equity. This approach could translate into providing all students with access to high-quality education tailored to their needs, enabling them to develop the necessary skills and knowledge to achieve their goals. Campano et al. (2020) and Hart (2018) emphasize the importance of collective agency in educational change and the development of children's agency, well-being, and participatory rights. Broderick (2018) applies the Capability Approach to the right to education for persons with disabilities, highlighting its potential to ensure equality and human potential development. Walker (2007) extends this discussion to the specific context of gender equality in education, emphasizing the role of education capabilities in shaping agency and the importance of learning in developing agency.

Using the CA as a theoretical framework for this study enables examining the various forms of disparity and inequality contributing to the equity gap in educational access. It also allows an exploration of the role of AI technology in addressing these disparities. Additionally, the CA could highlight how AI technology impacts students' agency, whether it leads to their empowerment or reinforces existing inequities. The framework could also aid in developing strategies to ensure that the use of AI technology in education is equitable and accessible for all students.

### **Methodology and data**

This study seeks to assess the role of AI technology in mitigating the equity gap in educational access in Zimbabwe. Hence, the study adopted qualitative methodologies to understand this phenomenon. The target population of this study is 3,000 lecturers and 25,000 university students in Zimbabwe. The sample size for this study was six lecturers and six students. Snowball and convenience sampling were used to determine the sample size. At the 12th interview, data was saturated. A mixture of telephone interviews and face-to-face interviews were used. Telephone interviews were critical in soliciting information from seven participants outside Harare.

Five participants were interviewed face to face because they were in Harare, where there were no transport costs. Before the publication of the results, study participants were given the results to peruse and confirm if the research was a product of their beliefs and perceptions. The participants were satisfied that the results reflected their views on the phenomenon. It was significant in the solicitation of non-verbal information. Ethics were not an issue as study participants were treated as autonomous agents who could withdraw from the study at any time. Anonymity and confidentiality were achieved through anonymizing the names of participants and also ensuring that the data was stored in a password protected hard drive accessible only to the principal researchers. Thematic analysis was conducted using NVivo 14. Interview responses were grouped, classified, and presented using themes and codes.

The research paradigm of the study is interpretivism (William, 2024), as it seeks to understand the role of AI technology in educational access in Zimbabwe through qualitative methodologies, focusing on the perceptions and beliefs of the participants. The study values the subjective experiences and perspectives of the participants to gain a deeper understanding of the phenomenon. Table 1 below summarize the sample details.

Table 1. Sample details.

Category	details
Lecturers	Total: 6
Gender	Female: 3, Male: 3
Age Range	31-40: 4, 41-50: 2
University Type	Private: 3, State: 3
Faculty	Commerce: 1, ICT: 1, Engineering: 1, Social Science: 1, Arts: 1, Natural Science: 1
Position	Lecturer: 2, Senior Lecturer: 2, Associate Professor: 1, Full Professor: 1
University Students	Total: 6
Gender	Female: 3, Male: 3
Age Range	18-27: 4, 28-37: 1, >37: 1
University Type	Private: 3, State: 3
Faculty	Commerce: 1, ICT: 1, Engineering: 1, Social Science: 1, Arts: 1, Natural Science: 1
Student Level	Undergraduate: 3, Graduate: 3

## Findings and discussions

The study identifies several benefits and challenges associated with using AI technology to reduce educational inequities in Zimbabwean universities.

Regarding the benefits, four key themes emerged: affordability, independent learning, personalized learning, and personalized support. AI technologies, such as chatbots, provide cost-effective resources for vulnerable learners, enabling them to access educational support without the financial burden of traditional tutoring. Participants noted that AI encourages independent learning by allowing students to study remotely, particularly in challenging economic conditions where transportation and resources may be lacking. Additionally, AI offers personalized learning experiences, helping students grasp complex concepts quickly and saving time and effort. Participants also emphasized that AI could resolve administrative queries, providing essential support to students who may not have other means to access information.

Despite these benefits, the study highlighted significant challenges, including the high costs associated with some AI technologies, limited internet access, and the potential negative impact on social skills. Premium AI services can be unaffordable for many students, and the cost of internet data remains a barrier, particularly for those in remote areas. Participants expressed concern that reliance on AI might lead to reduced opportunities for interpersonal interaction, which is vital for developing social skills in a collectivistic culture like Zimbabwe.

Finally, to promote equitable access to AI technologies, the study recommends that universities establish clear AI policies that support rather than penalize AI use, subscribe to premium AI services to ensure accessibility for all students, and implement a broader range of chatbots to facilitate administrative and educational support.

### Benefits of AI technology in mitigating the equity gap in educational access

Regarding this finding, four themes emerged: cheap, independent learning, personalized learning, and personalized support. The study found that AI technology mitigates the equity gap in education access by providing affordable learning in Zimbabwean universities. Participants I, IV, and XII alluded that using chatbots is cheap for university learners, making it possible for every student to access learning. Participant 1, a lecturer, stated this:

If you look at WhatsApp chatbots such as FoondaMate, they are cheap to use for our learners and understand complex concepts. [FoondaMate is an AI-powered chatbot that leverages natural language processing (NLP) to assist students, particularly in mathematics. It offers a range of features designed to help users solve math problems and complete homework assignments by providing step-by-step explanations and solutions. The chatbot is mainly geared towards students who struggle with understanding complex math concepts, enabling them to learn at their own pace and gain confidence in their mathematical abilities. FoondaMate aims to make math learning more accessible and engaging, helping bridge learning gaps in various educational contexts (<https://foondamate.com/>).]

AI technologies can be a cheap resource for vulnerable learners (Campano et al., 2020; Adarkwah et al., 2023). In addition, the study found that AI technology is mitigating the equity gap in educational access by offering independent learning. According to Participants II, III, VIII, X, and XI, AI technologies present an opportunity for vulnerable learners. As Participant X suggests, at times, some students do not have money for transport and food to be able to go to campus to learn. However, they use AI technologies such as ChatGPT, FoondaMate, and PI to catch up with other learners' learning. On the other hand, XI, a student, stated that:

Some students from wealthy backgrounds are privileged to hire tutors for extra lessons to grasp complex concepts. AI has bridged this gap as it also functions as a tutor for extra lessons without spending a fortune.

AI encourages independent learning among students, as Haxhiu (2022) and Garcia and Lee (2020) noted. Furthermore, the study found that AI helps bridge the equity gap in educational access by providing university learners with personal learning. Participants I, III, V, IX, and XII subscribed to this view. According to these participants, with AI technologies, vulnerable students save time and money as they use AI to simplify specific concepts which they struggle to understand. For example, Participant IX, a university student, stated:

Use of AI technologies such as chatbots.....I do not waste time. The chatbot provides simple and understandable information about my problem and catches up with other learners.

It resonates with Berdahl et al. (2023) and Cheddadi & Bouache (2021) that the epitome of AI is offering personalized learning. Moreover, the study found that personalized support is another way AI technology bridges the educational access gap. Participants II, IV, XI, and XII explained that administration students' queries can be resolved if the students travel to the campus or by telephone. Campano et al. (2020) found that European universities have chatbots that resolve routine administration queries. However, students from poor backgrounds face challenges as they do not have these resources. AI has presented cheaper options to support students. A university lecturer, Participant II, stated that students can now use university chatbots to resolve administrative problems.

### **Challenges of AI in bridging educational equity gap**

Regarding the limitations and challenges of using AI technology to bridge the education access gap, four themes emerged: expensive, internet access, problem-solving, and social skills. Participants I, II, IV, V, X, XI, and XII explained that using artificial intelligence technology is, at times, expensive, thereby widening the educational access gap. For example, Participant II, a university lecturer, stated that:

Accessing premium ChatGPT4 is expensive for these vulnerable students, and those who can afford it are students from wealthy backgrounds.

On the other hand, Participant X, a student, asserted that:

To access AI technologies, you need data bundles, and data bundles are too expensive in Zimbabwe due to the hyper-inflation environment, and only a few sections of the students have access to artificial intelligence technologies.

Groothuijsen et al. (2024) and Labadze et al. (2023) argued that some AI technologies are beyond the reach of many. The study also found that internet access is another challenge

and limitation to using AI technology to bridge the gap in educational access. Participants II, III, V, VIII, X, and XI subscribed to this view by explaining that AI technology in Zimbabwe can only be accessed through the Internet. For example, Participant III, a university lecturer, stated that:

Most of the students who are vulnerable are those that stay in remote areas where internet access is a challenge.

Wanti et al. (2022) and Zafari et al. (2022) buttress this finding by stating that AI technologies require internet access, and those who do not have it cannot enjoy the benefits of AI technologies. In addition, the study found that social skills are another important theme that emerged from Participants, particularly Participants I, II, IV, VI, VII, and XII. All these participants stressed that university students relying on AI technology must catch up in social skills. For example, Participant II, a university lecturer, stated this:

In trying to bridge the education gap, these disadvantaged students who use AI end up not having important social skills due to not physically interacting with their peers and lecturers.

This finding resonates with Yang (2022), and Kouam and Muchowe (2024) further explain that students who constantly use AI lack social skills. Social skills are essential, especially in Zimbabwe, which has a collectivistic cultural approach.

### **Equitable and accessible AI implementation in education**

The final objective was to establish best practices for Zimbabwean universities for implementing AI technology in a way that is equitable and accessible for all students. Three themes emerged from the study: AI policies, subscribing to premium AI, and rolling out AI chatbots. Participants V, VII, IX, X, and XII explained the need for AI policies. Participant IX stated that these policies should encourage learners to use AI technologies rather than discourage them. For example, Participant X, a university student, said that:

The university should develop policies such as how we cite and reference work derived from AI chatbots rather than making it criminal to use information from chatbots.

Labadze et al. (2023) and Portus et al. (2024) explain that policies should govern the use of AI chatbots in every sector. The other finding pertained to universities subscribing to premium AI technologies. According to Participants VII, X, XI, and XII, disadvantaged students cannot afford to use premium AI such as ChatGPT-4. Participant XI, a university student, highlighted this:

Universities should subscribe to premium AI technologies so that all students can use these technologies in bridging the education gap.

Only the better-off can afford AI technologies such as ChatGPT-4 in Zimbabwe (Kouam & Muchowe, 2024). The study found that universities should roll out chatbots.

Participants I, III, V, VI, VIII, X, XI, and XI highlighted the need for universities to roll out chatbots to enable learning. For example, instead of only having chatbots that help with administration, they should invest in chatbots that help students in learning. It resonates with Labadze et al. (2023), who says that AI chatbots can be helpful in the entire university process, and universities need to explore their utility.

## Conclusion

This study has identified the potential benefits, limitations, and best practices of using AI technology to mitigate the equity gap in educational access in Zimbabwe. The key findings suggest that AI technology can offer affordable, independent, personalized learning experiences and student support, bridging the equity gap in educational access. By utilizing AI technology effectively, academic institutions can work towards closing the equity gap and promoting inclusive education systems that benefit all students, regardless of their socio-economic background.

However, challenges such as the expensive nature of some AI technologies, internet accessibility issues, lack of problem-solving skills, and potential social skills deficits among students have been identified as limitations to the widespread implementation of AI technology in education.

The implications and contributions of this study are significant for educational institutions in Zimbabwe and beyond. By understanding the potential of AI technology to address the equity gap in educational access, universities can formulate policies, subscribe to premium AI platforms, and roll out AI chatbots to ensure equitable and accessible learning opportunities for all students. This study underscores the importance of leveraging AI technology to enhance educational access and promote inclusive learning environments.

While the findings of this study provide valuable insights into the role of AI technology in educational access, some limitations should be acknowledged. The small sample size and focus on a specific context (Zimbabwe) may limit the generalizability of the findings. Future research could explore the role of AI technology in mitigating the equity gap in educational access in other regions and institutions to provide a more comprehensive understanding of this phenomenon. Additionally, further research could delve into the ethical considerations of using AI technology in education and its implications for student well-being and academic success.

## Acknowledgment

The authors are grateful to Zimbabwean universities' lecturers and students who helped carry out this investigation. They are also indebted to the reviewers.

## References

- Adarkwah, M. A., Amponsah, S., van Wyk, M. M., Huang, R., Tlili, A., Shehata, B., Metwally, A. H. S., & Wang, H. (2023). Awareness and acceptance of ChatGPT as a generative conversational AI for transforming education by Ghanaian academics: A two-phase study. *Journal of Applied Learning and Teaching*, 6(2), 78-93. <https://doi.org/10.37074/jalt.2023.6.2.26>
- Adoui, A. (2023). Exploring inequity factors in higher education: Promoting equitable access and success in the US. *Simulacra*, 6(1), 63-78. <http://dx.doi.org/10.21107/sml.v6i1.19256>
- Ahmad, M., Subih, M., Fawaz, M., Alnuqaidan, H., Abuejheisheh, A., Naqshbandi, V., & Alhalaiqa, F. (2024). Awareness, benefits, threats, attitudes, and satisfaction with AI tools among Asian and African higher education staff and students. *Journal of Applied Learning and Teaching*, 7(1), 57-64. <https://doi.org/10.37074/jalt.2024.7.1.10>
- Ahmad, S. F., Rahmat, M. K., Mubarik, M. S., Alam, M. M., & Hyder, S. I. (2021). Artificial intelligence and its role in education. *Sustainability*, 13(22), 12902. <http://dx.doi.org/10.3390/su132212902>
- Ajjawi, R., Tai, J., Boud, D., & Jorre de St Jorre, T. (2023). *Assessment for inclusion in higher education: Promoting equity and social justice in assessment* (p. 260). Taylor & Francis.
- Baldwin, G., & James, R. (2010). Access and equity in higher education. *International Encyclopedia of Education*, 4, 334-340.
- Bandyopadhyay, M., & Subrahmanian, R. (2008). *Gender equity in education: A review of trends and factors*. CREATE Pathways to Access. Research Monograph No. 18.
- Berdahl, C. T., Baker, L., Mann, S., Osoba, O., & Giroso, F. (2023). Strategies to improve the impact of artificial intelligence on health equity: Scoping review. *JMIR AI*, 2, e42936. <https://doi.org/10.2196/42936>
- Broderick, A. (2018). Equality of what? The capability approach and the right to education for persons with disabilities. *Social Inclusion*, 6, 29-39. <https://doi.org/10.17645/si.v6i1.1193>
- Campano, G., Ghiso, M. P., Badaki, O., & Kannan, C. (2020). Agency as collectivity: Community-based research for educational equity. *Theory Into Practice*, 59, 223-233. <https://doi.org/10.1080/00405841.2019.1705107>
- Campbell, L. A., & McKendrick, J. (2017). Beyond aspirations: Deploying the capability approach to tackle the under-representation in higher education of young people from deprived communities. *Studies in Continuing Education*, 39, 120 - 137. <https://doi.org/10.1080/0158037X.2017.1293630>
- Chaudhry, I. S., Sarwary, S. A. M., El Refae, G. A., & Chabchoub, H. (2023). Time to revisit existing student's performance evaluation approach in higher education sector in a new era



- of ChatGPT—a case study. *Cogent Education*, 10(1), 2210461. <https://doi.org/10.1080/2331186X.2023.2210461>
- Cheddadi, S., & Bouache, M. (2021). Improving equity and access to higher education using artificial intelligence. *2021 16th International Conference on Computer Science & Education (ICCSE)* (pp. 241-246). <https://doi.org/10.1109/ICCSE51940.2021.9569548>
- Chigona, A., & Chigona, W. (2010). Capability approach on pedagogical use of ICT in schools. *The Journal for Transdisciplinary Research in Southern Africa*, 6, 16. Microsoft Word - 00 a Contents.docx
- Cunningham-Nelson, S., Boles, W., Trouton, L., & Margerison, E. (2019). A review of chatbots in education: Practical steps forward. In *30th Annual conference for the Australasian Association for Engineering Education (AAEE 2019): Educators becoming agents of change: Innovate, integrate, motivate* (pp. 299-306). Engineers Australia. AAEE2019\_Annual\_Conference\_paper\_184.pdf
- Garcia, A., & Lee, C. H. (2020). *Equity-centered approaches to educational technology*. [https://doi.org/10.1007/978-3-030-36119-8\\_10](https://doi.org/10.1007/978-3-030-36119-8_10)
- Groothuisen, S., van den Beemt, A., Remmers, J. C., & van Meeuwen, L. W. (2024). AI chatbots in programming education: Students' use in a scientific computing course and consequences for learning. *Computers and Education: Artificial Intelligence*, 7, 100290. <https://doi.org/10.1016/j.caeai.2024.100290>
- Hart, C. S. (2012). The capability approach and education. *Cambridge Journal of Education*, 42, 275-282. <https://doi.org/10.1080/0305764X.2012.706393>
- Haxhiu, Z. (2022). Closing the achievement gap: An analysis of equity-based educational interventions. *Journal of Education Review Provision*, 2(2), 32-35. <http://dx.doi.org/10.55885/jerp.v2i2.154>
- Herguner, B. (2012). In pursuit of equity: The capability approach and education. *Public Policy and Administration Research*, 2, 22-28. [https://www.researchgate.net/publication/350459377\\_In\\_Pursuit\\_of\\_Equity\\_The\\_Capability\\_Approach\\_and\\_Education](https://www.researchgate.net/publication/350459377_In_Pursuit_of_Equity_The_Capability_Approach_and_Education)
- Hoang, A. (2019). Fantastic educational gaps and where to find them: A review of research in educational equity and equality. *Journal of International Education and Practice*. <http://dx.doi.org/10.30564/jiep.v2i4.1309>
- Holstein, K., & Doroudi, S. (2021). *Equity and artificial intelligence in education: Will "AIED" amplify or alleviate inequities in education?* <https://doi.org/10.48550/arXiv.2104.12920>
- Huang, W., Hew, K. F., & Gonda, D. E. (2019). Designing and evaluating three chatbot-enhanced activities for a flipped graduate course. *International Journal of Mechanical Engineering and Robotics Research*. <http://dx.doi.org/10.18178/ijmerr.8.5.813-818>
- Jurado de los Santos, P., Moreno-Guerrero, A., Marín-Marín, J., & Soler Costa, R. (2020). The term equity in education: A literature review with scientific mapping in web of science. *International Journal of Environmental Research and Public Health*, 17. <https://doi.org/10.3390/ijerph17103526>
- Kefalaki, M., Diamantidaki, F., & Rudolph, J. (2022). Editorial 5 (S11): Technology and education: Innovation or hindrance. *Journal of Applied Learning & Teaching*, 6(1), 6-11. <https://doi.org/10.37074/jalt.2022.5.s1.1>
- Kouam, A. W. F., & Muchowe, R. M. (2024). Exploring graduate students' perception and adoption of AI chatbots in Zimbabwe: Balancing pedagogical innovation and development of higher-order cognitive skills. *Journal of Applied Learning and Teaching*, 7(1), 1-11. <https://dx.doi.org/10.2139/ssrn.4748274>
- Labadze, L., Grigolia, M., & Machaidze, L. (2023). Role of AI chatbots in education: Systematic literature review. *International Journal of Educational Technology in Higher Education*, 20(1), 56. <https://doi.org/10.1186/s41239-023-00426-1>
- Leenknecht, M. J., Snijders, I., Wijnia, L., Rikers, R. M., & Loyens, S. M. (2023). Building relationships in higher education to support students' motivation. *Teaching in Higher Education*, 28(3), 632-653. <https://doi.org/10.1080/13562517.2020.1839748>
- Lin, Y., Hung, T., & Huang, L. T. (2020). Engineering equity: How AI can help reduce the harm of implicit bias. *Philosophy & Technology*, 1-26. <https://doi.org/10.1007/s13347-020-00406-7>
- Ling, T., & Nasri, N. M. (2019). A systematic review: Issues on equity in education. *Creative Education*, 10(12), 3163-3174. <http://dx.doi.org/10.4236/ce.2019.1012240>
- McCowan, T. (2007). Expansion without equity: An analysis of current policy on access to higher education in Brazil. *Higher education*, 53, 579-598. <https://doi.org/10.1007/s10734-005-0097-4>
- McCowan, T. (2016). Three dimensions of equity of access to higher education. *Compare: A Journal of Comparative and International Education*, 46, 645-665. [https://discovery.ucl.ac.uk/id/eprint/1501901/1/McCowan\\_Three%20dimensions%20of%20equity%20of%20access%20to%20higher%20education.pdf](https://discovery.ucl.ac.uk/id/eprint/1501901/1/McCowan_Three%20dimensions%20of%20equity%20of%20access%20to%20higher%20education.pdf)
- Meyer, M. S., Shen, Y., & Plucker, J. A. (2023). Reducing excellence gaps: A systematic review of research on equity in advanced education. *Review of Educational Research*, 94, 33-72. <https://doi.org/10.3102/00346543221148461>
- Murphy, R. F. (2019). *Artificial intelligence applications to support K-12 teachers and teaching: A review of promising applications, opportunities, and challenges*. Perspective. The RAND Corporation. <https://www.jstor.org/stable/resrep19907>
- Nussbaum, M. C. (2011). *Creating capabilities: The human*

development approach. Harvard University Press.

Okonkwo, C. W., & Ade-Ibijola, A. (2021). Chatbots applications in education: A systematic review. *Computers and Education: Artificial Intelligence*, 2, 100033. <http://dx.doi.org/10.1016/j.caeai.2021.100033>

Ondáš, S., Pleva, M., & Hládek, D. (2019, November). How chatbots can be involved in the education process. In *2019 17th International Conference on Emerging Elearning Technologies and Applications (ICETA)* (pp. 575-580). IEEE. <https://doi.org/10.1186/s41239-023-00426-1>

Parjanadze, N., & Kapanadze, I. (2016). Equity in access to higher education for special needs and socially deprived students in Georgia. *Journal of Education in Black Sea Region*, 2(1). <http://dx.doi.org/10.31578/jrebs.v2i1.31>

Peercy, C. L., & Svenson, N. (2016). The role of higher education in equitable human development. *International Review of Education*, 62, 139-160. <http://dx.doi.org/10.1007/s11159-016-9549-6>

Pérez, J. Q., Daradoumis, T., & Puig, J. M. M. (2020). Rediscovering the use of chatbots in education: A systematic literature review. *Computer Applications in Engineering Education*, 28(6), 1549-1565. <https://doi.org/10.1002/cae.22326>

Popenici, S. (2023). The critique of AI as a foundation for judicious use in higher education. *Journal of Applied Learning and Teaching*, 6(2), 379-384. <https://doi.org/10.37074/jalt.2023.6.2.4>

Portus, R., Aarnio-Linnanvuori, E., Dillon, B., Fahy, F., Gopinath, D., Mansikka-Aho, A., ... & McEwen, L. (2024). Exploring environmental value action gap and education research: A semi-systematic literature review. *Environmental Education Research*, 1-31. <https://doi.org/10.1080/13504622.2024.2314060>

Ribeiro, A. S. (2015). A normative framework or an emerging theory? The capability approach in higher education research. In *Theory and method in higher education research* (Vol. 1, pp. 277-294). Emerald Group Publishing Limited. <http://dx.doi.org/10.1108/S2056-375220150000001013>

Ross, J. A., & Berger, M. J. (2009). Equity and leadership: Research-based strategies for school leaders. *School Leadership & Management*, 29, 463-476. <http://dx.doi.org/10.1080/13632430903152310>

Rudolph, J., Ismail, F., & Popenici, S. (2024). Higher education's generative artificial intelligence paradox: The meaning of chatbot mania. *Journal of University Teaching and Learning Practice*, 21(6), 1-35. <https://doi.org/10.53761/54fs5e77>

Sandu, N., & Gide, E. (2019, September). Adoption of AI-Chatbots to enhance student learning experience in higher education in India. In *2019 18th International Conference on Information Technology Based Higher Education and Training (ITHET)* (pp. 1-5). IEEE. [https://www.researchgate.net/publication/338868551\\_Adoption\\_of\\_AI-Chatbots\\_](https://www.researchgate.net/publication/338868551_Adoption_of_AI-Chatbots_)

[to\\_Enhance\\_Student\\_Learning\\_Experience\\_in\\_Higher\\_Education\\_in\\_India](https://www.researchgate.net/publication/338868551_Adoption_of_AI-Chatbots_to_Enhance_Student_Learning_Experience_in_Higher_Education_in_India)

Sen, A. (1979). *Equality of what?* (Vol. 1). [Sen\\_lequalityRexanmined\\_Chaps-1\\_AND\\_5.pdf](https://www.researchgate.net/publication/338868551_Adoption_of_AI-Chatbots_to_Enhance_Student_Learning_Experience_in_Higher_Education_in_India)

Sevnarayan, K., & Potter, M. A. (2024). Generative artificial intelligence in distance education: Transformations, challenges, and impact on academic integrity and student voice. *Journal of Applied Learning and Teaching*, 7(1), 104-114. <http://dx.doi.org/10.37074/jalt.2024.7.1.41>

Shaheen, N. L., & Lohnes Watulak, S. (2019). Bringing disability into the discussion: Examining technology accessibility as an equity concern in the field of instructional technology. *Journal of Research on Technology in Education*, 51, 187-201. <https://doi.org/10.1080/15391523.2019.1566037>

Sidana, M. (2019). A review of the use of artificial intelligence in the field of education. *International Journal of Artificial Intelligence and Machine Learning*, 1(3). <https://www.ijaiml.com/wp-content/uploads/2019/05/Volume1-Issue3-Paper1.pdf>

Slabbert, I. (2018). Applying the capability approach in social work education. *Social Work Education*, 37, 867- 880. <https://doi.org/10.1080/02615479.2018.1458830>

Sung, M. C. (2020). Preservice primary English teachers' AI chatbots. *Language Research*, 56(1), 97-115. <http://dx.doi.org/10.30961/lr.2020.56.1.97>

Walker, M. (2007). Selecting capabilities for gender equality in education. In *Amartya Sen's capability approach and social justice in education* (pp. 177-195). New York: Palgrave Macmillan US. [https://doi.org/10.1057/9780230604810\\_9](https://doi.org/10.1057/9780230604810_9)

Wang, G. Y., & Shulruf, B. (2013). Admission model and equity in higher education. *The Asia-Pacific Education Researcher*, 22, 111-117. <https://doi.org/10.1007/s40299-012-0002-8>

Wanti, M., Wesselink, R., Biemans, H. J., & Brok, P. (2022). Determining factors of access and equity in higher education: A systematic review. *Equity in Education & Society*, 1, 279 - 296. <https://doi.org/10.1177/27526461221092429>

Ward, N. L. (2006). Improving equity and access for low-income and minority youth into institutions of higher education. *Urban Education*, 41, 50 - 70. <https://doi.org/10.1177/0042085905282253>

William, F. K. A. (2024). Interpretivism or constructivism: Navigating research paradigms in social science research. *International Journal of Research Publications*, 143(1). <https://ssrn.com/abstract=4801235>

Winkler, R., & Söllner, M. (2018, July). Unleashing the potential of chatbots in education: A state-of-the-art analysis. In *Academy of management proceedings* (Vol. 2018, No. 1, p. 15903). Briarcliff Manor, NY 10510: Academy of Management. <http://dx.doi.org/10.5465/AMBPP.2018.15903abstract>

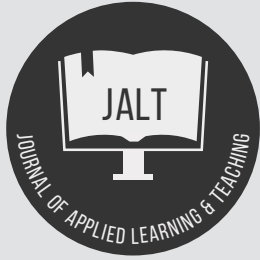
Yang, J. (2022). Perceptions of preservice teachers on AI

chatbots in English education. *International Journal of Internet, Broadcasting and Communication*, 14(1), 44-52. <https://doi.org/10.7236/IJIBC.2022.14.1.44>

Yang, S., & Evans, C. (2019, November). Opportunities and challenges in using AI chatbots in higher education. In *Proceedings of the 2019 3rd International Conference on Education and E-Learning* (pp. 79-83). <https://doi.org/10.1145/3371647.3371659>

Zafari, M., Bazargani, J. S., Sadeghi-Niaraki, A., & Choi, S. (2022). Artificial intelligence applications in K-12 education: A Systematic literature review. *IEEE Access*, 1-1. <https://doi.org/10.1109/ACCESS.2022.3179356>

Copyright: © 2025. Arthur William Fodouop Kouam and Regis Misheal Muchowe. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Lectures in higher education: A 22-year systematic review

---

Joseph Crawford<sup>A</sup>

A

*Senior Lecturer in Management, University of Tasmania, Australia*

Mitch Parsell<sup>B</sup>

B

*Deputy Vice Chancellor (Education), University of Tasmania, Australia*

---

### Keywords

Higher education;  
instructional pedagogy;  
systematic literature review;  
university lecture.

---

### Correspondence

[joseph.crawford@utas.edu.au](mailto:joseph.crawford@utas.edu.au)<sup>A</sup>

---

### Article Info

Received 25 November 2024  
Received in revised form 4 February 2025  
Accepted 7 February 2025  
Available online 13 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.25>

### Abstract

Large-scale lectures alongside sandstone buildings are two of the most romanticised facets of higher education. While the Latin root to lecture means 'to read' (*lectus* is the past participle of *legere*), its practice has evolved with technology. Using a systematic review methodology leveraging a clear search strategy, screening and PRISMA reporting for articles between 2000-2022, this study curates knowledge on the contemporary lecture to provide a clear evidence base for future educators to draw upon in curriculum and learning design. Using Braun and Clarke (2006)'s thematic analysis of 296 papers on lectures, we identified six key theme areas: defence and critiques, examination of types of lectures, pedagogical adaptations, use of supports, student motivations and influences, and comparative evaluations of lecture-based instruction. We identify conflation and explore the clarity of the university lecture. Importantly, we identify that as the face-to-face lecture decreases in popularity as a research subject, it increases in online and recorded lectures are being observed. While longer-scale analysis is needed to understand the impact of this evolution on student engagement, attendance, and learning, it is evident that conflation of the types of lectures is making this kind of analysis difficult. We offer a clear typology of lectures to support future researchers and practitioners to be consistent in the application of lecture-based instructional pedagogy.

## Introduction

In the public imagination, university education is synonymous with lectures (French & Kennedy, 2017). There are strong historical reasons for this association. The current form of the lecture arose in the first European universities in the early 14th century (Haskins, 2002). Laurentius de Voltolina's painting from Bologna during this period is instantly recognisable as a lecture (see Figure 1). The instructor is positioned at the front, his sourcebook on the lectern, with students arranged in rows, either taking notes, talking, or sleeping.



Figure 1. A digital reproduction of Laurentius de Voltolina's painting depicting a University of Bologna fourteenth century lecture (Wikimedia Foundation, 2008).

Most lectures in early universities usually consisted of the instructor reading directly from a sourcebook. The term 'lecture' itself – from the Latin *lectus* or 'to read' (*lectus* is the past participle of *legere*) – is likely derived from this practice. Such a practice has become increasingly rare since the invention of the printing press made books accessible to individuals and not merely well-resourced institutions such as Churches and Universities, although its translation to replacement of all practice was considerably slow in some parts of the world; with lecturers reading to students evident in the twentieth century (Brookfield et al., 2023). Much more recently, the rise of the internet has seen different types of lectures evolve (Kekkonen-Moneta & Moneta, 2002). In a contemporary university, lectures now occur online, face-to-face, synchronous, and asynchronous. Not only have lectures evolved in response to the latest technology and the affordances that they provide, but there is a substantial body of research on such adaptations to the lecture (e.g., Bredow et al., 2021; Elavsky et al., 2011; George et al., 2013). Closely related to studies of different types of lectures are studies on the adaptation of the lecture more generally. Contemporary versions of the lecture can include significant interaction with the audience. This interaction goes well beyond the audience merely asking questions of the lecturer and, in many circumstances, leverages hardware and/or software specifically designed to facilitate such interaction or cooperation, although this is not new pedagogically

(e.g., Slavin, 1980). Lectures have also adapted to make systematic use of social media or podcasts. The purpose of some lecture variations has moved away from content delivery to being designed to build a sense of community, professional identity or connection between peers. Other forms attempt to model behaviour or demonstrate specific techniques. Often, the principal aim of these variations is to increase student engagement – or to support students to affectively, cognitively, and behaviourally connect with content through some meaningful learning experience (Kelly, 2012); although more recently understanding its effects on student belonging (Crawford et al., 2024a). This is to combat what has become a consistent and conspicuous problem with lectures in the modern university: a decline in student attendance.

Various studies have discussed the role of attendance in student performance (Credé et al., 2010) and the changing nature of student attendance (Kelly, 2012; Massingham & Herrington, 2006). There seems to be a form of consensus in the literature that this decline is to be bemoaned – that students who are engaged and attend lectures perform better than students who are disengaged and do not attend. However, this position is not universally supported by the literature. As we go on to discuss, the relationship between attendance and learning in lectures is contested (e.g., Clark et al., 2011; Nyatanga & Mukorera, 2019; Obiosa, 2020).

Perhaps because of its long association with university instruction, the very term lecture can often take on a political dimension (e.g., Webster, 2015). This mostly occurs in public defences of the lecture or institutional reactions to attempts to deemphasise lectures as the dominant form of instruction. While not as overtly emotional or political, echoes of this can be seen in conceptual or philosophical treatments of lectures in the literature. These papers either defend or criticise lectures rather than present a disinterested analysis of the benefits and challenges of the lecture as an instructional format (e.g., Webster, 2015). Interestingly, general defences tend not to examine the effectiveness of lectures as a method for discipline skills or knowledge, but either their efficiency or their ability to support other aspects of learning, such as generic skills (e.g., active listening, notetaking) or positive social aspects (e.g., development of community). Similarly, general critiques of lectures tend also to be conceptual, arguing that the format does not support some other desirable characteristic (e.g., student-centredness) rather than directly criticising the ability of lectures to effectively support student learning. These also are not new arguments, with McMann (1979, p. 270) writing in defence of the lecture against "the new social studies" in the late 1970s.

What is clear from a current scan of the literature is the general lack of agreed understanding of what a lecture is, is not, and could be. Our paper offers an objective response by examining the effectiveness or efficacy of lectures using a systematic review method. The purpose of this study is to address the following research question: What is currently known about the instructional pedagogy of the lecture in higher education? To address this, we leverage the PRISMA approach to explore the current knowledge on the practice of lectures in higher education. Following the method

explication of the present study, we present a summary of themes identified through thematic analysis and continue to discuss what this knowledge base means for lectures in higher education. We take a post-pandemic view to this discussion but recognise that the COVID-19 pandemic has likely had a role in shifting the current dialogue on contemporary higher education lectures. We conclude by discussing the implications of this work. Further, we provide the conceptual resources to support a nuanced discussion of the place of different types of lectures in the contemporary university by offering a clear set of terms for the categorisation of current variations.

## Method

### Search strategy

The search strategy comprised a single search phrase conducted over multiple education-based databases based on a previous systematic literature review (Ives & Castillo-Montoya, 2020): APA PsycInfo, ERIC (through EBSCOHost), and Academic Search Ultimate (through EBSCOHost). The search phrase selected was restricted to between 2000 and 2021, English, and academic journals only: *Lecture (title) AND "higher education" (full-text)*. The simplicity of this search was possible as lectures are a distinctive concept in higher education, with scholars likely to only refer to the lecture concept by that name. Some studies that discussed alternatives to lectures (e.g., flipped or blended learning) would have been excluded from the study unless they explicitly discussed lectures. The aim of this research is focused on understanding current assessments of lecture-based instruction, and as such, it was considered appropriate to exclude alternative practices that did not explicitly discuss lectures. There were 1,832 results identified: APA PsycInfo (194 results), ERIC (1,149 results), and Academic Search Ultimate (489 results). After duplicates were removed, 1,310 were screened by the authors. An additional manual search of Google Scholar was conducted, viewing the first ten pages of results, with no new manuscripts identified.

### Selection procedure and quality assessment

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA: Moher et al., 2009) statement was used for the presentation of search results and selection (see Figure 2). A single screening of the titles and abstract was completed to ensure manuscripts were: a) based primarily on lectures and b) situated in higher education. This resulted in the exclusion of 387 manuscripts. A quality decision was made to exclude all manuscripts (n = 629) that were not in the top 25 per cent of Scopus Education rankings (Q1). This was to support a deeper analysis of the highest-quality articles within the study. Following a full-text review, 20 manuscripts were excluded as out of scope (e.g., not higher education, discussed 'lecture-based courses' instead of lectures). A snowball search of the final sample was conducted to ensure no additional articles were missed (Bae et al., 2021). 21 manuscripts were identified. However, eight were duplicates, and 13 were not Scopus Education Q1 manuscripts. The final sample included 294 manuscripts.

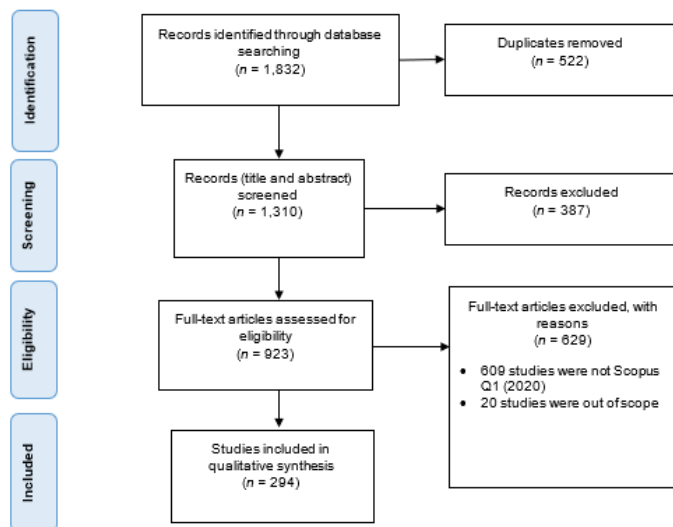


Figure 2. PRISMA statement.

### Thematic analysis

The authors conducted a thematic analysis using Braun and Clarke's (2006) approach. To do so, the lead author became familiar with each paper. This occurred through the process of screening and full-text reviewers, where the manuscripts were reviewed multiple times prior to their final inclusion. Initial data coding occurred at the point of full-text reviews, where manuscripts determined to be included were assessed for their initial coding themes. The thematic review was conducted by sensemaking across the initial codes, grouping and ungrouping to generate collective meaning across codes. Each theme was then defined and named, with a write-up conducted for each theme individually, given the size of studies included after a re-review of the manuscripts in that sample. Due to the volume of papers on the topic, not all sources are referenced in each theme, with key subthemes and examples extracted from the sample.

### Bibliometric summary

There were 68 top-tier journals that published at least one manuscript included in the final sample; of these, only ten journals feature ten or more publications (see Table 1), representing almost half (48.8%) of the final sample. Over the 22-year period of this review, there was a consistent incline in manuscripts on lectures in higher education across Q1 (divided across the Top 10 as per Table 1, and the balance of Q1s) and non-Q1 publications (see Figure 3).

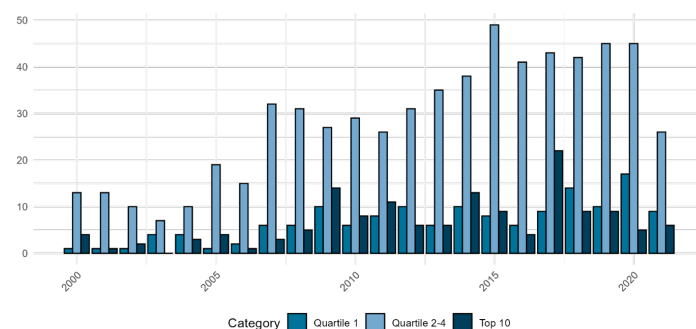


Figure 3. 22 Years of higher education lecture publications.

In 2017, eight manuscripts stemmed from a Communication Education forum on lectures (see Mazer & Hess, 2017), resulting in a skew in that year.

Table 1. Journals with more than 10 manuscripts in the final sample.

Source	n
Computers & Education	24
Australasian Journal of Educational Technology	19
British Journal of Educational Technology	16
Innovations in Education & Teaching International	15
Medical Teacher	14
Active Learning in Higher Education	13
Journal of Chemical Education	12
Communication Education	11
Interactive Technology and Smart Education	10
Journal of Computer Assisted Learning	10

## Results

Through the thematic analysis, broad themes were identified using Braun and Clarke's (2006) method. The aim was to, given the size of the final volume, identify key themes within the sample to enable deeper analysis for each set of manuscripts within the sub-samples. This resulted in the following initial themes (see Figure 4): student-based (student bring-your-own-device, attendance and motivation, cognitive load), pedagogical reviews (critique or defence of lectures), adaption to traditional lectures, modality evaluation (didactic lectures, recorded lectures and lecture capture, online lectures), teacher supports (pre-learning materials, note-taking) and comparison studies (e.g., traditional lectures and alternate models). In defining these themes, manuscripts that appeared in the final sample for themes had to have a specific focus on the theme. For example, in the theme of student support in the manuscripts, each had an objective to explore a particular support rather than a peripheral mention of student support in a broader study.

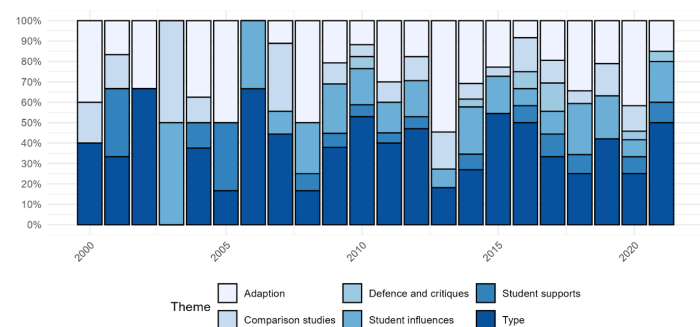


Figure 4. Distribution of themes over the 22-year period.

### The defence and critique of lectures

In the sample, there were five formal critiques of the lecture and five defences. Those that defended the role of the lecture often took deep philosophical perspectives. Some key defences documented included the experiential and real-

world nature of a quality lecture (Belenkiosop et al., 2016), highlighting that lectures can provide context and structure for a unit of study, create opportunities for sustained lecturer narrative, can motivate and challenge students, can promote skills such as note-taking and active listening, for students to be made aware of emergent research, offer a cost-effective teaching offering, and can create a communal sense of understanding and community (French & Kennedy, 2017). French and Kennedy (2017) also highlight the need for more innovative approaches to lecturing. Fulford and Mahon (2020) also comment that lectures are not simply a practice of content dissemination but a mode of address where students are invited (or required) to respond, a practice argued as essential for a student's identity, their being, and their becoming. Nordmann et al. (2021) take a different perspective and argue that the post-pandemic push for the reduction or abolition of lectures is equally as unhelpful as arguing for lectures as a learning default. In their case, lectures have a specific instructional and pedagogical value that, at times, can be the most efficient and effective modality in a given context.

In contrast, there were some explicit critiques of the lecture. For example, in a paper titled 'The lecture is dead, long live the e-lecture', Folley (2010) presents that students are increasingly seeking self-directed learning opportunities to assess the relevance of the lecture content to their assignments. Students see less relevance to lectures as they progress and increasingly prefer alternatives. Stearns's (2017) work somewhat confirms this position by arguing that active learning and student-centredness are not feasible within traditional and passive lecture environments. One possible observation from the defences and critiques of lectures, however, was their one-sided academic nature. Each manuscript typically took a particular angle to argue in favour of or opposition to the traditional lecture. As the reader will see further, while many manuscripts do speak to strengths, weaknesses, or alternatives to the traditional lecture, most tend to take a more balanced position.

### The types of lectures

Almost half of all manuscripts specifically discussed the pedagogy, efficacy, or practical approaches to a specific form of lecture delivery ( $n = 125$ , 42.5%). The studies in this theme were not those that made peripheral mentions of a delivery modality, but rather those which studied and evaluated that modality. Across the sample, three key types emerged: recorded lectures ( $n = 67$ ), face-to-face lectures ( $n = 34$ ), and online lectures ( $n = 24$ ). Figure 5 highlights how the sector has changed over time in its research to a progressive decline in face-to-face research, a temporarily heightened online lecture environment, and a consistent incline in studies on recording and recorded lectures. The scaling to 100 percent per year does, however, miss that there were more manuscripts published in later years (see Figure 3), but shows a representation of the research published in that year. Discussion in this section remains limited, as the emergent conversations within these studies are typically addressed in future sections.

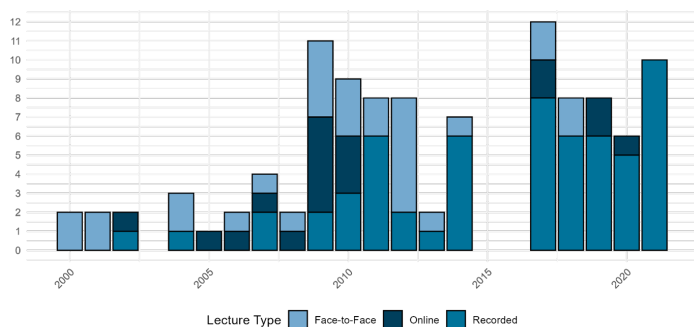


Figure 5. Distribution of lecture modality over years.

**Face-to-face lectures.** The studies on face-to-face lectures were commonly oriented towards incremental improvements to the speaking, slide decks, and language used or curated by the lecturer. For example, studies explored performance differences in how lecturers vocalise photography (Hallewell & Lackovic, 2017), academics after public speaking training (Mowbray & Perry, 2015), using personal pronouns (Fortanet, 2004; Yeo & Ting, 2014), using organisational cues (Titsworth, 2001), and using laughter (Nesi, 2012). One study identified that lecturers deployed different discursive decisions in small and large lecture classes (Lee, 2009). There tended not to be extensive innovation but rather an incremental improvement to the existing model of teaching, which is not surprising for a mature method of teaching.

**Online lectures.** Online lectures, or lectures delivered synchronously online, were discussed for their incremental improvements also, with some commentary on more advanced innovation in this context. Incremental improvements discussed included synchronous annotation and text (Debusse et al., 2009; Grünwald et al., 2015) or larger changes like the integration of communities of inquiry (d'Alessio et al., 2019). Most studies focused on student engagement and their usage of this modality of learning. However, many used inconsistent language as to their lecture type, including e-lectures, online lectures, video lectures, virtual lectures, and web lectures. There is perhaps a need for a clearer pedagogical perspective on online lectures and the evidence surrounding quality online lecture practices, which are uniquely different from their face-to-face counterpart.

**Recorded lectures.** Asynchronous recorded lectures occupied a large part of the sample in more recent years seeing significant growth in the use of the recorded lecture (particularly in the 2020-2021 COVID-19 years). The studies on recorded lectures highlighted greater commentary on optimal practices. However, these were typically discussed in isolation. For example, the effects of instructor facial expressions on student learning (Wang et al., 2019), instructor gestures on student learning (Pi et al., 2017a, 2017b), and contradictory understandings of lecture spaces by staff and students (MacKay, 2019) were all explored independently. These studies, along with many others, seem to begin the indicative pedagogy of recorded lectures. However, few studies took integrated perspectives on the recorded lecture. The somewhat systematic review of lecture recordings (O'Callaghan et al., 2017) begins to point to useful practices within the recorded lecture

space, yet their recommendations tend to orient towards institutional practices rather than pedagogy. For example, the concluding comments of this work are oriented towards ensuring students are trained in technology for learning use, lecturers are educated on the benefit and use of recorded lectures, and institutions support the technological practice. While these are useful propositions, there is perhaps greater theoretical positioning needed for the recorded lecture pedagogy prior to assuring what is being assessed or evaluated for performance.

**How teachers adapt lectures.** Perhaps to no surprise, studies that focus on the adaptation of lectures were the second most prominent by size ( $n = 89$ , 30.1%). To be clear, these studies tended not to prioritise evaluation within a specific lecture modality (e.g., face-to-face), but rather speak more holistically to the instructional method of lectures. Many studies spoke to general adaptation ( $n = 42$ , 47.2% of the theme), such as time of day, including images or movie clips, and reviewing the semiotics of slides. There were repeated references to audience response systems ( $n = 11$ ), developing peer interaction and community ( $n = 9$ ), using podcasts ( $n = 8$ ), low-level artificial intelligence support including learning analytics ( $n = 6$ ), social media ( $n = 5$ ), clickers ( $n = 5$ ), and gamified learning ( $n = 3$ ).

**Audience Response Systems.** The sample highlighted a series of academics embedding audience response systems into traditional lecture formats to enhance interactivity and autonomy. These were typically in the form of voting to choose elective content in the lecture (e.g., Grund & Tulis, 2020) or to engage synchronously with questions and answers using a student device (Abdulla, 2018). Studies tended to conclude, as early as 2004 (Draper & Brown, 2004), that providing students with choice in content or enabling the lecturer to track student conceptual understanding in real-time fostered higher engagement, more targeted teaching, and higher end-of-semester results. In an early review on the topic, Simpson and Oliver (2006) highlight that their efficacy depends in part on how teaching staff use the tools to guide learning and that feedback should be embedded into the process (e.g., after voting or after content selection) to support sustained engagement.

**Developing community and peer connection.** Peer learning, communities of practice, and communities of inquiry were discussed in some lecture-based studies. The goal of which was typically to support active learning (Tomkin et al., 2019), support student learning generally (Luo et al., 2016), and distribute learning (Risko et al., 2013). In one introductory physics unit, students, when afforded opportunities to have peer discussions, tended to discuss (in order of prevalence) content knowledge, metaconceptual comments, practical issues, and set up future discussions (Leinonen et al., 2017). The individual students who addressed peer content-related questions and the groups who had a higher volume of content-related discussions went on to perform better in tests. The use of collaborative and interactive learning was discussed briefly in many studies, but there were only a small number of manuscripts where this was an explicit focus.



**Using Podcasts and Social Media.** Social media (particularly Twitter and Facebook) were used to support higher degrees of active learning and engagement in lectures (e.g., Elavsky et al., 2011; George et al., 2013). In a study of 321 freshman US students, students who used a class-level Facebook group performed better in the end-of-semester grades and tended to have a positive attitude toward using it in class (Bowman & Akcaoglu, 2014). Podcasting was also used to supplement the learning content of lectures as a primer (Popova et al., 2014) and after class (Jiménez-Castillo et al., 2017). The effective integration of podcasts with lecture content supported higher learning of new knowledge. However, there was limited evidence of podcasts within lectures like social media usage.

**Embedding forms of Artificial Intelligence.** In the latter half of the sample by year, artificial intelligence supports increased in usage (and publication). Many of these were designed to support student resistance to common practices within lectures (e.g., asking questions when unsure). For example, one study used robotic question support (Shimaya et al., 2021), and another used automatic emotional recognition (Tonguc & Ozkara, 2020). These were also used to embed automatic lecture summarisation (Shimada et al., 2018) and augmented reality-informed feedback (Zarraonandia et al., 2013). Although this area has progressed significantly, many scholars indicated the current limitations of these systems at the time of their publishing. For example, Zarraonandia et al. (2013) argued that a head-mounted augmented reality display is obtrusive to a seamless lecture experience.

### **Student support to succeed in lectures**

Student support to succeed in lectures was represented through 20 manuscripts (6.8%). In further examination, two key types of support were embedded into lecture-based studies: provision of pre-learning materials (30%) and notetaking during lectures (70%).

**Lecture notetaking.** There was a series of studies discussing the efficacy of note-taking during lectures. Chen (2021), for example, highlighted that students tended to emphasise writing key points they find significant in their note-taking, followed by comparing missing writing to peer's notes and copying important notes, using the lecture notes to organise the topics to write notes against, writing verbatim lecturer speech, and elaborating on lecturer comments with examples or homophones.

Several of the studies focused on student performance (e.g., more complete notes, higher word volumes, quality of notes) and preferences. This included key findings that undistracted laptop notetakers outperformed longhand notetaking (Flanigan & Titsworth, 2020), notetakers were more effective when partial and full slide decks were not provided (Kim, 2018; Machida et al., 2018), although Aguilar-Roca et al. (2012) provide evidence that laptop-based notetaking resulted in lower performance. Students also found it easier to take notes digitally (van der Velden, 2020). When reflecting on lecturer influence, lecturer organisational cues and the use of immediacy supported higher-quality note-taking (Huxham, 2010; Titsworth & Kiewra, 2004). Lecture

pace also affected student performance (Bui & Myerson, 2014).

**Pre-learning materials.** The provision of pre-learning materials – often embedded in flipped or blended curriculum – was discussed as a mechanism to enhance the efficacy of existing lectures. Evans et al. (2021) found that when students were provided low-stakes pre-lecture quizzes, students were incentivised to attend and engage in lectures. In a similar study, Grabe and Christopherson (2008) provided online pre-lecture resources and saw that when students engaged with pre-lecture notes, their performance in the three exams of the subject improved, but engagement with pre-learning notes only outperformed attendance in examination at the end of the third module: highlighting mixed results. Students also tended to review complete lecture notes within two days of the lecture rather than in the two days prior to the exam. This finding was consistent with Kinsella et al. (2017), who identified that pre-learning materials, although designed as pre-lecture content, were regularly (re)engaged with after the associated lecture.

### **Student motivations and influences**

There were 55 manuscripts in the sample that discussed key student drivers of engagement (or disengagement) with lectures (18.7%). These were observable from three subtheme groupings: use of student technology in lectures, attendance, and student cognitive capacity in lectures.

**Student technology use.** While students in the original fourteenth-century lectures recorded notes on parchment or vellum, increasingly, students now are engaging in mobiles, laptops, and tablets to take notes. Roberts and Rees (2014) identified that in one Australian lecture, 66 per cent of students used a mobile device in their lecture to type notes and access lecture slides. Some academics saw this as an opportunity to increase interactivity in didactic settings (Gan & Balakrishnan, 2014), and others introduced 'laptop-free zone' trials (Aguilar-Roca et al., 2012). There does seem to be conflict, however, in students being on- and off-task when using technology. Ragan et al. (2014) highlights students were off-task two-thirds of the time, whereas Roberts and Rees (2014) articulate the opposite. Similar to the evidence on note-taking, there seems to be continued conflicting evidence on the role that technology plays in supporting learning against paper and pen methods (at least in the lecture context).

**Student attendance.** When coding the papers within the student influence thematic area, a vast number of these were related to unpacking student attendance and motivation. There seemed to be a general consensus that when students were motivated, attended, and engaged, they also performed better and were more satisfied (e.g., Clark et al., 2011; Nyatanga & Mukorera, 2019; Obiosa, 2020). However, this was not universal. For example, nonattendance had no effect on programming exam performance in one study (Veerasingam et al., 2018). Many studies referred to the general decline in attendance over the semester (Brennan et al., 2019; Mattick et al., 2007). Some highlighted the use of supplementary materials that equally supported student

learning compared to face-to-face attendance (Meehan & McCallig, 2018). This finding was congruent with Bos et al. (2016) who demonstrated no significant exam performance difference between students attending by recording or in-person in a psychology course. Yet, Brennan et al. (2019), in an analysis of 'richness' and 'evenness' behaviours in 255 courses, identified that students considered 'present' was significantly higher in online classes than in their face-to-face equivalents.

In examining the motivations for attending, Forsgren et al. (2021) found in qualitative analysis of 131 students' open-ended question answers that vivid lectures, multisensory experiences, opportunities for understanding key points of the subject, and the offer of a structured 'shortcut' to learning were reasons for attending. The misalignment to time commitments or learning pace, lecturers being difficult to understand, multiple lecturers may cause confusion by highlighting different arguments, and personal life constraints were reasons to non-attendance. Motivational predictors of situational interest in lectures included novelty, cognitive activation, perceived utility, individual interest, and perceptions of the teacher (e.g., enthusiasm, approachability, and expertise: Quinlan, 2019). However, these were argued to change over the course of a semester (Moss et al., 2015). Student cognition. Student cognitive load was discussed as a key consideration regarding the format of instructional lecture content. In video lectures, cognitive load changed across declarative and procedural knowledge with instructor visibility increasing cognitive load when learning procedural knowledge only, with instructor visuals being effective in declarative knowledge instruction (Hong et al., 2018). Costley et al. (2012) offer an extension of this finding articulating that instructors need to support students to deploy viewing strategies that emphasize the right kind of load. That is, germane load (or cognitive processing that contributes to learning) contrasted with extraneous load (or cognitive processing that does not contribute to learning). Pre-lecture resources were used as one response (Seery & Donnelly, 2012).

Table 2. Summary of key comparison studies.

Author	Method	Key variables	Key Findings
Brallier et al. (2007)	Quasi-experimental analysis of exam performance with undergraduate sociology students (n = 139).	Demographic and historical academic effects on exam performance.	Online courses were affected more significantly by race-based differences than lecture-based courses.
Wijnen et al. (2017)	Quasi-experimental study with undergraduate law students (n = 338).	Information processing, student regulation (self, external, and lack of), self-study time.	Problem-based learning supported higher rates of deep and stepwise processing, but not concrete processing, than lectures. Students experienced higher self-regulation and external regulation in problem-based learning over lectures. Self-study time was higher in lecture-based courses.
Moneta and Kekkonen-Moneta (2007)	Survey with undergraduate computing students (n = 414).	Student intrinsic and extrinsic engagement, negative affect.	E-learning modules enabled higher levels of intrinsic motivation, equivalent extrinsic motivation, and higher negative affect than lectures.
Savoy et al. (2009)	Quasi-experimental survey with undergraduate engineering course students (n = 62).	Information retention, student preference.	Lectures with engaging PowerPoint presentations were preferred by students over didactic lectures, but in didactic lectures students retained 15 percent more information.
Dalsgaard and Godsk (2007)	Quantitative study with postgraduate students (n = 14).	Student achievement, student preference.	Problem-based blended learning supported higher student achievement than lectures, and students preferred the interactive learning environment over lectures.
Peroz et al. (2009)	Randomised control trial with pre-clinical dental students (n = 85).	Knowledge acquisition, student enjoyment.	Computer assisted learning was more preferable than traditional lectures, with short-term learning higher as an outcome of lectures and medium-term learning showing no differences.
Pearce and Scutter (2010)	Survey with undergraduate health science students (n = 1,112).	Attendance, student preference.	Podcasting and m-learning offered an alternative to lectures, but had limited effect on attendance, particular with ESL student.
Wijania et al. (2011)	Quasi-experimental survey with undergraduate psychology students - lecture (n = 117) and problem-based learning (n = 126) environments. Focus groups (n = 14)	Student competence, autonomous motivation, mandatory attendance, student uncertainty.	Problem-based learning supported higher student competence than lecture-based learning, but not higher autonomous motivation. Mandatory attendance and uncertainty affected student motivation.
O'Bannon et al. (2011)	Quasi-experimental survey with technology students (n = 69).	Student achievement, student preference.	Podcasts had no significant effect on student achievement over lectures, although students preferred to podcast over attending lectures. Students disagreed that one should replace the other.
Grimley et al. (2012)	Quasi-experimental survey with undergraduate students (n = 108)	Student experience, preference.	Computer games offered students greater challenge and higher value than lectures, but students tended to want to do something else. High achieving students reported preferring lectures to games, and low achieving students had better experiences in games.
Gupta and Saks (2013)	Quantitative survey with undergraduate medical students (n = 213).	Attendance, first and second year differences.	Recorded lectures were attended less by first year students than on-campus lectures, but second year students attended them equally.
Maher et al. (2013)	Quasi-experimental pre- post-test survey with undergraduate medical students (n = 216).	Student achievement.	Blended lectures had the same level of student achievement gains (21% higher test scores) as on-campus lectures.

Conway (2014)	Quasi-experimental study with health science students (n = 576).	Exam results, student achievement.	Guided inquiry learning and students with guided and lecture-based learning had higher achievement and results than lecture-based learners.
Alluri et al. (2016)	Randomised control trial including pre-, post-, and post-delayed tests with medical students (n = 20).	Student achievement	Simulation and lectures enabled higher achievement however, only simulation-based students showed improvement in the immediate post-test and delayed post-test.
Lucieer et al. (2015)	Quantitative survey with undergraduate medical students (n = 384)	Self-regulated learning.	Self-regulated learning experienced a decline over the medical studies, regardless of lecture-based or problem-based learning.
Tang et al. (2017)	Quasi-experimental study with undergraduate health science students (n = 95).	Student motivation, student skills, comprehension, communication skills, clinical thinking, student achievement.	Flipped classrooms were seen to support higher student achievement, motivation, comprehension, communication, and clinical skills than lectures. However, students preferred lectures and reported feeling higher pressure in flipped classrooms.
Gustin et al. (2018)	Quasi-experimental study with undergraduate medical students (n = 1,394).	Student perceptions of learning, deep learning.	Problem-based learning and integrated curricula (including lectures) supported student learning than lecture-based learning.
Liu et al. (2018)	Quasi-experimental pre- and post-test survey with X undergraduate chemistry students (n = 166).	Extrinsic motivation, sex.	Flipped classrooms supported higher extrinsic motivation for students, but student sex had no effect between lectures and flipped classrooms.
Bolden et al. (2019)	Quasi-experimental survey with undergraduate students (n = 309).	Student active engagement, information processing, and attention.	Small classrooms supported higher student engagement and meaningful information processing, but lectures supported deeper processing, greater understanding, and higher attention.
Opdecaem and Everaert (2019)	Eight-year study using institutional datasets on student satisfaction, performance, and selection.	Learning outcomes, student choice, student satisfaction.	Team learning had a larger effect on learning outcomes than lecture-based learning, although the majority preferred to choose lectures, and satisfaction was comparable.
Kay et al. (2019)	Quantitative survey with undergraduate computing students (n = 103).	Social presence, cognitive presence, and learning performance.	Active learning supported the highest overall teaching, social, and cognitive presence, compared to flipped learning and lecture-based learning.
Kestlin et al. (2020)	Quasi-experimental survey with undergraduate physics students (n = 110).	Student learning, student enjoyment.	Online lecture demonstrations enabled higher student learning and student enjoyment than on-campus lectures.
Sudarmika et al. (2020)	Quasi-experimental study with undergraduate nursing students (n = 72).	Student achievement, student character	Group discussion-based flipped classrooms showed higher student achievement and student character than lecture-based learning.

## Comparing efficacy of lecture-based learning

There were 23 direct comparison studies identified in the sample, providing empirical evaluations of lectures versus alternatives (e.g., online lectures, recorded lectures, problem-based learning, podcasts, flipped learning, blended learning, computer-assisted learning). There was inconsistency across the results series. However, there were some key insights that were true of most studies (see Table 2). Lecture-based learning, on balance, tended to support poorer student motivation than alternatives. This was particularly true of those with active learning components, and in supporting external motivation. Student achievement (e.g., grades, exam results, passing subjects) was higher in lecture alternatives such as simulation, flipped classrooms, and guided inquiry. Short-term knowledge acquisition was higher in lecture-based environments, but there was no significant difference in longer-term knowledge retention. Yet, student enjoyment and student preferences had far more mixed results with several studies highlighting that students preferred lectures, despite the majority of studies reporting students perform worse in lecture-based studies.

## Discussion

In addition to the manuscript-specific themes identified during the thematic analysis, there were three key areas that emerged with conflict. The first was the terminology associated with lectures. To support clarity in future work that reviews the efficacy of specific styles of lectures, we offer a typology of modality and pedagogy using the terms commonly expressed across the sample. We offer perhaps a more contentious view of recorded lectures and lecture recordings in the following section and seek to elaborate on the role of recordings in contemporary higher education. We also highlight a key challenge with the incongruence of evidence used to support or refute the value of lectures and offer some solutions for future researchers.

## A typology of lectures

Across the sample studies, there was general confusion in the terminology for different lectures, including lecture, didactic lecture, digital lecture, e-lecture, face-to-face

lecture, flipped lecture, online lecture, recorded lecture, video lecture, and more; and we have contributed to that ambiguity (Crawford et al., 2024b). We propose as a solution a series of terms that were most prevalently used across the literature alongside clear definitions for each of these (Table 3). A lecture, to be clear, is instruction designed to provide students with an awareness of subject knowledge through conversation (typically unidirectional conversation).

Table 3: Typology of lecture modes.

Modality	Definition
Face-to-face lecture	A lecture that is physically proximate, in-person, and typically conducted in a lecture theatre.
Online lecture	A lecture that is conducted synchronously through use of educational technology or videoconferencing software.
Lecture recording	A recording of a lecture where the recording is a secondary purpose.
Recorded lecture	A lecture that is conducted and filmed for the primary purpose of present or future viewing.

There were also observable differences in the pedagogical approaches taken to lectures. A key difference between modes and pedagogies is that some pedagogies may overlap (e.g., it is possible to have a synchronous didactic lecture). Table 4 provides a summary of the terms used throughout the sample and definitions proposed for each.

Table 4: Typology of lecture pedagogies.

Pedagogy	Definition
Asynchronous lecture	A lecture developed in advance of the time when students will view it.
Demonstration lecture	A lecture where the lecturer presents knowledge and proceeds to complete a limited-interaction practical demonstration.
Didactic lecture	A lecture where the lecturer is primarily speaking <i>at</i> the audience with limited, if any, opportunities for engagement.
Flipped lecture	A lecture that has the primary purpose of instruction preceding a workshop or tutorial.
Interactive lecture	A lecture where there are short periods of instruction followed with breakout opportunities for students to work on the lecture content.
Lectorial	A lecture-tutorial hybrid where the lecturer provides a brief didactic lecture and follows this with tutorial-style activities.
Synchronous lecture	A lecture presented while students are present and observing the lecture.

The typologies, while discrete, should allow most subtypes of lecture terminologies to be categorised within. For example, a Socratic lecture (lecture by asking one student a sequence of questions) is didactic for all students but one. It is arguable, however, that to be considered a 'lecture', the instruction must have a majority of, or a key focus on, the practice of lecturing. Activities with a five-minute instructional period using a slide deck in a workshop-style room followed by thirty minutes of group activities are better characterised outside the realm of a lecture (including when such activities take place inside a lecture theatre). Importantly, scholars and educators ought to ensure that the embedding of technologies (e.g., Burton, 2019) considers first the aspired educational teaching method and the technology's relevance to that context.

### The rise of lecture recordings

This review highlights a significant incline in the use of lecture recordings and recorded lectures in higher education. Yet, we found significant evidence for growth in the digitalisation of content over designing recorded lectures using a pedagogy suited for the medium. This is

congruent with emerging evidence seeking to distinguish digitalisation and digital pedagogies (Bygstad et al., 2022; Cowling et al., 2022). In this study, there were inherent challenges associated with distinguishing which manuscripts used a specifically designed recorded lecture to support student learning, and a recording of a lecture specifically designed for an alternate delivery. Each of these serves a unique purpose and has been conflated in the literature. For example, a recorded lecture is an opportunity to provide students with asynchronous access to learning materials. This may be through a cohesive immersive video, TED Talk-style recording filmed in a recording studio (or lecturer's office), or narrated PowerPoint slides.

A lecture recording, however, is a category of lecture where a student has the opportunity to access a previously accessible lecture. This is a valuable activity for students to return to a lecture they observed live and revisit content they did not understand or to view a lecture that they were unable to attend. A lecture recording is, however, a secondary output of a previously accessible lecture and its use as the primary mode of instruction is not a best practice. The latter was prevalent during the pandemic years 2020-2021 to digitalise lectures quickly and economically from previous semesters (e.g., Witt et al., 2021; Zawacki-Richter, 2021) for continuity of learning, not quality of learning. The value of recorded lectures and lecture recordings is not proposed as of contention in this section, but rather that their value is in environments where they are implemented with purpose. Recorded lectures are synonymous with a YouTube video that was recorded for the specific purpose of being a video. Lecture recordings are supplements to existing practices of lecturing to allow students to revise and catch-up when they are seeking to strengthen their knowledge.

### Incongruence in evidence

The purpose of this systematic review was to identify the current practices and knowledge associated with higher education lectures since 2000. The sample was large, and it pointed to a lack of consensus on several key topics assessing the efficacy of lectures. These have been highlighted in their respective sections but point to a need for more rigorous studies on the effects of lectures. Many of the studies referred to, while published in top-tier journals, reflect localised samples that are missing key references to broader and international literature, congruent with what Crawford et al. (2021) term place-based context useful for enhancing individual practice with limits to its broader applicability. And the emergent effects of generative artificial intelligence on the lecture modality (Rudolph et al., 2023) are only likely to exacerbate the challenge of congruent delivery of lectures consistent with pedagogical aims.

### Conclusion

The objective of this study was to address the research question: What is currently known about the instructional pedagogy of the lecture in higher education? Through a careful review of the literature, it was identified that much is known about the nature of lectures, yet there is

an inconsistency in the practices and terminology of what a lecture is and is not. In this study, the aim was not to investigate the lecture's utility from an objective standpoint but to present the current knowledge of the lecture. It was also an opportunity to categorise the types of lectures identified in this study. It was clear that pedagogical approaches were conflated with lecture modalities with frequency, and these were distinguished during this study. There were strong opportunities identified for further research on the pedagogies and modalities of lectures in seeking to understand the relative efficacy of each type of lecture in context. As the higher education sector moves through and beyond the COVID-19 pandemic, there is a genuine need for rigorous evidence that can inform curriculum and instructional decisions that include or exclude lecture-based content. Indeed, there needs to be a more targeted evaluation of models. It was also identified that there is a need for clearer conceptualisation of newer forms of lectures, and deeper reviews of existing methods to prevent continuous conceptual overlap. Such overlap reduces the efficacy of such studies and the ability to engage in future meta-analyses and transferral of practice across jurisdictions.

In reflecting on the strengths and limitations of this study, there were a few to note. The study reviewed top-tier journals (Scopus Quartile 1) in education as a way to maximise the potential rigour of the final sample and likewise had a strong international sample to draw upon. However, it was limited by the size also, with the ability to engage in in-depth analysis of specific elements of lectures made difficult by size. Future scholars should consider reviewing individual components of this study, from lecture recordings to specific modalities. This paper serves as a key foundation for future scholars and practitioners in decision-making regarding lecture use in curriculum and should continue to inform scholarly pursuits in studying the efficacy of lecture-based curriculum and its alternatives. Importantly, as lectures continue to evolve with the advent and popularisation of generative artificial intelligence (e.g., Rasul et al., 2023) and as universities progress beyond COVID-19 digitalisations, scholars and educators alike are required to do a more substantial job of applying consistent language for their lecture materials to support a clearer long-term picture of the relative efficacy of each type of lecture across temporal, human, and spatial contexts.

## Acknowledgement

The authors report no conflicts of interest and note that generative artificial intelligence was used to make corrections to the reference list after human generation.

## References

\*Abdulla, M. (2018). The use of an online student response system to support learning of physiology during lectures to medical students. *Education and Information Technologies*, 23(6), 2931-2946. <https://doi.org/10.1007/s10639-018-9752-0>

\*Aguilar-Roca, N., Williams, A., & O'Dowd, D. (2012). The impact of laptop-free zones on student performance and attitudes in large lectures. *Computers & Education*, 59(4), 1300-1308. <https://doi.org/10.1016/j.compedu.2012.05.002>

\*Alcaraz, R., Martinez-Rodrigo, A., Zangroniz, R., & Rieta, J. (2020). Blending inverted lectures and laboratory experiments to improve learning in an introductory course in digital systems. *IEEE Transactions on Education*, 63(3), 144-154. <https://doi.org/10.1109/TE.2019.2954393>

\*Aldamen, H., Al-Esmail, R., & Hollindale, J. (2015). Does lecture capturing impact student performance and attendance in an introductory accounting course? *Accounting Education*, 24(4), 291-317. <https://doi.org/10.1080/09639284.2015.1043563>

\*Alluri, R., Tsing, P., Lee, E., & Napolitano, J. (2016). A randomized controlled trial of high-fidelity simulation versus lecture-based education in preclinical medical students. *Medical Teacher*, 38(4), 404-409. <https://doi.org/10.3109/0142159X.2015.1031734>

\*Auyuanet, A., Modzelewski, H., Loureiro, S., Alessandrini, D., & Miguez, M. (2018). FisiActiva: Applying active learning strategies to a large engineering lecture. *European Journal of Engineering Education*, 43(1), 55-64. <https://doi.org/10.1080/03043797.2017.1306026>

\*Babb, K., & Ross, C. (2009). The timing of online lecture slide availability and its effect on attendance, participation, and exam performance. *Computers & Education*, 52(4), 868-881. <https://doi.org/10.1016/j.compedu.2008.12.009>

\*Badger, R., White, G., Sutherland, P., & Haggis, T. (2001). Note perfect: An investigation of how students view taking notes in lectures. *System*, 29(3), 405-417. [https://doi.org/10.1016/S0346-251X\(01\)00028-8](https://doi.org/10.1016/S0346-251X(01)00028-8)

Bae, C. L., Mills, D. C., Zhang, F., Sealy, M., Cabrera, L., & Sea, M. A. (2021). Systematic review of science discourse in K-12 urban classrooms in the United States: Accounting for individual, collective, and contextual factors. *Review of Educational Research*, 91(6), 831-877. <https://doi.org/10.3102/00346543211042415>

\*Banerjee, S. (2021). To capture the research landscape of lecture capture in university education. *Computers & Education*, 160. <https://doi.org/10.1016/j.compedu.2020.104032>

\*Barak, M., Lipson, A., & Lerman, S. (2006). Wireless laptops as means for promoting active learning in large lecture halls. *Journal of Research on Technology in Education*, 38(3), 245-263. <https://doi.org/10.1080/15391523.2006.10782459>

\*Behmke, D., & Atwood, C. (2012). IM-Chem: The use of instant messaging to improve student performance and personalize large lecture general chemistry courses. *Journal of Chemical Education*, 89(4), 474-476. <https://doi.org/10.1021/ed200155d>

Blenkinsop, S., Nolan, C., Hunt, J., Stonehouse, P., & Telford, J. (2016). The lecture as experiential education: The cucumber

- in 17th-century Flemish art. *Journal of Experiential Education*, 39(2), 101-114. <https://doi.org/10.1177/1053825916641434>
- \*Bickerdike, S., Whittle, S., & Pickering, J. (2014). Do lecture audio-recordings support engagement and flexible learning? *Medical Education*, 48(5), 522-523. <https://doi.org/10.1111/medu.12442>
- \*Blenkinsop, S., Nolan, C., Hunt, J., Stonehouse, P., & Telford, J. (2016). The lecture as experiential education. *Journal of Experiential Education*, 39(2), 101-114. <https://doi.org/10.1177/1053825916641434>
- \*Bolden, E., Oestreich, T., Kenney, M., & Yuhnke, B., Jr. (2019). Location, location, location: A comparison of student experience in a lecture hall to a small classroom using similar techniques. *Active Learning in Higher Education*, 20(2), 139-152. <https://doi.org/10.1177/1469787417742018>
- \*Borda, E., Schumacher, E., Hanley, D., Geary, E., Warren, S., Ipsen, C., & Stredicke, L. (2020). Initial implementation of active learning strategies in large, lecture STEM courses: Lessons learned from a multi-institutional, interdisciplinary STEM faculty development program. *International Journal of STEM Education*, 7. <https://doi.org/10.1186/s40594-020-0203-2>
- \*Bos, N., Groeneveld, C., Bruggen, J., & Brand-Gruwel, S. (2016). The use of recorded lectures in education and the impact on lecture attendance and exam performance. *British Journal of Educational Technology*, 47(5), 906-917. <https://doi.org/10.1111/bjjet.12300>
- \*Bowman, N., & Akcaoglu, M. (2014). "I see smart people!": Using Facebook to supplement cognitive and affective learning in the university mass lecture. *Internet & Higher Education*, 23. <https://doi.org/10.1016/j.iheduc.2014.05.003>
- \*Bradley, A., Ulrich, S., Jones, M., & Jones, S. (2002). Teaching the sophomore organic course without a lecture. Are you crazy? *Journal of Chemical Education*, 79(4), 514-519. <https://doi.org/10.1021/ed079p514>
- \*Brallier, S. A., Palm, L. J., & Gilbert, R. (2007). Predictors of exam performance in web and lecture courses. *Journal of Computing in Higher Education*, 18(2), 82-98. <https://doi.org/10.1007/BF03033414>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101. <http://dx.doi.org/10.1191/1478088706qp063oa>
- Bredow, C. A., Roehling, P. V., Knorp, A. J., & Sweet, A. M. (2021). To flip or not to flip? A meta-analysis of the efficacy of flipped learning in higher education. *Review of Educational Research*, 91(6), 878-918. <https://doi.org/10.3102/00346543211019122>
- \*Brennan, A., Sharma, A., & Munguia, P. (2019). Diversity of online behaviours associated with physical attendance in lectures. *Journal of Learning Analytics*, 6(1), 34-53. <https://doi.org/10.18608/jla.2019.61.3>
- Brookfield, S. D., Rudolph, J., & Tan, S. (2023). *Teaching well: Understanding key dynamics of learning-centered classrooms*. Taylor & Francis. <https://doi.org/10.4324/9781003447467>
- \*Brown, M. (2020). Seeing students at scale: How faculty in large lecture courses act upon learning analytics dashboard data. *Teaching in Higher Education*, 25(4), 384-400. <https://doi.org/10.1080/13562517.2019.1698540>
- \*Bui, D. C., & Myerson, J. (2014). The role of working memory abilities in lecture note-taking. *Learning and Individual Differences*, 33. <https://doi.org/10.1016/j.lindif.2014.05.002>
- Burton, R. (2019). A review of Nearpod—an interactive tool for student engagement. *Journal of Applied Learning and Teaching*, 2(2), 95-97. <https://doi.org/10.37074/jalt.2019.2.2.13>
- \*Buzzanell, P. (2017). Rethinking lecture-learning from communicative lenses: A response to forum essays. *Communication Education*, 66(2), 250-252. <https://doi.org/10.1080/03634523.2017.1287412>
- Bygstad, B., Øvrelid, E., Ludvigsen, S., & Dæhlen, M. (2022). From dual digitalization to digital learning space: Exploring the digital transformation of higher education. *Computers & Education*, 182, 104463. <https://doi.org/10.1016/j.compedu.2022.104463>
- \*Caglayan, E., & Ustunluoglu, E. (2021). A study exploring students' usage patterns and adoption of lecture capture. *Technology, Knowledge and Learning*, 26(1), 13-30. <https://doi.org/10.1007/s10758-020-09435-9>
- \*Cavanagh, M. (2011). Students' experiences of active engagement through cooperative learning activities in lectures. *Active Learning in Higher Education*, 12(1), 23-33. <https://doi.org/10.1177/1469787410387724>
- \*Chandra, S. (2011). Experiences in personal lecture video capture. *IEEE Transactions on Learning Technologies*, 4(3), 261-274. <https://doi.org/10.1109/TLT.2011.10>
- \*Chang, Y. (2012). The use of questions by professors in lectures given in English: Influences of disciplinary cultures. *English for Specific Purposes*, 31(2), 103-116. <https://doi.org/10.1016/j.esp.2011.08.002>
- \*Chapin, L. (2018). Australian university students' access to web-based lecture recordings and the relationship with lecture attendance and academic performance. *Australasian Journal of Educational Technology*, 34(5), 1-12. <https://doi.org/10.14742/ajet.2989>
- \*Chen, C., & Wu, C. (2015). Effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance. *Computers & Education*, 80, 108-121. <https://doi.org/10.1016/j.compedu.2014.08.015>
- \*Chen, P. (2021). In-class and after-class lecture note-taking strategies. *Active Learning in Higher Education*, 22(3), 245-260. <https://doi.org/10.1177/1469787419893490>

- \*Cheng, S. (2012). "That's it for today": Academic lecture closings and the impact of class size. *English for Specific Purposes*, 31(4), 234-248. <https://doi.org/10.1016/j.esp.2012.05.004>
- \*Chesebro, J., & McCroskey, J. (2000). The relationship between students' reports of learning and their actual recall of lecture material: A validity test. *Communication Education*, 49(3), 297-301. <https://doi.org/10.1080/03634520009379217>
- \*Choate, J., Kotsanas, G., & Dawson, P. (2014). Exploring tablet PC lectures: Lecturer experiences and student perceptions in biomedicine. *Australasian Journal of Educational Technology*, 30(2), 167-183. <https://doi.org/10.14742/ajet.334>
- \*Choi, I., Lee, S., & Kang, J. (2009). Implementing a case-based e-learning environment in a lecture-oriented anaesthesiology class: Do learning styles matter in complex problem solving over time? *British Journal of Educational Technology*, 40(5), 933-947. <https://doi.org/10.1111/j.1467-8535.2008.00884.x>
- \*Clark, G., Gill, N., Walker, M., & Whittle, R. (2011). Attendance and performance: Correlations and motives in lecture-based modules. *Journal of Geography in Higher Education*, 35(2), 199-215. <https://doi.org/10.1080/03098265.2010.524196>
- \*Collins, M. (2000). Comparing web, correspondence and lecture versions of a second-year non-major biology course. *British Journal of Educational Technology*, 31(1), 21-27. <https://doi.org/10.1111/1467-8535.00132>
- \*Conway, C. (2014). Effects of guided inquiry versus lecture instruction on final grade distribution in a one-semester organic and biochemistry course. *Journal of Chemical Education*, 91(4), 480-483. <https://doi.org/10.1021/ed300137z>
- \*Copley, J. (2007). Audio and video podcasts of lectures for campus-based students: Production and evaluation of student use. *Innovations in Education and Teaching International*, 44(4), 387-399. <https://doi.org/10.1080/14703290701602805>
- \*Cosgun Ogeyik, M. (2017). The effectiveness of PowerPoint presentation and conventional lecture on pedagogical content knowledge attainment. *Innovations in Education and Teaching International*, 54(5), 503-510. <https://doi.org/10.1080/14703297.2016.1250663>
- \*Costley, J., Fanguy, M., Lange, C., & Baldwin, M. (2021). The effects of video lecture viewing strategies on cognitive load. *Journal of Computing in Higher Education*, 33(1), 19-38. <https://doi.org/10.1007/s12528-020-09254-y>
- \*Costley, J., & Lange, C. (2017). Video lectures in e-learning: Effects of viewership and media diversity on learning, satisfaction, engagement, interest, and future behavioral intention. *Interactive Technology and Smart Education*, 14(1), 14-30. <https://doi.org/10.1108/ITSE-08-2016-0025>
- \*Cotes, S., & Cotua, J. (2014). Using audience response systems during interactive lectures to promote active learning and conceptual understanding of stoichiometry. *Journal of Chemical Education*, 91(5), 673-677. <https://doi.org/10.1021/ed400111m>
- Cowling, M., Crawford, J., Vallis, C., Middleton, R., & Sim, K. (2022). The EdTech difference: Digitalisation, digital pedagogy, and technology enhanced learning. *Journal of University Teaching & Learning Practice*, 19(2), 1-13. <https://doi.org/10.53761/1.19.2.1>
- \*Cramer, K., Collins, K., Snider, D., & Fawcett, G. (2006). Virtual lecture hall for in-class and online sections: A comparison of utilization, perceptions, and benefits. *Journal of Research on Technology in Education*, 38(4), 371-381. <https://doi.org/10.1080/15391523.2006.10782465>
- \*Cramer, K., Collins, K., Snider, D., & Fawcett, G. (2007). The virtual lecture hall: Utilisation, effectiveness and student perceptions. *British Journal of Educational Technology*, 38(1), 106-115. <https://doi.org/10.1111/j.1467-8535.2006.00598.x>
- Crawford, J., Allen, K. A., Sanders, T., Baumeister, R., Parker, P., Saunders, C., & Tice, D. (2024a). Sense of belonging in higher education students: An Australian longitudinal study from 2013 to 2019. *Studies in Higher Education*, 49(3), 395-409. <https://doi.org/10.1080/03075079.2023.2238006>
- Crawford, J., Andrew, M., Rudolph, J., Lalani, K., & Butler-Henderson, K. (2021). The cross-cultural effects of COVID-19 on higher education learning and teaching practice. *Journal of University Teaching & Learning Practice*, 18(5), 01. <https://doi.org/10.53761/1.18.5.01>
- Crawford, J., Butler-Henderson, K., Lalani, K., Rudolph, J., & Sabu, K. M. (2024b). Initial crisis leadership during COVID-19 higher education: A systematic review. *Technology, Pedagogy and Education*, 1-17. <https://doi.org/10.1080/1475939X.2024.2410276>
- Credé, M., Roch, S. G., & Kieszczynka, U. M. (2010). Class attendance in college: A meta-analytic review of the relationship of class attendance with grades and student characteristics. *Review of Educational Research*, 80(2), 272-295. <https://doi.org/10.3102/0034654310362998>
- \*d'Alessio, M., Schwartz, J., Pedone, V., Pavia, J., Fleck, J., & Lundquist, L. (2019). Geology goes Hollywood: Building a community of inquiry in a fully online introductory geology lecture and laboratory. *Journal of Geoscience Education*, 67(3), 211-221. <https://doi.org/10.1080/10899995.2019.1578467>
- \*Dalsgaard, C., & Godsk, M. (2007). Transforming traditional lectures into problem-based blended learning: Challenges and experiences. *Open Learning*, 22(1), 29-42. <https://doi.org/10.1080/02680510601100143>
- \*Danielson, J., Preast, V., Bender, H., & Hassall, L. (2014). Is the effectiveness of lecture capture related to teaching approach or content type? *Computers & Education*, 72, 121-131. <https://doi.org/10.1016/j.compedu.2013.10.016>
- \*Dean, T., Lee-Post, A., & Hapke, H. (2017). Universal

- design for learning in teaching large lecture classes. *Journal of Marketing Education*, 39(1). <https://doi.org/10.1177/0273475316662104>
- \*Debuse, J., Hede, A., & Lawley, M. (2009). Learning efficacy of simultaneous audio and on-screen text in online lectures. *Australasian Journal of Educational Technology*, 25(5), 748-762. <https://doi.org/10.14742/ajet.1119>
- \*Dewhurst, D., MacLeod, H., & Norris, T. (2000). Independent student learning aided by computers: An acceptable alternative to lectures? *Computers & Education*, 35(3), 223-241. [https://doi.org/10.1016/S0360-1315\(00\)00033-6](https://doi.org/10.1016/S0360-1315(00)00033-6)
- \*Doig, K., & Werner, E. (2000). The marriage of a traditional lecture-based curriculum and problem-based learning: Are the offspring vigorous? *Medical Teacher*, 22(2), 173-178. <https://doi.org/10.1080/01421590078616>
- \*Dolnicar, S., Kaiser, S., Matus, K., & Vialle, W. (2009). Can Australian universities take measures to increase the lecture attendance of marketing students? *Journal of Marketing Education*, 31(3), 203-211. <https://doi.org/10.1177/0273475309345202>
- \*Dommett, E., Gardner, B., & van Tilburg, W. (2020). Staff and students' perception of lecture capture. *Internet & Higher Education*, 46. <https://doi.org/10.1016/j.iheduc.2020.100732>
- \*Dommett, E., van Tilburg, W., & Gardner, B. (2019). A case study: Views on the practice of opting in and out of lecture capture. *Education and Information Technologies*, 24(5). <https://doi.org/10.1007/s10639-019-09918-y>
- \*Dona, K., Gregory, J., & Pechenkina, E. (2017). Lecture-recording technology in higher education: Exploring lecturer and student views across the disciplines. *Australasian Journal of Educational Technology*, 33(4), 122-133.
- \*Dong, J., Hwang, W., Shadiev, R., & Chen, G. (2017). Pausing the classroom lecture: The use of clickers to facilitate student engagement. *Active Learning in Higher Education*, 18(2), 157-172. <https://doi.org/10.1177/1469787417707617>
- \*Dosseville, F., Laborde, S., & Scelles, N. (2012). Music during lectures: Will students learn better? *Learning and Individual Differences*, 22(2), 258-262. <https://doi.org/10.1016/j.lindif.2011.10.004>
- \*Draper, S. W., & Brown, M. I. (2004). Increasing interactivity in lectures using an electronic voting system. *Journal of Computer Assisted Learning*, 20(2), 81-94. <https://doi.org/10.1111/j.1365-2729.2004.00074.x>
- \*Egelanddsdal, K., & Krumsvik, R. (2017). Clickers and formative feedback at university lectures. *Education and Information Technologies*, 22(1), 55-74. <https://doi.org/10.1007/s10639-015-9437-x>
- \*Elavsky, C. M., Mislán, C., & Elavsky, S. (2011). When talking less is more: Exploring outcomes of "Twitter" usage in the large-lecture hall. *Learning, Media and Technology*, 36(3), 215-233. <https://doi.org/10.1080/17439884.2010.549828>
- \*Elliott, C., & Neal, D. (2016). Evaluating the use of lecture capture using a revealed preference approach. *Active Learning in Higher Education*, 17(2), 153-167. <https://doi.org/10.1177/1469787416637463>
- \*Evans, C. (2008). The effectiveness of m-learning in the form of podcast revision lectures in higher education. *Computers & Education*, 50(2), 491-498. <https://doi.org/10.1016/j.compedu.2007.09.016>
- \*Evans, T., Kensington-Miller, B., & Novak, J. (2021). Effectiveness, efficiency, engagement: Mapping the impact of pre-lecture quizzes on educational exchange. *Australasian Journal of Educational Technology*, 37(1), 163-177. <https://doi.org/10.14742/ajet.6258>
- \*Farooq, M., Salam, M., Jaafar, N., Fayolle, A., Ayupp, K., Radovic-Markovic, M., & Sajid, A. (2017). Acceptance and use of lecture capture system (LCS) in executive business studies: Extending UTAUT2. *Interactive Technology and Smart Education*, 14(4), 329-348. <https://doi.org/10.1108/ITSE-06-2016-0015>
- \*Fitzpatrick, J., Cronin, K., & Byrne, E. (2011). Is attending lectures still relevant in engineering education? *European Journal of Engineering Education*, 36(3), 301-312. <https://doi.org/10.1080/03043797.2011.585226>
- \*Flanigan, A., & Titsworth, S. (2020). The impact of digital distraction on lecture note taking and student learning. *Instructional Science*, 48(5), 495-524. <https://doi.org/10.1007/s11251-020-09517-2>
- \*Folley, D. (2010). The lecture is dead, long live the e-lecture. *Electronic Journal of e-Learning*, 8(2), 93-100.
- \*Forsgren, S., Christensson, T., Rudolfsson, G., & Rejno, A. (2021). To attend or not—The reasoning behind nursing students' attendance at lectures: A qualitative study. *Scandinavian Journal of Educational Research*, 65(3), 500-509. <https://doi.org/10.1080/00313831.2020.1727004>
- \*Fortanet, I. (2004). The use of "we" in university lectures: Reference and function. *English for Specific Purposes*, 23(1), 45-66. [https://doi.org/10.1016/S0889-4906\(03\)00018-8](https://doi.org/10.1016/S0889-4906(03)00018-8)
- \*French, S., & Kennedy, G. (2017). Reassessing the value of university lectures. *Teaching in Higher Education*, 22(6), 639-654. <https://doi.org/10.1080/13562517.2016.1273213>
- \*Friesen, N. (2011). The lecture as a transmedial pedagogical form: A historical analysis. *Educational Researcher*, 40(3), 95-102. <https://doi.org/10.3102/0013189X11404603>
- \*Fulford, A., & Mahon, A. (2020). A philosophical defence of the university lecture. *Oxford Review of Education*, 46(3), 363-374. <https://doi.org/10.1080/03054985.2019.1702013>
- \*Fyrenius, A., Bergdahl, B., & Silen, C. (2005). Lectures in problem-based learning—why, when and how? An example of interactive lecturing that stimulates meaningful learning. *Medical Teacher*, 27(1), 61-65. <https://doi.org/10.1080/01421590400016365>

- \*Gan, C., & Balakrishnan, V. (2014). Determinants of mobile wireless technology for promoting interactivity in lecture sessions: An empirical analysis. *Journal of Computing in Higher Education*, 26(2), 159-181. <https://doi.org/10.1007/s12528-014-9082-1>
- \*George, D., Dreibelbis, T., & Aumiller, B. (2013). How we used two social media tools to enhance aspects of active learning during lectures. *Medical Teacher*, 35(12), 985-988. <https://doi.org/10.3109/0142159X.2013.818631>
- \*Germany, L. (2012). Beyond lecture capture: What teaching staff want from web-based lecture technologies. *Australasian Journal of Educational Technology*, 28(7), 1208-1220. <https://doi.org/10.14742/ajet.797>
- \*Giacaman, N., & De Ruvo, G. (2018). Bridging theory and practice in programming lectures with active classroom programming. *IEEE Transactions on Education*, 61(3), 177-186. <https://doi.org/10.1109/TE.2018.2819969>
- \*Giannakos, M., Jaccheri, L., & Krogstie, J. (2016). Exploring the relationship between video lecture usage patterns and students' attitudes. *British Journal of Educational Technology*, 47(6), 1259-1275. <https://doi.org/10.1111/bjet.12313>
- \*Godlewska, A., Beyer, W., Whetstone, S., Schaeffli, L., Rose, J., Talan, B., Kamin-Patterson, S., Lamb, C., & Forcione, M. (2019). Converting a large lecture class to an active blended learning class: Why, how, and what we learned. *Journal of Geography in Higher Education*, 43(1), 96-115. <https://doi.org/10.1080/03098265.2019.1570090>
- \*Gorissen, P., van Bruggen, J., & Jochems, W. (2015). Does tagging improve the navigation of online recorded lectures by students? *British Journal of Educational Technology*, 46(1), 45-57. <https://doi.org/10.1111/bjet.12121>
- \*Grabe, M., & Christopherson, K. (2008). Optional student use of online lecture resources: Resource preferences, performance and lecture attendance. *Journal of Computer Assisted Learning*, 24(1). <https://doi.org/10.1111/j.1365-2729.2007.00228.x>
- \*Grabe, M. (2005). Voluntary use of online lecture notes: Correlates of note use and note use as an alternative to class attendance. *Computers & Education*, 44(4), 409-421. <https://doi.org/10.1016/j.compedu.2004.04.005>
- \*Grabe, M., & Christopherson, K. (2005). Evaluating the advantages and disadvantages of providing lecture notes: The role of internet technology as a delivery system and research tool. *Internet and Higher Education*, 8(4), 291-298. <https://doi.org/10.1016/j.iheduc.2005.09.002>
- \*Grimley, M., Green, R., Nilsen, T., & Thompson, D. (2012). Comparing computer game and traditional lecture using experience ratings from high and low achieving students. *Australasian Journal of Educational Technology*, 28(4), 619-638. <https://doi.org/10.14742/ajet.831>
- \*Grund, C., & Tulis, M. (2020). Facilitating student autonomy in large-scale lectures with audience response systems. *Educational Technology Research and Development*, 68(3), 975-993. <https://doi.org/10.1007/s11423-019-09713-z>
- \*Grunewald, F., & Meinel, C. (2015). Implementation and evaluation of digital e-lecture annotation in learning groups to foster active learning. *IEEE Transactions on Learning Technologies*, 8(3), 286-298. <https://doi.org/10.1109/TLT.2015.2396042>
- \*Gupta, A., & Saks, N. (2013). Exploring medical student decisions regarding attending live lectures and using recorded lectures. *Medical Teacher*, 35(9), 767-771. <https://doi.org/10.3109/0142159X.2013.801940>
- \*Gustin, M., Abbiati, M., Bonvin, R., Gerbase, M., & Baroffio, A. (2018). Integrated problem-based learning versus lectures: A path analysis modelling of the relationships between educational context and learning approaches. *Medical Education Online*, 23(1). <https://doi.org/10.1080/10872981.2018.1489690>
- \*Hadie, S., Hassan, A., Ismail, Z., Ismail, H., Talip, S., & Abdul Rahim, A. (2018). Empowering students' minds through a cognitive load theory-based lecture model: A metacognitive approach. *Innovations in Education and Teaching International*, 55(4), 398-407. <https://doi.org/10.1080/14703297.2016.1252685>
- \*Hall, G., & Ivaldi, A. (2017). A qualitative approach to understanding the role of lecture capture in student learning experiences. *Technology, Pedagogy and Education*, 26(4), 383-394. <https://doi.org/10.1080/1475939X.2016.1263805>
- \*Hallewell, M., & Lackovic, N. (2017). Do pictures "tell" a thousand words in lectures? How lecturers vocalise photographs in their presentations. *Higher Education Research and Development*, 36(6), 1166-1180. <https://doi.org/10.1080/07294360.2017.1303454>
- Haskins, C. H. (2002). *The rise of universities*. Routledge.
- \*Hatun Atas, A., & Delialioglu, A. (2018). A question-answer system for mobile devices in lecture-based instruction: A qualitative analysis of student engagement and learning. *Interactive Learning Environments*, 26(1), 75-90. <https://doi.org/10.1080/10494820.2017.1283331>
- \*Hembrooke, H., & Gay, G. (2003). The laptop and the lecture: The effects of multitasking in learning environments. *Journal of Computing in Higher Education*, 15(1), 46-64. <https://doi.org/10.1007/BF02940852>
- \*Herder, P. M., Subrahmanian, E., Talukdar, S., Turk, A. L., & Westerberg, A. W. (2002). The use of video-taped lectures and web-based communications in teaching: A distance-teaching and cross-Atlantic collaboration experiment. *European Journal of Engineering Education*, 27(1), 39-48. <https://doi.org/10.1080/03043790110100209>
- \*Hermann, C., & Ottmann, T. (2011). Electures-Wiki--Toward engaging students to actively work with lecture recordings. *IEEE Transactions on Learning Technologies*, 4(4), 315-326. <https://doi.org/10.1109/TLT.2011.18>



- \*Hoisch, T., Austin, B., Newell, S., & Manone, M. (2010). Application of tablet PCs to lecture demonstrations on optical mineralogy. *Journal of Geoscience Education*, 58(4), 221-231. <https://doi.org/10.5408/1.3534862>
- \*Holbrey, C. (2020). Kahoot! Using a game-based approach to blended learning to support effective learning environments and student engagement in traditional lecture theatres. *Technology, Pedagogy and Education*, 29(2), 191-202. <https://doi.org/10.1080/1475939X.2020.1737568>
- \*Hong, J., Pi, Z., & Yang, J. (2018). Learning declarative and procedural knowledge via video lectures: Cognitive load and learning effectiveness. *Innovations in Education and Teaching International*, 55(1), 74-81. <https://doi.org/10.1080/14703297.2016.1237371>
- \*Hughes, C., Costley, J., & Lange, C. (2018). The effects of self-regulated learning and cognitive load on beginning to watch and completing video lectures at a cyber-university. *Interactive Technology and Smart Education*, 15(3), 220-237. <https://doi.org/10.1108/ITSE-03-2018-0018>
- \*Hughes, C., Costley, J., & Lange, C. (2019). The effects of multimedia video lectures on extraneous load. *Distance Education*, 40(1), 54-75. <https://doi.org/10.1080/01587919.2018.1553559>
- \*Hussain, F., Al-Mannai, R., Diab, M., & Agouni, A. (2020). Investigating the use of a lecture capture system within pharmacy education: Lessons from an undergraduate pharmacy program at Qatar University. *International Journal of Educational Technology in Higher Education*, 17. <https://doi.org/10.1186/s41239-020-00214-1>
- \*Huxham, M. (2005). Learning in lectures: Do 'interactive windows' help? *Active Learning in Higher Education*, 6(1), 17-31. <https://doi.org/10.1177/1469787405049943>
- \*Huxham, M. (2010). The medium makes the message: Effects of cues on students' lecture notes. *Active Learning in Higher Education*, 11(3), 179-188. <https://doi.org/10.1177/1469787410379681>
- Ives, J., & Castillo-Montoya, M. (2020). First-generation college students as academic learners: A systematic review. *Review of Educational Research*, 90(2), 139-178. <https://doi.org/10.3102/0034654319899707>
- \*Jiménez-Castillo, D., Sánchez-Fernández, R., & Marín-Carrillo, G. M. (2017). Dream team or odd couple? Examining the combined use of lectures and podcasting in higher education. *Innovations in Education & Teaching International*, 54(5), 448-457. <https://doi.org/10.1080/14703297.2016.1148622>
- \*Jo, J., Yu, W., Koh, K., & Lim, H. (2018). Development of a game-based learning judgment system for online education environments based on video lecture: Minimum learning judgment system. *Journal of Educational Computing Research*, 56(6), 802-825. <https://doi.org/10.1177/0735633117734122>
- \*Joordens, S., Le, A., Grinnell, R., & Chrysostomou, S. (2009). Eating your lectures and having them too: Is online lecture availability especially helpful in "skills-based" courses? *Electronic Journal of e-Learning*, 7(3), 281-288.
- \*Joseph-Richard, P., Jessop, T., Okafor, G., Almpanis, T., & Price, D. (2018). Big Brother or harbinger of best practice: Can lecture capture actually improve teaching? *British Educational Research Journal*, 44(3), 377-392. <https://doi.org/10.1002/berj.3336>
- \*Kang, H., Lundeberg, M., Wolter, B., delMas, R., & Herreid, C. (2012). Gender differences in student performance in large lecture classrooms using personal response systems ("Clickers") with narrative case studies. *Learning, Media and Technology*, 37(1), 53-76. <https://doi.org/10.1080/17439884.2011.556123>
- \*Kay, R., MacDonald, T., & DiGiuseppe, M. (2019). A comparison of lecture-based, active, and flipped classroom teaching approaches in higher education. *Journal of Computing in Higher Education*, 31(3), 449-471. <https://doi.org/10.1007/s12528-018-9197-x>
- \*Kekkonen-Moneta, S., & Moneta, G. (2002). E-learning in Hong Kong: Comparing learning outcomes in online multimedia and lecture versions of an introductory computing course. *British Journal of Educational Technology*, 33(4), 423-433. <https://doi.org/10.1111/1467-8535.00279>
- Kelly, G. E. (2012). Lecture attendance rates at university and related factors. *Journal of Further and Higher Education*, 36(1), 17-40. <https://doi.org/10.1080/0309877X.2011.596196>
- \*Kestin, G., Miller, K., McCarty, L., Callaghan, K., & Deslauriers, L. (2020). Comparing the effectiveness of online versus live lecture demonstrations. *Physical Review Physics Education Research*, 16(1). <https://doi.org/10.1103/PhysRevPhysEducRes.16.013101>
- \*Ketterl, M., Mertens, R., & Vornberger, O. (2009). Bringing Web 2.0 to web lectures. *Interactive Technology and Smart Education*, 6(2), 82-96. <https://doi.org/10.1108/17415650910968099>
- \*Ketterl, M., Mertens, R., Wiesen, C., & Vornberger, O. (2011). Enabling user-to-user interactions in web lectures with history-aware user awareness. *Interactive Technology and Smart Education*, 8(4), 224-235. <https://doi.org/10.1108/17415651111189469>
- \*Kim, H. (2018). Impact of slide-based lectures on undergraduate students' learning: Mixed effects of accessibility to slides, differences in note-taking, and memory term. *Computers & Education*, 123, 13-25. <https://doi.org/10.1016/j.compedu.2018.04.004>
- \*Kinnari-Korpela, H. (2015). Using short video lectures to enhance mathematics learning: Experiences on differential and integral calculus course for engineering students. *Informatics in Education*, 14(1), 67-81. <https://doi.org/10.15388/infedu.2015.05>
- \*Kinoshita, T., Knight, D., & Gibbes, B. (2017). The positive

- influence of active learning in a lecture hall: An analysis of normalized gain scores in introductory environmental engineering. *Innovations in Education & Teaching International*, 54(3), 275-284. <https://doi.org/10.1080/14703297.2015.1114957>
- \*Kinsella, G., Mahon, C., & Lillis, S. (2017). Using pre-lecture activities to enhance learner engagement in a large group setting. *Active Learning in Higher Education*, 18(3), 231-242. <https://doi.org/10.1177/1469787417715205>
- \*Kokoc, M., Ilgaz, H., & Altun, A. (2020). Effects of sustained attention and video lecture types on learning performances. *Educational Technology Research & Development*, 68(6), 3015-3039. <https://doi.org/10.1007/s11423-020-09829-7>
- \*Kramer, M. (2017). Forum: The lecture and student learning. Sage on the stage or bore at the board? *Communication Education*, 66(2), 245-247. <https://doi.org/10.1080/03634523.2016.1272129>
- \*Kunberger, T. (2013). Revising a design course from a lecture approach to a project-based learning approach. *European Journal of Engineering Education*, 38(3), 254-267. <https://doi.org/10.1080/03043797.2013.800020>
- \*Kwon, K., Saporova, D., & Hoffman, K. (2015). Online lecture capturing system: Expected and actual effects of implementation in a problem-based learning medical curriculum. *Medical Teacher*, 37(6), 578-584. <https://doi.org/10.3109/0142159X.2014.956060>
- \*Lackovic, N., & Popova, B. (2021). Multimodality and socio-materiality of lectures in global universities' media: Accounting for bodies and things. *Learning, Media & Technology*, 46(4), 531-549. <https://doi.org/10.1080/17439884.2021.1928694>
- \*Lampi, F., Lemelson, H., Kopf, S., & Effelsberg, W. (2009). A question managing suite for automatic lecture recording. *Interactive Technology and Smart Education*, 6(2), 108-118. <https://doi.org/10.1108/17415650910968116>
- \*Larkin, H. (2010). "But they won't come to lectures..." The impact of audio-recorded lectures on student experience and attendance. *Australasian Journal of Educational Technology*, 26(2), 238-249. <https://doi.org/10.14742/ajet.1093>
- \*Lau, K. H., Vincent, F., Pue, L., Gary, S., Michael, L., Sadler, R., & Moeller, J. (2018). Using learning analytics to evaluate a video-based lecture series. *Medical Teacher*, 40(1), 91-98. <https://doi.org/10.1080/0142159X.2017.1395001>
- \*Le, A., Joordens, S., Chrysostomou, S., & Grinnell, R. (2010). Online lecture accessibility and its influence on performance in skills-based courses. *Computers & Education*, 55(1), 313-319. <https://doi.org/10.1016/j.compedu.2010.01.017>
- \*Leadbeater, W., Shuttleworth, T., Couperthwaite, J., & Nightingale, K. (2013). Evaluating the use and impact of lecture recording in undergraduates: Evidence for distinct approaches by different groups of students. *Computers & Education*, 61, 185-192. <https://doi.org/10.1016/j.compedu.2012.09.011>
- \*Lee, J. (2009). Size matters: An exploratory comparison of small- and large-class university lecture introductions. *English for Specific Purposes*, 28(1), 42-57. <https://doi.org/10.1016/j.esp.2008.11.001>
- \*Leinonen, R., Asikainen, M., & Hirvonen, P. (2017). Peer discussions in lecture-based tutorials in introductory physics. *Physical Review Physics Education Research*, 13(1). <https://doi.org/10.1103/PhysRevPhysEducRes.13.010114>
- \*Lew, K., Fukawa-Connelly, T., Mejía-Ramos, J., & Weber, K. (2016). Lectures in advanced mathematics: Why students might not understand what the mathematics professor is trying to convey. *Journal for Research in Mathematics Education*, 47(2), 162-198. <https://doi.org/10.5951/jresmetheduc.47.2.0162>
- \*Lewis, S., & Lewis, J. (2005). Departing from lectures: An evaluation of a peer-led guided inquiry alternative. *Journal of Chemical Education*, 82(1), 135-139. <https://doi.org/10.1021/ed082p135>
- \*Lim, R., Wegelin, J., Hua, L., Kramer, E., & Servis, M. (2008). Evaluating a lecture on cultural competence in the medical school preclinical curriculum. *Academic Psychiatry*, 32(4), 327-331. <https://doi.org/10.1176/appi.ap.32.4.327>
- \*Lin, C. (2015). Seminars and interactive lectures as a community of knowledge co-construction: The use of modifiers. *English for Specific Purposes*, 38, 99-108. <https://doi.org/10.1016/j.esp.2015.02.002>
- \*Lin, Y., Liu, T., & Chu, C. (2011). Implementing clickers to assist learning in science lectures: The clicker-assisted conceptual change model. *Australasian Journal of Educational Technology*, 27(6), 979-996. <https://doi.org/10.14742/ajet.924>
- \*Lin, Y., Yen, B., Chang, C., Lee, G., & Lin, Y. (2010). Content-based indexing and teaching focus mining for lecture videos. *Interactive Technology and Smart Education*, 7(3), 131-153. <https://doi.org/10.1108/17415651011071613>
- \*Littlemore, J. (2001). The use of metaphor in university lectures and the problems that it causes for overseas students. *Teaching in Higher Education*, 6(3), 333-349. <https://doi.org/10.1080/13562510120061205>
- \*Liu, C., & Chen, H. (2020). Analyzing the functions of lexical bundles in undergraduate academic lectures for pedagogical use. *English for Specific Purposes*, 58, 122-137. <https://doi.org/10.1016/j.esp.2019.12.003>
- \*Liu, Y., Raker, J., & Lewis, J. (2018). Evaluating student motivation in organic chemistry courses: Moving from a lecture-based to a flipped approach with peer-led team learning. *Chemistry Education Research and Practice*, 19(1), 251-264. <https://doi.org/10.1039/C7RP00153C>
- \*Llamas-Nistal, M., & Mikic-Fonte, F. (2014). Generating OER by recording lectures: A case study. *IEEE Transactions*

on *Education*, 57(4), 220-228. <https://doi.org/10.1109/TE.2014.2336630>

\*Lochner, L., & Gijsselaers, W. (2011). Improving lecture skills: A time-efficient 10-step pedagogical consultation method for medical teachers in healthcare professions. *Medical Teacher*, 33(2), 131-136. <https://doi.org/10.3109/0142159X.2010.498490>

\*Lucieer, S., van der Geest, J., El-Santos, S., de Faria, R., Dellbone, J., Laura, V., Chris, R., Remy, M., & Themmen, A. (2016). The development of self-regulated learning during the pre-clinical stage of medical school: A comparison between a lecture-based and a problem-based curriculum. *Advances in Health Sciences Education*, 21(1), 93-104. <https://doi.org/10.1007/s10459-015-9613-1>

\*Ludvigsen, K., Krumsvik, R., & Furnes, B. (2015). Creating formative feedback spaces in large lectures. *Computers & Education*, 88, 48-63. <https://doi.org/10.1016/j.compedu.2015.04.002>

\*Luke, K. (2020). The pause/play button actor-network: Lecture capture recordings and (re)configuring multi-spatial learning practices. *Interactive Learning Environments*. <https://doi.org/10.1080/10494820.2019.1706052>

\*Luo, L., Kiewra, K., Flanigan, A., & Peteranetz, M. (2018). Laptop versus longhand note taking: Effects on lecture notes and achievement. *Instructional Science*, 46(6), 947-971. <https://doi.org/10.1007/s11251-018-9458-0>

\*Luo, L., Kiewra, K., & Samuelson, L. (2016). Revising lecture notes: How revision, pauses, and partners affect note taking and achievement. *Instructional Science*, 44(1), 45-67. <https://doi.org/10.1007/s11251-016-9370-4>

\*Luttenberger, S., Macher, D., Maidl, V., Rominger, C., Aydin, N., & Paechter, M. (2018). Different patterns of university students' integration of lecture podcasts, learning materials, and lecture attendance in a psychology course. *Education and Information Technologies*, 23(1), 165-178. <https://doi.org/10.1007/s10639-017-9592-3>

\*Lyon, D. C., & Lagowski, J. J. (2008). Effectiveness of facilitating small-group learning in large lecture classes: A general chemistry case study. *Journal of Chemical Education*, 85(11), 1571-1576. <https://doi.org/10.1021/ed085p1571>

\*Macedo-Rouet, M., Ney, M., Charles, S., & Lallich-Boidin, G. (2009). Students' performance and satisfaction with web vs. paper-based practice quizzes and lecture notes. *Computers & Education*, 53(2), 375-384. <https://doi.org/10.1016/j.compedu.2009.02.013>

\*MacGeorge, E., Homan, S., Dunning, J., Elmore, D., Bodie, G., Evans, E., Khichadia, S., Lichti, S., Feng, B., & Geddes, B. (2008). Student evaluation of audience response technology in large lecture classes. *Educational Technology Research & Development*, 56(2), 125-145. <https://doi.org/10.1007/s11423-007-9053-6>

\*Machida, K., Chin, M., & Johnson, K. (2018). The provision

of partial notes is not associated with improved student attention in lectures or subsequent understanding of the lecture material. *Active Learning in Higher Education*, 19(2), 101-115. <https://doi.org/10.1177/1469787417723241>

\*MacKay, J. R. D. (2019). Show and 'tool': How lecture recording transforms staff and student perspectives on lectures in higher education. *Computers & Education*, 140, 103593. <https://doi.org/10.1016/j.compedu.2019.05.019>

\*Maher, K., Brower, K., Mullan, P., Gay, T., & Gruppen, L. (2013). Web-streamed didactic instruction on substance use disorders compares favorably with live-lecture format. *Academic Psychiatry*, 37(3), 165-170. <https://doi.org/10.1176/appi.ap.12010001>

\*Maki, R., & Maki, W. (2003). Prediction of learning and satisfaction in web-based and lecture courses. *Journal of Educational Computing Research*, 28(3), 197-219. <https://doi.org/10.2190/DXJU-7HGJ-1RVP-Q5F2>

\*Mallin, I. (2017). Forum: The lecture and student learning. Lecture and active learning as a dialectical tension. *Communication Education*, 66(2), 242-243. <https://doi.org/10.1080/03634523.2016.1275720>

\*Mann, S., & Robinson, A. (2009). Boredom in the lecture theatre: An investigation into the contributors, moderators and outcomes of boredom amongst university students. *British Educational Research Journal*, 35(2), 243-258. <https://doi.org/10.1080/01411920802042911>

\*Martin, V., & Bennett, D. (2004). Creation of a web-based lecture series for psychiatry clerkship students: Initial findings. *Academic Psychiatry*, 28(3), 209-214. <https://doi.org/10.1176/appi.ap.28.3.209>

\*Masikunis, G., Panayiotidis, A., & Burke, L. (2009). Changing the nature of lectures using a personal response system. *Innovations in Education and Teaching International*, 46(2), 199-212. <https://doi.org/10.1080/14703290902843935>

Massingham, P., & Herrington, T. (2006). Does attendance matter? An examination of student attitudes, participation, performance and attendance. *Journal of University Teaching & Learning Practice*, 3(2), 20-42. <https://doi.org/10.53761/1.3.2.3>

\*Masters, K. (2014). Nipping an education myth in the bud: Poh's brain activity during lectures. *Medical Teacher*, 36(8), 732-735. <https://doi.org/10.3109/0142159X.2014.916785>

\*Mattick, K., Crocker, G., & Bligh, J. (2007). Medical student attendance at non-compulsory lectures. *Advances in Health Sciences Education*, 12(2), 201-210. <https://doi.org/10.1007/s10459-005-5492-1>

\*Mayer, R., Stull, A., DeLeeuw, K., Almeroth, K., Bimber, B., Chun, D., Bulger, M., Campbell, J., Knight, A., & Zhang, H. (2009). Clickers in college classrooms: Fostering learning with questioning methods in large lecture classes. *Contemporary Educational Psychology*, 34(1), 51-57. <https://doi.org/10.1016/j.cedpsych.2008.04.002>

- \*Mazer, J., & Hess, J. (2017). What is the place of lecture in higher education? *Communication Education*, 66(2), 236-237. <https://doi.org/10.1080/03634523.2017.1287411>
- \*McCullough, K., & Munro, N. (2018). Finance students' experiences of lecture-based active learning tasks. *Innovations in Education & Teaching International*, 55(1), 65-73. <https://doi.org/10.1080/14703297.2016.1189843>
- \*McCunn, P., & Newton, G. (2015). Student perception of topic difficulty: Lecture capture in higher education. *Australasian Journal of Educational Technology*, 31(3), 252-262. <https://doi.org/10.14742/ajet.1681>
- \*McGarr, O. (2009). A review of podcasting in higher education: Its influence on the traditional lecture. *Australasian Journal of Educational Technology*, 25(3), 309-321. <https://doi.org/10.14742/ajet.1136>
- \*McInnes, D. (2013). The performance of academic identity as pedagogical model and guide in/through lecture discourse. *Teaching in Higher Education*, 18(1), 53-64. <https://doi.org/10.1080/13562517.2012.678327>
- \*McKenzie, W., Perini, E., Rohlf, V., Toukhsati, S., Conduit, R., & Sanson, G. (2013). A blended learning lecture delivery model for large and diverse undergraduate cohorts. *Computers & Education*, 64, 116-126. <https://doi.org/10.1016/j.compedu.2013.01.009>
- McMann Jr, F. (1979). In defense of lecture. *The Social Studies*, 70(6), 270-274. <https://doi.org/10.1080/00220973.1944.11019620>
- \*McQueen, H., & McMillan, C. (2020). Quectures: Personalised constructive learning in lectures. *Active Learning in Higher Education*, 21(3), 217-231. <https://doi.org/10.1177/1469787418760325>
- \*Meehan, M., & McCallig, J. (2019). Effects on learning of time spent by university students attending lectures and/or watching online videos. *Journal of Computer Assisted Learning*, 35(2), 283-293. <https://doi.org/10.1111/jcal.12329>
- \*Memon, B., & Memon, M. (2007). Surgical e-learning: Validation of multi-media, web-based lectures. *Medical Education*, 41, 1235-1236. <https://doi.org/10.1111/j.1365-2923.2007.02926.x>
- \*Mertens, R., Ketterl, M., & Brusilovsky, P. (2010). Social navigation in web lectures: A study of VirtPresenter. *Interactive Technology and Smart Education*, 7(3), 181-196. <https://doi.org/10.1108/17415651011071640>
- \*Meyer, K., & Hunt, S. (2017). Forum: The lecture and student learning. The lost art of lecturing: Cultivating student listening and notetaking. *Communication Education*, 66(2), 239-241. <https://doi.org/10.1080/03634523.2016.1275719>
- Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Med*, 6, e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- \*Moneta, G., & Kekkonen-Moneta, S. (2007). Affective learning in online multimedia and lecture versions of an introductory computing course. *Educational Psychology*, 27(1), 51-74. <https://doi.org/10.1080/01443410601061413>
- \*Moore, S., Armstrong, C., & Pearson, J. (2008). Lecture absenteeism among students in higher education: A valuable route to understanding student motivation. *Journal of Higher Education Policy and Management*, 30(1), 15-24. <https://doi.org/10.1080/13600800701457848>
- \*Mora, G. (2010). Peer instruction and lecture tutorials equally improve student learning in introductory geology classes. *Journal of Geoscience Education*, 58(5), 286-296. <https://doi.org/10.5408/1.3559693>
- \*Morell, T. (2004). Interactive lecture discourse for university EFL students. *English for Specific Purposes*, 23(3), 325-338. [https://doi.org/10.1016/S0889-4906\(03\)00029-2](https://doi.org/10.1016/S0889-4906(03)00029-2)
- \*Morell, T. (2007). What enhances EFL students' participation in lecture discourse? Student, lecturer and discourse perspectives. *Journal of English for Academic Purposes*, 6(3), 222-237. <https://doi.org/10.1016/j.jeap.2007.07.002>
- \*Morris, N., Swinnerton, B., & Coop, T. (2019). Lecture recordings to support learning: A contested space between students and teachers. *Computers & Education*, 140. <https://doi.org/10.1016/j.compedu.2019.103604>
- \*Moss, N., Hamilton, K., White, K., & Hansen, J. (2015). The changing motivations of students' use of lecture podcasts across a semester: An extended theory of planned behaviour approach. *Innovations in Education and Teaching International*, 52(6), 599-609. <https://doi.org/10.1080/14703297.2012.746513>
- \*Mostert, L., & Townsend, R. (2018). Embedding the teaching of academic writing into anthropology lectures. *Innovations in Education and Teaching International*, 55(1), 82-90. <https://doi.org/10.1080/14703297.2016.1231619>
- \*Mowbray, R., & Perry, L. (2015). Improving lecture quality through training in public speaking. *Innovations in Education and Teaching International*, 52(2), 207-217. <https://doi.org/10.1080/14703297.2013.849205>
- \*Mulligan, D., & Kirkpatrick, A. (2000). How much do they understand? Lectures, students and comprehension. *Higher Education Research & Development*, 19(3), 311-335. <https://doi.org/10.1080/758484352>
- \*Mundy, D., & Consoli, R. (2013). Here be dragons: Experiments with the concept of 'choose your own adventure' in the lecture room. *Innovations in Education & Teaching International*, 50(2), 214-223. <https://doi.org/10.1080/14703297.2012.760869>
- \*Myllymaki, S. (2013). Incorporation of continuous student assessment into lectures in engineering education. *European Journal of Engineering Education*, 38(4), 385-393. <https://doi.org/10.1080/03043797.2013.780010>

- \*Nesi, H. (2012). Laughter in university lectures. *Journal of English for Academic Purposes*, 11(2), 79-89. <https://doi.org/10.1016/j.jeap.2011.12.003>
- \*Neumann, D., Neumann, M., & Hood, M. (2011). Evaluating computer-based simulations, multimedia and animations that help integrate blended learning with lectures in first-year statistics. *Australasian Journal of Educational Technology*, 27(2), 274-289. <https://doi.org/10.14742/ajet.970>
- \*Nightingale, K., Anderson, V., Onens, S., Fazil, Q., & Davies, H. (2019). Developing the inclusive curriculum: Is supplementary lecture recording an effective approach in supporting students with specific learning difficulties (SpLDs)? *Computers & Education*, 130, 13-25. <https://doi.org/10.1016/j.compedu.2018.11.006>
- \*Nordmann, E., Hutchison, J., & MacKay, J. (2021). Lecture rapture: The place and case for lectures in the new normal. *Teaching in Higher Education*, 44774. <https://doi.org/10.35542/osf.io/h8zt6>
- \*Nyatanga, P., & Mukorera, S. (2019). Effects of lecture attendance, aptitude, individual heterogeneity and pedagogic intervention on student performance: A probability model approach. *Innovations in Education & Teaching International*, 56(2), 195-205. <https://doi.org/10.1080/14703297.2017.1371626>
- \*O'Bannon, B., Lubke, J., Beard, J., & Britt, V. (2011). Using podcasts to replace lecture: Effects on student achievement. *Computers & Education*, 57(3), 1885-1892. <https://doi.org/10.1016/j.compedu.2011.04.001>
- \*Obiosa, N. (2020). Effects of students' motivation and engagement on students' satisfaction in a lecture: Empirical analysis. *International Journal of Instruction*, 13(3), 861-876. <https://doi.org/10.29333/iji.2020.13357a>
- \*O'Callaghan, F., Neumann, D., Jones, L., & Creed, P. (2017). The use of lecture recordings in higher education: A review of institutional, student, and lecturer issues. *Education and Information Technologies*, 22(1), 399-415. <https://doi.org/10.1007/s10639-015-9451-z>
- \*Odhabi, H., & Nicks-McCaleb, L. (2011). Video recording lectures: Student and professor perspectives. *British Journal of Educational Technology*, 42(2), 327-336. <https://doi.org/10.1111/j.1467-8535.2009.01011.x>
- \*Okulich-Kazarin, V., Zhurba, M., Bokhonkova, Y., & Losiyevska, O. (2019). Three scientific facts about Ukrainian and Polish law-students: Verification of statistical hypotheses about their preferences of learning at lectures. *European Journal of Contemporary Education*, 8(3), 562-573. <https://doi.org/10.13187/ejced.2019.3.562>
- \*Oliveira, P., & Oliveira, C. (2013). Using conceptual questions to promote motivation and learning in physics lectures. *European Journal of Engineering Education*, 38(4), 417-424. <https://doi.org/10.1080/03043797.2013.780013>
- \*Oliver, E., Markland, D., & Hardy, J. (2010). Interpretation of self-talk and post-lecture affective states of higher education students: A self-determination theory perspective. *British Journal of Educational Psychology*, 80(2), 307-323. <https://doi.org/10.1348/000709909X477215>
- \*Ollermann, F., Rolf, R., Greweling, C., & Klaben, A. (2017). Principles of successful implementation of lecture recordings in higher education. *Interactive Technology and Smart Education*, 14(1). <https://doi.org/10.1108/ITSE-09-2016-0031>
- \*Opdecam, E., & Everaert, P. (2019). Choice-based learning: Lecture-based or team learning? *Accounting Education*, 28(3), 239-273. <https://doi.org/10.1080/09639284.2019.1570857>
- \*Owston, R., Lupshenyuk, D., & Wideman, H. (2011). Lecture capture in large undergraduate classes: Student perceptions and academic performance. *Internet & Higher Education*, 14(4), 262-268. <https://doi.org/10.1016/j.iheduc.2011.05.006>
- \*Pale, P., Petrovic, J., & Jeren, B. (2014). Assessing the learning potential and students' perception of rich lecture captures. *Journal of Computer Assisted Learning*, 30(2), 187-195. <https://doi.org/10.1111/jcal.12039>
- \*Pare, D. E., & Joordens, S. (2008). Peering into large lectures: Examining peer and expert mark agreement using peerScholar, an online peer assessment tool. *Journal of Computer Assisted Learning*, 24(6), 526-540. <https://doi.org/10.1111/j.1365-2729.2008.00290.x>
- \*Parry, D., le Roux, D., & Cornelissen, L. (2020). Managing in-lecture media use: The feasibility and value of a split-class policy. *Journal of Computing in Higher Education*, 32(2), 261-281. <https://doi.org/10.1007/s12528-019-09232-z>
- \*Paul, S., Pusic, M., & Gillespie, C. (2015). Medical student lecture attendance versus iTunes U. *Medical Education*, 49(5), 530-531. <https://doi.org/10.1111/medu.12723>
- \*Pearce, K., & Scutter, S. (2010). Podcasting of health sciences lectures: Benefits for students from a non-English speaking background. *Australasian Journal of Educational Technology*, 26(7), 1028-1041. <https://doi.org/10.14742/ajet.1032>
- \*Peroz, I., Beuche, A., & Peroz, N. (2009). Randomized controlled trial comparing lecture versus self-studying by an online tool. *Medical Teacher*, 31(6), 508-512. <https://doi.org/10.1080/01421590802203504>
- \*Petrovic, J., & Pale, P. (2015). Students' perception of live lectures' inherent disadvantages. *Teaching in Higher Education*, 20(2), 143-157. <https://doi.org/10.1080/13562517.2014.962505>
- \*Pi, Z., Hong, J., & Yang, J. (2017a). Does instructor's image size in video lectures affect learning outcomes? *Journal of Computer Assisted Learning*, 33(4), 347-354. <https://doi.org/10.1111/jcal.12183>
- \*Pi, Z., Hong, J., & Yang, J. (2017b). Effects of the instructor's pointing gestures on learning performance in video lectures.

- British Journal of Educational Technology*, 48(4), 1020-1029. <https://doi.org/10.1111/bjet.12471>
- \*Pohl, A., Gehlen-Baum, V., & Bry, F. (2011). Introducing Backstage--A digital backchannel for large class lectures. *Interactive Technology and Smart Education*, 8(3), 186-200. <https://doi.org/10.1108/17415651111165410>
- \*Popova, A., Kirschner, P., & Joiner, R. (2014). Effects of primer podcasts on stimulating learning from lectures: How do students engage? *British Journal of Educational Technology*, 45(2), 330-339. <https://doi.org/10.1111/bjet.12023>
- \*Preston, G., Phillips, R., Gosper, M., McNeill, M., Woo, K., & Green, D. (2010). Web-based lecture technologies: Highlighting the changing nature of teaching and learning. *Australasian Journal of Educational Technology*, 26(6), 717-728. <https://doi.org/10.14742/ajet.1038>
- \*Quinlan, K. (2019). What triggers students' interest during higher education lectures? Personal and situational variables associated with situational interest. *Studies in Higher Education*, 44(10), 1781-1792. <https://doi.org/10.1080/03075079.2019.1665325>
- \*Rae, M., & O'Malley, D. (2017). Do prerecorded lecture vodcasts affect lecture attendance of first-year preclinical graduate entry to medicine students? *Medical Teacher*, 39(3), 250-254. <https://doi.org/10.1080/0142159X.2017.1270436>
- \*Ragan, E., Jennings, S., Massey, J., & Doolittle, P. (2014). Unregulated use of laptops over time in large lecture classes. *Computers & Education*, 78, 78-86. <https://doi.org/10.1016/j.compedu.2014.05.002>
- \*Ramachandran, R., & Rodriguez, M. (2020). Student perspectives on remote learning in a large organic chemistry lecture course. *Journal of Chemical Education*, 97(9), 2565-2572. <https://doi.org/10.1021/acs.jchemed.0c00572>
- \*Ramadan, R. (2016). Syrians' acceptance of digital lectures: A case study. *Open Learning*, 31(1). <https://doi.org/10.1080/02680513.2016.1150160>
- Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., ... & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching*, 6(1), 41-56. <https://doi.org/10.37074/jalt.2023.6.1.29>
- \*Revell, A., & Wainwright, E. (2009). What makes lectures "unmissable"? Insights into teaching excellence and active learning. *Journal of Geography in Higher Education*, 33(2), 209-223. <https://doi.org/10.1080/03098260802276771>
- \*Revell, K. (2014). A comparison of the usage of tablet PC, lecture capture, and online homework in an introductory chemistry course. *Journal of Chemical Education*, 91(1), 48-51. <https://doi.org/10.1021/ed400372x>
- \*Risko, E. F., Foulsham, T., Dawson, S., & Kingstone, A. (2013). The Collaborative Lecture Annotation System (CLAS): A new tool for distributed learning. *IEEE Transactions on Learning Technologies*, 6(1). <https://doi.org/10.1109/TLT.2012.15>
- \*Roberts, D. (2019). Higher education lectures: From passive to active learning via imagery? *Active Learning in Higher Education*, 20(1), 63-77. <https://doi.org/10.1177/1469787417731198>
- \*Roberts, N., & Rees, M. (2014). Student use of mobile devices in university lectures. *Australasian Journal of Educational Technology*, 30(4), 415-426. <https://doi.org/10.14742/ajet.589>
- \*Roy, S., & Banerjee, P. (2012). Understanding students' experience of transition from lecture mode to case-based teaching in a management school in India. *Journal of Educational Change*, 13(4), 487-509. <https://doi.org/10.1007/s10833-012-9191-4>
- Rudolph, J., Tan, S., & Tan, S. (2023). War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *Journal of Applied Learning and Teaching*, 6(1), 364-389. <https://doi.org/10.37074/jalt.2023.6.1.23>
- \*Sailer, M., & Sailer, M. (2021). Gamification of in-class activities in flipped classroom lectures. *British Journal of Educational Technology*, 52(1), 75-90. <https://doi.org/10.1111/bjet.12948>
- \*Sarju, J. (2020). Rapid adaptation of a traditional introductory lecture course on catalysis into content for remote delivery online in response to global pandemic. *Journal of Chemical Education*, 97(9), 2590-2597. <https://doi.org/10.1021/acs.jchemed.0c00786>
- \*Savoy, A., Proctor, R., & Salvendy, G. (2009). Information retention from PowerPoint and traditional lectures. *Computers & Education*, 52(4), 858-867. <https://doi.org/10.1016/j.compedu.2008.12.005>
- \*Sawon, K., Pembroke, M., & Wille, P. (2012). An analysis of student characteristics and behaviour in relation to absence from lectures. *Journal of Higher Education Policy and Management*, 34(6), 575-586. <https://doi.org/10.1080/1360080X.2012.716004>
- \*Scagnoli, N., Choo, J., & Tian, J. (2019). Students' insights on the use of video lectures in online classes. *British Journal of Educational Technology*, 50(1), 399-414. <https://doi.org/10.1111/bjet.12572>
- \*Scheines, R., Leinhardt, G., Smith, J., & Cho, K. (2005). Replacing lecture with web-based course materials. *Journal of Educational Computing Research*, 32(1). <https://doi.org/10.2190/F59B-382T-E785-E4J4>
- \*Sciullo, N. (2017). Forum: The lecture and student learning. The lecture's absent audience. *Communication Education*, 66(2), 237-239. <https://doi.org/10.1080/03634523.2016.1275722>
- \*Seery, M. (2015). Confchem conference on flipped classroom: Student engagement with flipped chemistry

- lectures. *Journal of Chemical Education*, 92(9), 1566-1567. <https://doi.org/10.1021/ed500919u>
- \*Seery, M., & Donnelly, R. (2012). The implementation of pre-lecture resources to reduce in-class cognitive load: A case study for higher education chemistry. *British Journal of Educational Technology*, 43(4), 667-677. <https://doi.org/10.1111/j.1467-8535.2011.01237.x>
- \*Senior, C., Howard, C., Reddy, P., Clark, R., & Lim, M. (2012). The relationship between student-centred lectures, emotional intelligence, and study teams: A social telemetry study with mobile telephony. *Studies in Higher Education*, 37(8), 957-970. <https://doi.org/10.1080/03075079.2011.556719>
- \*Shantikumar, S. (2009). From lecture theatre to portable media: Students' perceptions of an enhanced podcast for revision. *Medical Teacher*, 31(6), 535-538. <https://doi.org/10.1080/01421590802365584>
- \*Shimada, A., Okubo, F., Yin, C., & Ogata, H. (2018). Automatic summarization of lecture slides for enhanced student preview—Technical report and user study. *IEEE Transactions on Learning Technologies*, 11(2), 165-178. <https://doi.org/10.1109/TLT.2017.2682086>
- \*Shimaya, J., Yoshikawa, Y., Ogawa, K., & Ishiguro, H. (2021). Robotic question support system to reduce hesitation for face-to-face questions in lectures. *Journal of Computer Assisted Learning*, 37(3), 621-631. <https://doi.org/10.1111/jcal.12511>
- \*Simpson, V., & Oliver, M. (2007). Electronic voting systems for lectures then and now: A comparison of research and practice. *Australasian Journal of Educational Technology*, 23(2), 187-208. <https://doi.org/10.14742/ajet.1264>
- Slavin, R. (1980). Cooperative learning. *Review of Educational Research*, 50(2), 315-342. <https://doi.org/10.3102/00346543050002315>
- \*Smith, C., & Sodano, T. (2011). Integrating lecture capture as a teaching strategy to improve student presentation skills through self-assessment. *Active Learning in Higher Education*, 12(3), 151-162. <https://doi.org/10.1177/1469787411415082>
- \*Smith, D. (2006). Use of the mid-lecture break in chemistry teaching: A survey and some suggestions. *Journal of Chemical Education*, 83(11), 1621-1624. <https://doi.org/10.1021/ed083p1621>
- \*Sprenger, D., & Schwaninger, A. (2021). Technology acceptance of four digital learning technologies (classroom response system, classroom chat, e-lectures, and mobile virtual reality) after three months' usage. *International Journal of Educational Technology in Higher Education*, 18. <https://doi.org/10.1186/s41239-021-00243-4>
- \*Stearns, S. (2017). What is the place of lecture in student learning today? *Communication Education*, 66(2), 243-245. <https://doi.org/10.1080/03634523.2016.1275723>
- \*Stephenson, J., Brown, C., & Griffin, D. (2008). Electronic delivery of lectures in the university environment: An empirical comparison of three delivery styles. *Computers & Education*, 50(3), 640-651. <https://doi.org/10.1016/j.compedu.2006.08.007>
- \*Stone, G. (2014). Work all day, study at night: The interactive evening lecture to invigorate working students. *Accounting Education*, 23(1), 71-74. <https://doi.org/10.1080/09639284.2013.864084>
- \*Struyven, K., Dochy, F., & Janssens, S. (2008). Students' likes and dislikes regarding student-activating and lecture-based educational settings: Consequences for students' perceptions of the learning environment, student learning and performance. *European Journal of Psychology of Education*, 23(3), 295-317. <https://doi.org/10.1007/BF03173001>
- \*Struyven, K., Dochy, F., & Janssens, S. (2010). "Teach as you preach": The effects of student-centred versus lecture-based teaching on student teachers' approaches to teaching. *European Journal of Teacher Education*, 33(1), 43-64. <https://doi.org/10.1080/02619760903457818>
- \*Struyven, K., Dochy, F., & Janssens, S. (2012). Explaining students' appraisal of lectures and student-activating teaching: Perceived context and student characteristics. *Interactive Learning Environments*, 20(5), 391-422. <https://doi.org/10.1080/10494820.2010.500084>
- \*Stuart, S. A. J., Brown, M. I., & Draper, S. W. (2004). Using an electronic voting system in logic lectures: One practitioner's application. *Journal of Computer Assisted Learning*, 20(2), 95-102. <https://doi.org/10.1111/j.1365-2729.2004.00075.x>
- \*Sudarmika, P., Santyasa, I. Wayan, D., & Hendra, D. (2020). Comparison between group discussion flipped classroom and lecture on student achievement and student characters. *International Journal of Instruction*, 13(3), 171-186. <https://doi.org/10.29333/iji.2020.13312a>
- \*Sun, Y., & Yang, H. (2012). Do language proficiency and lecture comprehension matter? OpenCourseWare lectures for vocabulary learning. *CALICO Journal*, 29(4), 663-678. <https://doi.org/10.11139/cj.29.4.663-678>
- \*Tang, F., Chen, C., Zhu, Y., Zuo, C., Zhong, Y., Wang, N., Zhou, L., Zou, Y., & Liang, D. (2017). Comparison between flipped classroom and lecture-based classroom in ophthalmology clerkship. *Medical Education Online*, 22(1). <https://doi.org/10.1080/10872981.2017.1395679>
- \*Taplın, R., Low, L., & Brown, A. (2011). Students' satisfaction and valuation of web-based lecture recording technologies. *Australasian Journal of Educational Technology*, 27(2), 175-191. <https://doi.org/10.14742/ajet.964>
- \*Taylor, M., Marrone, M., Tayar, M., & Mueller, B. (2018). Digital storytelling and visual metaphor in lectures: A study of student engagement. *Accounting Education*, 27(6), 552-569. <https://doi.org/10.1080/09639284.2017.1361848>

- \*Thai, N., De Wever, B., & Valcke, M. (2017). The impact of a flipped classroom design on learning performance in higher education: Looking for the best blend of lectures and guiding questions with feedback. *Computers & Education, 107*, 113-126. <https://doi.org/10.1016/j.compedu.2017.01.003>
- \*Thesen, L. (2009). Researching "ideological becoming" in lectures: Challenges for knowing differently. *Studies in Higher Education, 34*(4), 391-402. <https://doi.org/10.1080/03075070902771929>
- \*Tiernan, P. (2014). A study of the use of Twitter by students for lecture engagement and discussion. *Education and Information Technologies, 19*(4), 673-690. <https://doi.org/10.1007/s10639-012-9246-4>
- \*Tin, T. (2009a). Emergence and maintenance of student teachers' "interest" within the context of two-hour lectures: An actual genetic perspective. *Asia-Pacific Journal of Teacher Education, 37*(1), 109-133. <https://doi.org/10.1080/13598660802530768>
- \*Tin, T. (2009b). Features of the most interesting and the least interesting postgraduate second language acquisition lectures offered by three lecturers. *Language and Education, 23*(2), 117-135. <https://doi.org/10.1080/09500780802152770>
- \*Titsworth, B. (2001). The effects of teacher immediacy, use of organizational lecture cues, and students' notetaking on cognitive learning. *Communication Education, 50*(4), 283-297. <https://doi.org/10.1080/03634520109379256>
- \*Titsworth, B., & Kiewra, K. (2004). Spoken organizational lecture cues and student notetaking as facilitators of student learning. *Contemporary Educational Psychology, 29*(4), 447-461. <https://doi.org/10.1016/j.cedpsych.2003.12.001>
- \*Tlhoale, M., Hofman, A., Naidoo, A., & Winnips, K. (2014). Using clickers to facilitate interactive engagement activities in a lecture room for improved performance by students. *Innovations in Education and Teaching International, 51*(5), 497-509. <https://doi.org/10.1080/14703297.2013.796725>
- \*Tomkin, J., Beilstein, S., Morphew, J., & Herman, G. (2019). Evidence that communities of practice are associated with active learning in large STEM lectures. *International Journal of STEM Education, 6*. <https://doi.org/10.1186/s40594-018-0154-z>
- \*Tonguc, G., & Ozaydin Ozkara, B. (2020). Automatic recognition of student emotions from facial expressions during a lecture. *Computers & Education, 148*. <https://doi.org/10.1016/j.compedu.2019.103797>
- \*Tormey, R., & Henchy, D. (2008). Re-imagining the traditional lecture: An action research approach to teaching student teachers to "do" philosophy. *Teaching in Higher Education, 13*(3), 303-314. <https://doi.org/10.1080/13562510802045337>
- \*Toto, J., & Booth, K. (2008). Effects and implications of mini-lectures on learning in first-semester general chemistry. *Chemistry Education Research and Practice, 9*(3), 259-266. <https://doi.org/10.1039/B812415A>
- \*Traphagan, T., Kucsera, J., & Kishi, K. (2010). Impact of class lecture webcasting on attendance and learning. *Educational Technology Research & Development, 58*(1), 19-37. <https://doi.org/10.1007/s11423-009-9128-7>
- \*Valor Miró, J. D., Spencer, R. N., Pérez González de Martos, A., Garcés Díaz-Munío, G., Turró, C. I. V. E. R. A., Civera, J., & Juan, A. (2014). Evaluating intelligent interfaces for post-editing automatic transcriptions of online video lectures. *Open Learning: The Journal of Open, Distance and e-Learning, 29*(1), 72-85. <https://doi.org/10.1080/02680513.2014.909722>
- \*Valtonen, T., Havu-Nuutinen, S., Dillon, P., & Vesisenaho, M. (2011). Facilitating collaboration in lecture-based learning through shared notes using wireless technologies. *Journal of Computer Assisted Learning, 27*(6), 575-586. <https://doi.org/10.1111/j.1365-2729.2011.00420.x>
- \*van der Meij, H., & Backmann, L. (2021). Effects of embedded questions in recorded lectures. *Journal of Computing in Higher Education, 33*(1), 235-254. <https://doi.org/10.1007/s12528-020-09263-x>
- \*van der Velden, M. (2020). "I felt a new connection between my fingers and brain": A thematic analysis of student reflections on the use of pen and paper during lectures. *Teaching in Higher Education, 43*101. <https://doi.org/10.1080/013562517.2020.1863347>
- \*Van Dijk, L. A., Van Den Berg, G. C., & Van Keulen, H. (2001). Interactive lectures in engineering education. *European Journal of Engineering Education, 26*(1), 15-28. <https://doi.org/10.1080/03043790123124>
- \*Veerasamy, A., D'Souza, D., Linda, R., & Laakso, M. (2018). The impact of prior programming knowledge on lecture attendance and final exam. *Journal of Educational Computing Research, 56*(2), 226-253. <https://doi.org/10.1177/0735633117707695>
- \*Ventura, S., & Onsmann, A. (2009). The use of popular movies during lectures to aid the teaching and learning of undergraduate pharmacology. *Medical Teacher, 31*(7), 662-664. <https://doi.org/10.1080/01421590802641489>
- \*von Kinsky, B., Ivins, J., & Gribble, S. (2009). Lecture attendance and web-based lecture technologies: A comparison of student perceptions and usage patterns. *Australasian Journal of Educational Technology, 25*(4), 581-595. <https://doi.org/10.14742/ajet.1130>
- \*Waldeck, J., & Weimer, M. (2017). Forum: The lecture and student learning. Sound decision making about the lecture's role in the college classroom. *Communication Education, 66*(2), 247-250. <https://doi.org/10.1080/03634523.2016.1275721>
- \*Wang, P., Chiu, M., & Lee, Y. (2021). Effects of video lecture presentation style and questioning strategy on learner flow experience. *Innovations in Education & Teaching International, 58*(4), 473-483. <https://doi.org/10.1080/14703297.2020.1754272>

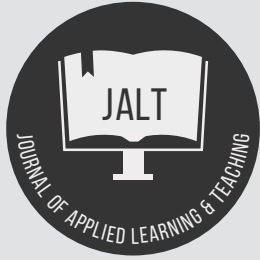


- \*Wang, Y., Liu, Q., Chen, W., Wang, Q., & Stein, D. (2019). Effects of instructor's facial expressions on students' learning with video lectures. *British Journal of Educational Technology*, 50(3), 1381-1395. <https://doi.org/10.1111/bjet.12633>
- Webster, R. S. (2015). In defence of the lecture. *Australian Journal of Teacher Education*, 40(10), 6. <https://doi.org/10.14221/ajte.2015v40n10.6>
- \*Weinberg, A., Fukawa-Connelly, T., & Wiesner, E. (2015). Characterizing instructor gestures in a lecture in a proof-based mathematics class. *Educational Studies in Mathematics*, 90(3), 233-258. <https://doi.org/10.1007/s10649-015-9623-1>
- \*Wieling, M. B., & Hofman, W. H. A. (2010). The impact of online video lecture recordings and automated feedback on student performance. *Computers & Education*, 54(4), 992-998. <https://doi.org/10.1016/j.compedu.2009.10.002>
- \*Wijnen, M., Loyens, S., Smeets, G., Kroeze, M., & van der Molen, H. (2017). Comparing problem-based learning students to students in a lecture-based curriculum: Learning strategies and the relation with self-study time. *European Journal of Psychology of Education*, 32(3), 431-447. <https://doi.org/10.1007/s10212-016-0296-7>
- \*Wijnia, L., Loyens, S., & Derous, E. (2011). Investigating effects of problem-based versus lecture-based learning environments on student motivation. *Contemporary Educational Psychology*, 36(2), 101-113. <https://doi.org/10.1016/j.cedpsych.2010.11.003>
- \*Wijtmans, M., van Rens, L., & van Muijlwijk-Koezen, J. (2014). Activating students' interest and participation in lectures and practical courses using their electronic devices. *Journal of Chemical Education*, 91(11), 1830-1837. <https://doi.org/10.1021/ed500148r>
- Wikimedia Foundation. (2008). File: Laurentius de Voltolina 001.jpg. *Wikipedia*. [https://en.m.wikipedia.org/wiki/File:Laurentius\\_de\\_Voltolina\\_001.jpg](https://en.m.wikipedia.org/wiki/File:Laurentius_de_Voltolina_001.jpg)
- \*Williams, A., Aguilar-Roca, N., & O'Dowd, D. (2016). Lecture capture podcasts: Differential student use and performance in a large introductory course. *Educational Technology Research & Development*, 64(1). <https://doi.org/10.1007/s11423-015-9406-5>
- \*Williams, A., Birch, E., & Hancock, P. (2012). The impact of online lecture recordings on student performance. *Australasian Journal of Educational Technology*, 28(2), 199-213. <https://doi.org/10.14742/ajet.869>
- Witt, T., Klumpp, M., & Beyer, B. (2021). Digital university teaching and learning in management—The Gini from the COVID-19 bottle and its empirical representations in Germany. *Education Sciences*, 11(11), 728. <https://doi.org/10.3390/educsci11110728>
- \*Witton, G. (2017). The value of capture: Taking an alternative approach to using lecture capture technologies for increased impact on student learning and engagement. *British Journal of Educational Technology*, 48(4), 1010-1019. <https://doi.org/10.1111/bjet.12470>
- \*Witton, G. (2021). Exploring dissonance in the use of (lecture) capture technologies: Institutional approaches and the realities of student engagement. *Interactive Learning Environments*. <https://doi.org/10.1080/10494820.2021.1905002>
- \*Wood, A. (2020). Utilizing technology-enhanced learning in geography: Testing student response systems in large lectures. *Journal of Geography in Higher Education*, 44(1), 160-170. <https://doi.org/10.1080/03098265.2019.1697653>
- \*Wood, A., Galloway, R., Sinclair, C., & Hardy, J. (2018). Teacher-student discourse in active learning lectures: Case studies from undergraduate physics. *Teaching in Higher Education*, 23(7), 818-834. <https://doi.org/10.1080/13562517.2017.1421630>
- \*Wood, A., Symons, K., Falisse, J., Gray, H., & Mkony, A. (2021). Can lecture capture contribute to the development of a community of inquiry in online learning? *Distance Education*, 42(1), 126-144. <https://doi.org/10.1080/01587919.2020.1869521>
- \*Wulff, S., & Wulff, D. (2004). "Of course I'm communicating, I lecture every day": Enhancing teaching and learning in introductory statistics. *Scholarship of teaching and learning. Communication Education*, 53(1), 92-102. <https://doi.org/10.1080/0363452032000135797>
- \*Yeo, J., & Ting, S. (2014). Personal pronouns for student engagement in arts and science lecture introductions. *English for Specific Purposes*, 34, 26-37. <https://doi.org/10.1016/j.esp.2013.11.001>
- \*Young, M., Robinson, S., & Alberts, P. (2009). Students pay attention! Combating the vigilance decrement to improve learning during lectures. *Active Learning in Higher Education*, 10(1), 41-55. <https://doi.org/10.1177/1469787408100194>
- \*Yu, P., Wang, B., & Su, M. (2015). Lecture capture with real-time rearrangement of visual elements: Impact on student performance. *Journal of Computer Assisted Learning*, 31(6), 655-670. <https://doi.org/10.1111/jcal.12109>
- \*Zarraonandia, T., Aedo, I., Diaz, P., & Montero, A. (2013). An augmented lecture feedback system to support learner and teacher communication. *British Journal of Educational Technology*, 44(4), 616-628. <https://doi.org/10.1111/bjet.12047>
- \*Zhao, S., & van Leeuwen, T. (2014). Understanding semiotic technology in university classrooms: A social semiotic approach to PowerPoint-assisted cultural studies lectures. *Classroom Discourse*, 5(1), 71-90. <https://doi.org/10.1080/19463014.2013.859848>

Zawacki-Richter, O. (2021). The current state and impact of COVID-19 on digital higher education in Germany. *Human Behavior and Emerging Technologies*, 3(1), 218-226. <https://doi.org/10.1002/hbe2.238>

*\*Studies in the final sample.*

Copyright: © 2025. Joseph Crawford and Mitch Parsell. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Languishing: Do university students with better mental health literacy fare better?

---

Amy J. Lim <sup>A</sup>	A	<i>Discipline of Psychology, Murdoch University</i>
Rhiannon Humble <sup>B</sup>	B	<i>Discipline of Psychology, Murdoch University</i>
Xin Di Ng <sup>C</sup>	C	<i>Discipline of Psychology, Murdoch University</i>
Ashvini Durai <sup>D</sup>	D	<i>Discipline of Psychology, Murdoch University</i>

---

### Keywords

---

COVID-19;  
higher education;  
languishing;  
mental health literacy;  
pandemic;  
university students.

### Abstract

---

The term “languishing” gained widespread recognition and appeal during the COVID-19 pandemic as it succinctly captured the pervasive sense of stagnation, disconnection, and emotional depletion experienced by many individuals amidst prolonged uncertainty and isolation. While existing research on the topic of languishing during COVID-19 has largely focused on people’s mental health states in different populations and across different time periods, this paper elucidates if mental health literacy protects against languishing in higher education students—where languishing is reportedly most prevalent. In this study, we employed a correlational design and recruited participants from a university in Australia (N = 149). Our results indicated that mental health literacy did not predict languishing. With the COVID-19 pandemic underscoring the significance of mental health, our work contributes to the increasing emphasis on safeguarding and potentially enhancing mental well-being within both public and policy discourse.

---

### Correspondence

[amy.lim@murdoch.edu.au](mailto:amy.lim@murdoch.edu.au)<sup>A</sup>

---

### Article Info

Received 23 April 2024  
Received in revised form 16 October 2024  
Accepted 10 December 2024  
Available online 9 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.6>

## Introduction

During the peak of the COVID-19 pandemic, stress, emptiness, aimlessness, feelings of insignificance, and inertia were widespread (Crabtree et al., 2023; Javed et al., 2020). Not only were people concerned about contracting COVID-19 and uncertainty about the future (Usher et al., 2020), but they also had to endure social isolation from lockdowns and quarantines (Blakely et al., 2021; Lu et al., 2020; Takashima et al., 2020). Schooling and working individuals also had to cope with "Zoom fatigue" from excessive virtual sessions (Lindstrom et al., 2021). Not surprisingly, many individuals throughout the pandemic reported their experience as being able to live life but without a reason or purpose, essentially feeling "blah" (Flaskerud, 2022). These feelings have become known as languishing – an idea introduced into public discourse by mainstream media, resulting in a wave of follow-up conversations (Grant, 2021). The idea of languishing gained significant popularity and appeal because it succinctly narrativised and captured the profound impact of the COVID-19 pandemic on people's lives and emotional states (Willen, 2022).

The concept of languishing was introduced to distinguish mental health from mental illness (Keyes, 2002). Keyes (2002) defines mental health as a collection of indicators encompassing emotional hedonic components, psychological well-being, and social well-being. Individuals who frequently experience positive emotions and have good psychological and social functioning are identified to be flourishing. In contrast, individuals who experience affective stagnation and perceive living their lives as empty but are not diagnosed with mental illness are said to be languishing (i.e., the absence of mental health). Flourishing and languishing exist on a mental health continuum. Languishing is associated with well-being, such that the more a person languishes, the lower their well-being (Wissing et al., 2021). Existing evidence also demonstrates that languishing is a predictor of mental illness and behaviours associated with mental illness; people in states of languish have a higher rate of being diagnosed with mood disorders such as anxiety and major depressive disorder (Keyes et al., 2010), are more likely to display suicidal behaviour (Keyes et al., 2012), and are slower to recover from mental illness (Iasiello et al., 2019). A rise in languishing was observed as the pandemic unfolded. Nine months into the pandemic, non-languishing individuals decreased by 40%, while those categorised as languishing increased by 43% (Nes et al., 2022).

Languishing is reportedly most prevalent in higher education (HE) students. Consequent experiences of stress and insecurity following a crisis are particularly acute among university students (Browning et al., 2021). Unlike the schooling population and non-schooling young adult population, not only do university students have to adapt to abrupt changes in their learning environments and make behavioural changes consistent with regulations (e.g., social distancing and isolation), university students are also concerned about post-education employability (Tan et al., 2023). Given the multiple stressors faced by higher education (HE) students, it's unsurprising that HE students – both university and college students – reported high levels of stress and academic burnout and had major concerns

regarding their mental health during the pandemic (Kwan, 2022; Mshigeni et al., 2021; Hawley et al., 2021). In fact, university students experienced poorer personal well-being than young adults of similar age in the general population (Tinsley, 2020). Anecdotal and empirical evidence demonstrate that languishing is also apparent among HE students and is experienced by most university students during the COVID-19 pandemic (Wixom, 2021; Visser & Law-van Wyk, 2021; Allen et al., 2023). HE students were in a state of languish for a longer period of time compared to the general adult population (ONS, 2021). Given that university students are more vulnerable to mental health difficulties given the developmental age phase they are in (Wen et al., 2021), these findings suggest that HE students – with their states of languish – are at a greater risk of developing mental illnesses at a later point in their lives.

The COVID-19 pandemic, while fostering an atmosphere of languishing, also catalysed increased momentum for mental health awareness (Nealon, 2021). Mental health literacy is the knowledge and ability to recognise mental disorders and seek help (Furnham & Swami, 2018). Specifically, mental health literacy includes the components of (1) the knowledge of how to seek information for mental health, (2) the knowledge and beliefs about causes and risk factors associated with mental health, (3) the recognition of specific illnesses/psychological distress, (4) attitudes which allow for recognition and help-seeking behaviour, (5) the knowledge regarding professional help and the availability and finally (6) the knowledge of self-help interventions (Jorm, 2012). Mental health literacy is paramount when it comes to the early intervention and prevention of the detrimental impact of mental health disorders (Bjørnsen et al., 2019; Kim et al., 2015; Kutcher et al., 2016; Spiker & Hammer, 2019; Zaidlin et al., 2022). Mental health literacy has been associated with the early identification of mental health disorders (Kelly et al., 2007) and higher levels of willingness to seek professional help for one's conditions (Gulliver et al., 2012). Teachers with higher levels of mental health literacy were more able to identify potential indicators of suicide, self-injury, and suicidal ideation among students (Campbell et al., 2019). Additionally, greater mental health literacy was associated with less severe levels of depression among university students with reported psychological symptoms (Kim et al., 2015). This suggests that mental health literacy can be a protective factor against mental illnesses and the worsening of mental states.

Accordingly, this paper examines whether mental health literacy protects against languishing. Existing studies have shown that several protective factors help buffer HE students from the adverse effects of the pandemic. For instance, mindfulness allows one to be better able to shift their attention to more positive things over negative ones while going through the pandemic (Racine et al., 2021). HE students who received greater social support, academic support, and access to study-related household resources (i.e., conducive study place, stable internet connection, access to study materials) reported better psychological health than students without such support and access (Haliwa et al., 2021; Burt & Eubank, 2021; Moeller et al., 2022). Students with emotionally stable personality traits also reported less psychological distress (Moeller et al., 2022).

However, less is known as to whether mental health literacy protects individuals against languishing. Additionally, most of the existing literature had only examined people's levels of languishing during and after the COVID-19 pandemic (e.g., Concerto et al., 2022; Graham & Eloff, 2022; Crabtree et al., 2023; Vinko et al., 2022; Paz et al., 2022). As such, this paper seeks to address this literature gap by examining whether mental health literacy is a protective factor against languishing. Since mental health literacy relates to an individual's knowledge and understanding surrounding mental health, those with higher levels of mental health literacy are less likely to experience the state of languish.

## Methods

### Participants

An a priori power analysis was conducted based on work examining the relationship between mental health literacy and mental health (Nobre et al., 2022). Assuming a relatively conservative effect size ( $f^2 = 0.15$ ), we used G\*Power's (version 3.1.9.7) F-tests linear multiple regression, fixed model,  $R^2$  deviation from zero with the following parameters to determine that we needed a minimum of  $n = 127$  with 0.80 power and an  $\alpha$  of 0.05.

A total of 149 participants were recruited through a university's subject pool system consisting of psychology students enrolled in the university (133 females, 14 males, and two others). Participants ranged from 17 to 50 years old ( $M$  age = 22.18,  $Median$  age = 20.00,  $SD$  age = 6.25). One hundred thirty participants have at least graduated from Year 12 high school, 17 have obtained a graduate degree, and 2 have a postgraduate degree. Within the university, there may be students who have decided to further their studies in psychology or to study psychology after obtaining their degree (or postgraduate degree) in a different field of study. This could clarify why some participants report having graduate or postgraduate degrees as their highest level of education.

A detailed analysis of the annual household income distribution among the participants reveals the following: 32 participants reported earning \$15,000 or less; 13 participants fell within the \$15,001 to \$25,000 range; 14 participants reported incomes between \$25,001 and \$35,000; 16 participants had annual incomes ranging from \$35,001 to \$50,000; 18 participants earned between \$50,001 and \$75,000; 20 participants reported incomes in the \$75,001 to \$100,000 bracket; 19 participants reported earnings between \$100,001 and \$150,000; and finally, 17 participants reported annual household incomes of \$150,000 or more (see Figure 1). Participants were awarded course credits for their psychology courses as compensation for their participation.

### Procedure

Participants were directed to a Qualtrics online survey where they were provided with the study information, including the background, aim, participation involvement,

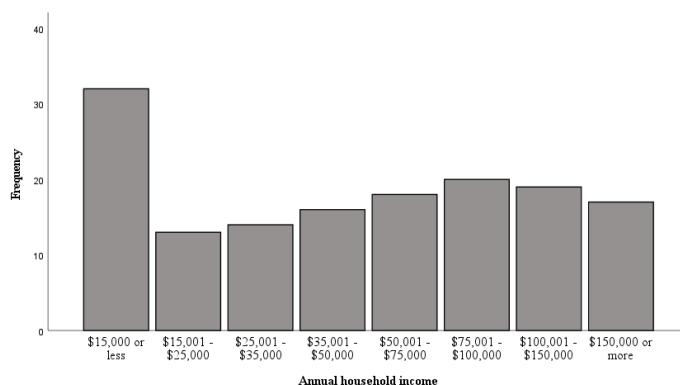


Figure 1. Annual household income distribution among participants (N = 149).

withdrawal process, data management and storage, privacy, possible risks and reimbursement of the study, and consent request. Participants indicated their consent by voluntarily proceeding with the online survey. Upon consent, participants completed a series of questionnaires assessing mental health state and health literacy. Participants also provided demographic information such as age, highest education level, and household annual income. This study was conducted in mid-2023 when the university has largely resumed in-campus activities and classes. This study has received the university's ethics approval.

## Materials

### Mental Health Literacy Scale

Mental health literacy was assessed using the Mental Health Literacy Scale (O'Connor & Casey, 2015), which contained 35 items designed to assess the knowledge and attitudes toward help-seeking behaviors and mental health. The items in this scale comprehensively assess all the attributes of mental health literacy previously defined by Jorm (2012) and have demonstrated good psychometric properties, including internal reliability, test-retest reliability, and content and structural validity (see O'Connor & Casey, 2015; Fulcher & Pote, 2021; Wei et al., 2018). Participants responded to the first 15 items of this scale, such as "To what extent do you think it is likely that Personality Disorder is a category of mental illness?" on a 4-point Likert scale (1 = *Very unlikely*, 4 = *Very likely*). They then responded to the next 20 items, such as "I am confident that I know where to seek information about mental illness" and "A mental illness is a sign of personal weakness" on a 5-point Likert scale (1 = *Strongly disagree*, 5 = *Strongly agree*). Items on this scale were summed to form a single index for mental health literacy, with higher scores indicating greater mental health literacy ( $M = 132.39$ ,  $SD = 15.51$ ,  $\alpha = .92$ ). This scale produces a minimum score of 35 and a maximum score of 160 (O'Connor & Casey, 2015).

## Languish

The mental state of languishing was measured using the Mental Health Continuum Scale – Short Form (Keyes, 2008). This scale is based on the concept of positive mental health, which comprises three dimensions: emotional well-being (positive emotions and life satisfaction), social well-being (social integration and social contribution), and psychological well-being (autonomy, purpose in life, and personal growth) (Keyes, 2002). The Mental Health Continuum Scale – Short Form (Keyes, 2008) consists of 14 items that assess emotional, social, and psychological well-being. This scale serves as an indicator of the positive functioning of an individual, with the lower end of the continuum indicating low levels of positive mental health (languishing) and the upper end of the continuum indicating high levels of positive mental health (flourishing). It also demonstrated good psychometric properties in measuring mental health (Lamers et al., 2011). In this scale, participants reported the frequency to which they felt “happy,” “interested in life,” and “satisfied with life” for emotional well-being ( $M = 12.11$ ,  $SD = 3.23$ ,  $\alpha = .91$ ) on a scale of 1 (*Never*) to 6 (*Every day*). Participants responded to 5 items, such as “How often do you feel that you had something important to contribute to society,” for social well-being ( $M = 15.81$ ,  $SD = 5.27$ ,  $\alpha = .81$ ) on a 6-point Likert scale (1 = *Never*, 6 = *Every day*). Finally, participants responded to 6 items, such as, “How often do you feel that you had experiences that challenged you to grow and become a better person?” for psychological well-being ( $M = 23.23$ ,  $SD = 6.02$ ,  $\alpha = .86$ ) on the same 6-point Likert scale (1 = *Never*, 6 = *Every day*). The 14 items were also summed to provide a single index for languish, with higher scores indicating lower levels of languish ( $M = 51.15$ ,  $SD = 13.06$ ;  $\alpha = .92$ ).

## Control variables

We also measured several variables that have been linked with mental health, including age (Weich et al., 2011; Burns et al., 2022), education (Bishop et al., 2021; Miles et al., 2020), and income (Fagrell Trygg et al., 2019). Participants reported their age (open-ended question) and indicated their highest educational level on a 4-point scale (1 = Year 10 high school, 2 = Year 12 high school, 3 = Graduate degree, 4 = Postgraduate degree). Participants’ objective income was determined by their responses to a questionnaire item where they indicated their current annual household income on an 8-point scale ranging from \$15,000 or less to \$150,000 or more. (1 = \$15,000 or less, 2 = \$15,001 - \$25,000, 3 = \$25,001- \$35,000, 4 = \$35,001 - \$50,000, 5 = \$50,001 - \$75,000, 6 = \$75,001 - \$100,000, 7 = \$100,000 - \$150,000, 8 = \$150,000 or more).

## Results

The assumption of normality was tested for all key variables – mental health literacy, languish, emotional well-being, social well-being, and psychological well-being. Values for skewness and kurtosis for all variables were between  $-2$  and  $+2$ , indicating a normal distribution (George & Mallery, 2010). Correlation analysis indicated that mental health literacy

was not correlated to languish ( $p = .42$ ), emotional well-being ( $p = .10$ ), social well-being ( $p = .77$ ), and psychological well-being ( $p = .25$ ). Table 1 displays the means, standard deviations, skewness, kurtosis, and intercorrelations of all the variables involved in this study.

Table 1. Descriptive statistics and intercorrelations of variables (N = 149).

Variables	1.	2.	3.	4.	5.
1. Mental health literacy	-				
2. Emotional well-being	.13	-			
3. Social well-being	-.02	.67**	-		
4. Psychological well-being	.10	.74**	.71**	-	
5. Languish	.07	.86	.89**	.93**	-
Mean	132.39	12.11	15.81	23.23	51.15
SD	15.51	3.23	5.27	6.02	13.06
Skew	-0.78	-0.28	0.23	-0.07	-0.001
Kurtosis	-0.10	-0.49	-0.67	-0.45	-0.51

\*\* Correlation significant at  $p < .01$

To determine if mental health literacy influenced languish and the different facets of well-being (namely, emotional, social, and psychological well-being), we conducted a series of multiple regression analyses. In Step 1 of the hierarchical multiple regression analyses, control variables, age, educational attainment (dummy-coded), and annual household income (dummy-coded) were included. Given their effects on mental health, these variables will be controlled during analyses to partial out the unique effect of mental health literacy on mental health. Mental health literacy was included in the second step of the analyses. Statistical assumptions relevant to multiple regression analysis were examined prior to the multiple regression analyses. No violations in normality, linearity and homoscedasticity of residuals, and multicollinearity between predictors were noted. Mahalanobis distance exceeded the critical  $\chi^2$  for  $df = 12$  (at  $\alpha = .001$ ) of 32.91 for three cases in the data file for the dependent variable of languish, indicating the presence of multivariate outliers. Multiple regression analyses were consequently conducted with and without the outlier.

The results revealed that the control variables accounted for a non-significant 12.3% of the variance in languish,  $R^2 = 0.12$ ,  $F(11, 137) = 1.75$ ,  $p = 0.68$ . Mental health literacy accounted for an additional 0.02% of the variance in languish,  $\Delta R^2 = 0.0002$ ,  $\Delta F(1, 136) = 0.03$ ,  $p = 0.86$ . The overall model explained 12.4% of the variance in languish,  $R^2 = 0.12$ , adjusted  $R^2 = 0.05$ ,  $F(12, 136) = 1.60$ ,  $p = 0.10$ . The analysis also revealed that mental health literacy did not predict languish,  $B = -0.01$ ,  $t(136) = -0.18$ ,  $p = 0.86$ , 95% CI (-0.16, 0.13). These findings remained after excluding the multivariate outliers (see Table 2). Similar analyses were conducted – separately – for emotional, social, and psychological well-being. Mental health literacy did not predict emotional well-being,  $B = 0.01$ ,  $t(136) = 0.47$ ,  $p = 0.64$ , 95% CI (-0.03, 0.04), social,  $B = -0.03$ ,  $t(136) = -1.09$ ,  $p = 0.28$ , 95% CI (-0.09, 0.03), and psychological well-being,  $B = 0.01$ ,  $t(136) = 0.32$ ,  $p = 0.75$ , 95% CI (-0.06, 0.08). These patterns of findings remained when multivariate outliers were excluded from the regression analyses. Given the asymmetrical male-female ratio of our sample, we also reran all the analyses with gender as an added control variable; results showed that mental health literacy did not predict languishing, emotional well-being, social well-being, and psychological well-being.

Table 2. Unstandardised (B) regression coefficients for multiple regression model predicting languish, emotional well-being, social well-being, and psychological well-being (N = 149).

Variables	Languish				Emotional Well-being				Social Well-being				Psychological Well-being			
	B	se	LLCI	ULCI	B	se	LLCI	ULCI	B	se	LLCI	ULCI	B	se	LLCI	ULCI
Constant	Step 1 (R <sup>2</sup> = .12)				Step 1 (R <sup>2</sup> = .14*)				Step 1 (R <sup>2</sup> = .10)				Step 1 (R <sup>2</sup> = .09)			
Age	36.76	5.03	26.83	46.70	7.96	1.23	5.52	10.39	11.62	2.66	7.56	15.69	11.19	2.35	12.53	21.84
Education Dummy 1 (Year 10 High School)	-2.08	4.97	-11.91	7.75	-0.51	1.22	-2.92	1.90	-0.60	2.03	-4.62	3.42	-0.97	2.33	-5.58	3.63
Education Dummy 2 (Graduate Degree)	-3.07	3.71	-10.41	4.27	-0.21	0.91	-2.01	1.59	-1.53	1.52	-4.53	1.47	-1.33	1.74	-4.77	2.11
Education Dummy 3 (Postgraduate Degree)	11.68	10.75	-9.57	32.94	1.85	2.64	-3.37	7.07	6.61	4.40	-2.08	15.30	3.22	5.03	-6.73	13.18
Income Dummy 1 (\$15,001 - \$25,000)	-1.93	4.27	-10.38	6.52	-0.37	1.03	-2.44	1.71	-0.93	1.75	-4.38	2.53	-0.64	2.00	-4.60	3.32
Income Dummy 2 (\$25,001 - \$35,000)	3.88	4.12	-4.26	12.03	0.68	1.01	-1.32	2.67	1.39	1.68	-2.04	4.62	1.92	1.93	-1.89	5.73
Income Dummy 3 (\$35,001 - \$50,000)	5.30	3.90	-2.42	13.01	1.07	0.96	-0.82	2.96	1.64	1.60	-1.52	4.79	2.59	1.83	-1.02	6.20
Income Dummy 4 (\$50,001 - \$75,000)	3.22	3.75	-4.19	10.63	1.26	0.92	-0.56	3.08	0.90	1.53	-2.13	3.93	1.07	1.75	-2.40	4.54
Income Dummy 5 (\$75,001 - \$100,000)	2.61	3.69	-4.68	9.91	1.05	0.91	-0.74	2.84	1.70	1.51	-2.28	3.68	0.87	1.73	-2.55	4.28
Income Dummy 6 (\$100,001 - \$150,000)	6.56	3.72	-0.99	13.71	1.57	0.91	-0.24	3.37	1.73	1.52	-1.27	4.74	3.06	1.74	-0.38	6.50
Income Dummy 7 (\$150,000 or more)	7.30	3.83	-0.27	14.87	1.83	0.94	-0.03	3.68	2.78	1.57	-0.32	5.88	2.69	1.79	-0.85	6.24
Constant	Step 2 (R <sup>2</sup> = .12)				Step 2 (R <sup>2</sup> = .14)				Step 2 (R <sup>2</sup> = .11)				Step 2 (R <sup>2</sup> = .09)			
Age	38.22	9.59	19.25	57.19	7.02	2.53	2.36	11.67	13.23	3.91	7.50	22.95	15.98	4.49	7.10	24.86
Education Dummy 1 (Year 10 High School)	0.53*	0.23	0.07	0.98	0.15**	0.06	0.03	0.26	0.17	0.09	-0.02	0.35	0.21*	0.11	0.00	0.43
Education Dummy 2 (Graduate Degree)	-2.13	4.99	-12.00	7.75	-0.48	1.22	-2.90	1.94	-0.71	2.03	-4.73	3.31	-0.94	2.34	-5.56	3.69
Education Dummy 3 (Postgraduate Degree)	-3.01	3.74	-10.40	4.38	-0.24	0.92	-2.05	1.57	-1.40	1.52	-4.41	1.61	-1.38	1.75	-4.84	2.08
Education Dummy 4 (\$15,001 - \$25,000)	11.56	10.81	-9.81	32.94	1.93	2.65	-3.31	7.17	6.32	4.40	-2.39	15.02	3.32	5.06	-6.69	13.33
Income Dummy 1 (\$15,001 - \$25,000)	-1.86	4.31	-10.38	6.66	-0.41	1.06	-2.50	1.68	-0.75	1.75	-4.22	2.72	-0.70	2.02	-4.68	3.29
Income Dummy 2 (\$25,001 - \$35,000)	3.94	4.14	-4.25	12.13	0.64	1.02	-1.37	2.65	1.42	1.69	-1.92	4.75	1.88	1.94	-1.96	5.71
Income Dummy 3 (\$35,001 - \$50,000)	5.37	3.93	-2.41	13.15	1.03	0.96	-0.88	2.93	1.81	1.60	-1.36	4.97	2.54	1.84	-1.11	6.18
Income Dummy 4 (\$50,001 - \$75,000)	3.28	3.78	-4.19	10.75	1.22	0.93	-0.61	3.05	1.05	1.54	-2.00	4.09	1.02	1.77	-2.48	4.51
Income Dummy 5 (\$75,001 - \$100,000)	2.74	3.77	-4.72	10.20	0.96	0.92	-0.86	2.79	1.02	1.54	-2.02	4.06	0.76	1.77	-2.74	4.25
Income Dummy 6 (\$100,001 - \$150,000)	6.49	3.80	-1.03	14.00	1.48	0.93	-0.36	3.33	2.05	1.55	-1.01	5.11	2.95	1.78	-0.56	6.47
Income Dummy 7 (\$150,000 or more)	7.42	3.90	-0.29	15.13	1.75	0.96	-0.14	3.64	3.08	1.59	-0.06	6.22	2.60	1.83	-1.02	6.21
Mental Health Literacy	-0.01	0.07	-0.15	0.13	0.01	0.02	-0.03	0.04	-0.03	0.03	-0.09	0.03	0.01	0.03	-0.06	0.08

\* p < .05

## Discussion

The present study examined the relationship between mental health literacy and languishing. Specifically, we hypothesised that individuals with higher mental health literacy would exhibit lower levels of languishing. The results in the current study, however, did not support the hypothesis that individuals with higher levels of mental health literacy experience less languishing. Mental health literacy had no effect on the mental state of languish. Mental health literacy also did not affect the other facets of mental health – namely, emotional, social, and psychological well-being. This finding runs contrary to existing literature examining the relationship between mental health literacy and mental health state (see Nobre et al., 2022). Nobre et al. (2022) found that mental health literacy was positively associated with positive mental health – albeit weakly.

The discrepancy between our findings and theirs may be an artifact of the operationalisations used in each of our papers. Nobre et al. (2022) operationalised mental health using the Positive Mental Health Questionnaire (Lluch, 1999) that assessed satisfaction, pro-sociality, self-control, autonomy, problem-solving and self-actualisation, and interpersonal relationship skills. In contrast, in our study, mental health was assessed by the Mental Health Continuum Scale – Short Form (Lamers et al., 2011), which measured three facets of well-being: emotional, social, and psychological well-being. While there may be a consensus on what constitutes mental health in theory, the phrasing of the items in each of these instruments may measure different nuances of mental health and lead to different interpretations of mental health. This is also the case for the conceptualisation of mental health literacy. Nobre et al. (2022) operationalised mental health literacy using the Mental Health Knowledge Questionnaire (MHKQ; Yu et al., 2015) and the Mental

Health-Promoting Knowledge (MHPK; Bjørnsen et al., 2019); these scales collectively assess individuals' understanding of mental health characteristics, their beliefs regarding the prevalence of mental disorders, awareness of mental health promotion efforts, and knowledge of factors contributing to maintaining good mental health. Our study operationalised mental health literacy with the Mental Health Literacy Scale (MHLS; O'Connor & Casey, 2015), which evaluates individuals' capacity to identify specific disorders or types of psychological distress, their knowledge, and beliefs about risk factors and causes, self-help strategies, available professional assistance, and their attitudes toward seeking help. A recent review of psychometric properties of mental health literacy measures demonstrated that the MHKQ was the least psychometrically robust questionnaire measure while MHPK had the most adequate psychometric properties amongst the seven available tools that measured mental health literacy (see Fulcher & Pote, 2021). The psychometric adequacy of MHLS remains inconclusive; while the MHLS has been widely evaluated for its psychometric properties, the quality of evidence that the MHLS had been evaluated on was of moderate quality at best (Fulcher & Pote, 2021). While all MHKQ, MHPK, and MHLS had demonstrated adequate construct validity, the limited evidence supporting the validity, reliability, and responsiveness of these different mental health literacy measures suggests that it is necessary to interpret findings concerning different mental health literacy measures with caution (see Fulcher & Pote, 2021).

There is also limited evidence on how mental health literacy influences mental health in the way that had conceptualised by Keyes (2002) – that is, mental health is distinct from mental illnesses. Existing studies that have examined the effects of mental health literacy have largely focused on mental illnesses. Mental health literacy - measured by Mental Health Literacy Scale (O'Connor & Casey, 2015) - was associated with professional help-seeking behaviour (McCabe et al., 2023), anxiety, and depression (Tambling et al., 2023). It has also been used to develop new scales to measure depression literacy (Kulwicka & Gasiorowska, 2023; Grabowski, 2021). Given that the criterion validity of mental health literacy measures is lacking (see Fulcher & Pote, 2021), it is unclear whether existing mental health literacy tools can accurately measure people's knowledge and belief about mental health (as opposed to mental illness). One study revealed that mental health literacy was correlated with help-seeking behaviours but with mental well-being (Gorczyński et al., 2017); this suggests that the mental health literacy scale may not be sensitive enough to capture people's knowledge about, and ability to recognise, the absence of mental health (as opposed to the presence of mental illnesses).

## Limitations and future research

This is, to our knowledge, the first study to examine the relationship between mental health literacy and languishing, a concept that was brought about and popularised by the COVID-19 pandemic. While the present study contributes to the growing body of evidence concerning mental health literacy and mental health outcomes, it is essential to acknowledge certain limitations that may impact the

generalisability and scope of our findings, particularly that of our study's sample. The sample recruited for this study were students enrolled in a university where mental health literacy rates are likely to be higher than the population. Bishop et al. (2021) found that participants who had a bachelor's degree or higher level of education had a score of 133.65/160 on the mental health literacy scale compared to their counterparts who did not have a bachelor's degree or higher level of education, scoring 127.8/160 on the mental health literacy scale. This pattern was also observed by Miles et al. (2020), whose study investigated the relationship between mental health literacy in college-aged students from diverse backgrounds.

Furthermore, our sample consisted primarily of young adults – the age group that was most affected during the COVID-19 pandemic (Kowal et al., 2020; Na et al., 2022). Data from a longitudinal survey consisting of a nationally representative sample from the United States (n = 7830) showed that people who belonged to the age bracket 18 to 34 years old reported the highest mental distress compared to those who belonged to the other age groups 35 to 49 years old, 50 to 64 years old, and those who were above 65 years of old (Na et al., 2022). A similar study from Canada (n = 8267) also found that people below the age of 25 reported the highest mean scores on scales assessing stress, anxiety, and psychological distress (Nwachukwu et al., 2020). As such, a more representative sample is required for us to understand the relationship between mental health literacy and languishing.

Other factors that influence languishing should be considered as they could affect the results found. These factors include religion, as participants see religion as a source of support; work, as those with higher languishing may have difficulties and those with low languishing may have a more positive work environment; goals, known as life purposes, can influence individuals seeking to obtain, maintain or avoid those life purposes and lastly, relationships; types of relationships can either have a detrimental or positive affect on an individual's life (Wissing et al., 2021). This indicates that MHL may not have been the only factor in the participants' languishing levels.

Finally, with "languish" being popularised during the COVID-19 pandemic as people found it helpful to use it to contextualise hard-to-explain mood changes and mental health states, "languish" may take on a different meaning from what has been theoretically and academically conceptualised (see Willen, 2022; Ismail, 2023; Hone et al., 2014). A review of four existing theorisations, conceptualisations, and operationalisations of mental health demonstrates that while there is a broad consensus on mental health constituting subjective well-being, it is a multi-dimensional construct that ends up being assessed differently depending on how people understand and interpret mental health (Hone et al., 2014). For instance, being adaptable to changing environments and possessing grit play a critical role in mental health for older adults (see dynamic-grit mindset, Ismail, 2023); this may not be the case for younger adults. As such, it warrants further research into examining 1) if theoretical conceptualisations of languishing and mental health reflect a real-world understanding of

these terms, and 2) the nuances of what mental health constitutes across different groups of people. Only when we can accurately identify what constitutes languishing and mental health can we then develop effective interventions for promoting mental well-being. To this end, further research must collect other demographic data such as nationality, or ethnicity - beyond the ones collected in our study- that would be useful in elucidating how different groups of people understand mental health.

## Conclusion

HE students are particularly vulnerable to mental health difficulties, especially following crises such as the COVID-19 pandemic (Browning et al., 2021). Not only did most HE students express languishing (Wixom, 2021; Visser & Law-van Wyk, 2021; Allen et al., 2023), they languished for a longer period of time compared to the general adult population (ONS, 2021), suggesting that they are at a greater risk of developing mental illnesses. As such, examining protective factors that may buffer against languishing is imperative. With existing findings demonstrating the negative association between mental health literacy and mental illnesses, this study investigated the role of mental health literacy as a protective factor against languishing. The results highlighted that mental health literacy was not a significant predictor of languishing. HE institutes play a significant role in helping to mitigate the potentially damaging impact on student mental health and well-being (Camfield et al., 2021). When students face setbacks and disruptions with their studies, HE students prefer to contact their lecturer or personal tutor over speaking to family members (Shafi et al., 2023), further highlighting the significance of HE institutes on HE students' well-being. This study is the first to examine the relationship between mental health literacy and languishing during the COVID-19 pandemic. However, it is far from conclusive. Based on previous findings (e.g., Kim et al., 2015), promoting mental health literacy can be advantageous for deterring mental illnesses and challenges. Yet, our study hints at the possibility that mental health literacy may not be sufficient in promoting mental health (as opposed to preventing mental illnesses). While there remains future research to be conducted to better understand the effects of mental health literacy on mental health, HE institutes can consider implementing programs that focus on developing skills and techniques for coping with emotional distress in the meantime. Among the existing mental health interventions for HE students, skill development programs—especially mindfulness programs that involve supervised practice over multiple sessions—have been the most successful in promoting positive adjustments, such as increased self-confidence and social skills (see Conley et al., 2013). Evidently, it is imperative to not only prevent mental illness but also to promote a salutogenic orientation of mental health (Mjøsund, 2021). Accordingly, more research is necessary to conclude if and how mental health literacy can help promote positive mental health.



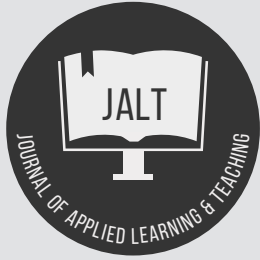
## References

- Allen, R., Kannangara, C., & Carson, J. (2023). Long-term mental health impacts of the Covid-19 Pandemic on university students in the UK: A longitudinal analysis over 12 months. *British Journal of Educational Studies*, 71(6), 585–608. <https://doi.org/10.1080/00071005.2023.2215857>
- Bishop, L., Gardiner, F. W., Quinlan, F., Gale, L., Gorelik, A., Gleeson, J., & Laverty, M. (2021). National mental health literacy survey: Final report. *The Royal Flying Doctors Service Australia*, 1, 1-88. <https://doi.org/10.13140/RG.2.2.26142.25923>
- Bjørnsen, H. N., Espnes, G. A., Eilertsen, M.-E. B., Ringdal, R., & Moksnes, U. K. (2019). The relationship between positive mental health literacy and mental well-being among adolescents: Implications for school health services. *The Journal of School Nursing: The Official Publication of the National Association of School Nurses*, 35(2), 107–116. <https://doi.org/10.1177/1059840517732125>
- Blakely, T., Thompson, J., Bablani, L., Andersen, P., Ait Ouakrim, D., Carvalho, N., Abraham, P., Boujaoude, M.-A., Katar, A., Akpan, E., Wilson, N., & Stevenson, M. (2021). Association of simulated COVID-19 policy responses for social restrictions and lockdowns with health-adjusted life-years and costs in Victoria, Australia. *Jama Health Forum*, 2(7), 211749. <https://doi.org/10.1001/jamahealthforum.2021.1749>
- Browning, M. H. E. M., Larson, L. R., Sharaievska, I., Rigolon, A., McAnirlin, O., Mullenbach, L., Cloutier, S., Vu, T. M., Thomsen, J., Reigner, N., Metcalf, E. C., D'Antonio, A., Helbich, M., Bratman, G. N., & Alvarez, H. O. (2021). Psychological impacts from COVID-19 among university students: Risk factors across seven states in the United States. *PloS One*, 16(1), 0245327. <https://doi.org/10.1371/journal.pone.0245327>
- Burns, R. A., Windsor, T., Butterworth, P., & Anstey, K. J. (2022). The protective effects of wellbeing and flourishing on long-term mental health risk. *SSM-Mental Health*, 2, 100052. <https://doi.org/10.1016/j.ssmmh.2021.100052>
- Burt, K. G., & Eubank, J. M. (2021). Optimism, resilience, and other health-protective factors among students during the COVID-19 pandemic. *Journal of Effective Teaching in Higher Education*, 4(1), 1-17. <https://doi.org/10.36021/jethe.v4i1.206>
- Camfield, E. K., Schiller, N. R., & Land, K. M. (2021). Nipped in the bud: COVID-19 reveals the malleability of STEM student self-efficacy. *CBE—Life Sciences Education*, 20(2), ar25. <https://doi.org/10.1187/cbe.20-09-0206>
- Campbell, L. O., Haugen, J. S., Sutter, C. C., & Lambie, G. W. (2019). Building capacity for mental health literacy of suicidality and self-injurious behaviors: A formative design investigation. *Journal of Formative Design in Learning*, 3(1), 53–61. <https://doi.org/10.1007/s41686-019-00029-y>
- Concerto, C., Rodolico, A., La Rosa, V. L., Aiello, B., Martinez, M., Stuto, S., ... & Aguglia, E. (2022). Flourishing or languishing? Predictors of positive mental health in medical students during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 19(23), 15814. <https://doi.org/10.3390/ijerph192315814>
- Conley, C. S., Durlak, J. A., & Dickson, D. A. (2013). An evaluative review of outcome research on universal mental health promotion and prevention programs for higher education students. *Journal of American College Health*, 61(5), 286–301. <http://dx.doi.org/10.1080/07448481.2013.802237>
- Crabtree, S. A., Captari, L. E., Hall, E. L., Sandage, S. J., & Jankowski, P. J. (2023). Mental health symptoms, well-being and experiences of the COVID-19 pandemic: A mixed-methods practice-based study. *Counselling and Psychotherapy Research*, 23(1), 134-151. <https://doi.org/10.1002/capr.12503>
- Fagrell Trygg, N., Gustafsson, P. E. & Månsdotter, A. (2019). Languishing in the crossroad? A scoping review of intersectional inequalities in mental health. *International Journal for Equity in Health*, 18, 115. <https://doi.org/10.1186/s12939-019-1012-4>
- Flaskerud, J. H. (2022). Mental health and the pandemic: New looks. *Issues in Mental Health Nursing*, 43(1), 83–86. <https://doi.org/10.1080/01612840.2021.1935798>
- Fulcher, E., & Pote, H. (2021). Psychometric properties of global mental health literacy measures. *Mental Health Review Journal*, 26(1), 87-99. <https://doi.org/10.1108/MHRJ-04-2020-0022>
- Furnham, A., & Swami, V. (2018). Mental health literacy: A review of what it is and why it matters. *International Perspectives in Psychology: Research, Practice, Consultation*, 7(4), 240–257. <https://doi.org/10.1037/ipp0000094>
- George, D., & Mallery, P. (2010). *SPSS for Windows step by step: A simple guide and reference, 17.0 update*. Allyn & Bacon.
- Gorczyński, P., Sims-Schouten, W., Hill, D., & Wilson, J. C. (2017). Examining mental health literacy, help seeking behaviours, and mental health outcomes in UK university students. *The Journal of Mental Health Training, Education, and Practice*, 12(2), 111–120. <https://doi.org/10.1108/JMHTP-05-2016-0027>
- Grabowski, F. C. (2021). Depression in childhood and adolescence. Development and piloting of a psychoeducational program for the professional development of teachers. *Empirische Sonderpädagogik*, 13(4), 328-341. <http://dx.doi.org/10.25656/01:24109>
- Graham, M. A., & Eloff, I. (2022). Comparing mental health, wellbeing and flourishing in undergraduate students pre- and during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health*, 19(12), 7438. <https://doi.org/10.3390/ijerph19127438>
- Grant, A. (2021, April 19). There's a name for the blah you're feeling: It's called languishing. *The New York Times*. <https://>

- www.nytimes.com/2021/04/19/well/mind/covid-mental-health-languishing.html
- Gulliver, A., Griffiths, K. M., Christensen, H., & Brewer, J. L. (2012). A systematic review of help-seeking interventions for depression, anxiety and general psychological distress. *BMC Psychiatry, 12*(1), 81. <https://doi.org/10.1186/1471-244X-12-81>
- Haliwa, I., Spalding, R., Smith, K., Chappell, A., & Strough, J. (2021). Risk and protective factors for college students' psychological health during the COVID-19 pandemic. *Journal of American College Health, 70*(8), 2257–2261. <https://doi.org/10.1080/07448481.2020.1863413>
- Hawley, S. R., Thriyakraman, J. K., Noveck, N., Romain, T. S., Ludy, M. J., Barnhart, L., ... & Tucker, R. M. (2021). Concerns of college students during the COVID-19 pandemic: Thematic perspectives from the United States, Asia, and Europe. *Journal of Applied Learning and Teaching, 4*(1), 11–20. <https://doi.org/10.37074/jalt.2021.4.1.10>
- Hone, L. C., Jarden, A., Schofield, G. M., & Duncan, S. (2014). Measuring flourishing: The impact of operational definitions on the prevalence of high levels of wellbeing. *International Journal of Wellbeing, 4*(1), 62–90. <http://dx.doi.org/10.5502/ijw.v4i1.4>
- Iasiello, M., van Agteren, J., Keyes, C. L., & Cochrane, E. M. (2019). Positive mental health as a predictor of recovery from mental illness. *Journal of Affective Disorders, 251*, 227–230.
- Ismail, F. (2023). The dynamic-grit mindset: Flourishing in the future workforce. In *New research and possibilities in wellbeing education* (pp. 283–312). Singapore: Springer Nature Singapore.
- Javed, B., Sarwer, A., & Soto, E. B. (2020). The coronavirus (COVID-19) pandemic's impact on mental health. *The International Journal of Health Planning & Management, 35*(5), 993–996. <https://doi.org/10.1002/hpm.3008>
- Jorm, A. F. (2012). Mental health literacy: Empowering the community to take action for better mental health. *American Psychologist, 67*(3), 231–243. <https://doi.org/10.1037/a0025957>
- Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior, 43*(2), 207–22. <https://doi.org/10.2307/3090197>
- Keyes, C. L. M., Dhingra, S. S., & Simoes, E. J. (2010). Change in level of positive mental health as a predictor of future risk of mental illness. *American Journal of Public Health, 100*(12), 2366–2371. <https://doi.org/10.2105/AJPH.2010.192245>
- Keyes, C. L., Eisenberg, D., Perry, G. S., Dube, S. R., Kroenke, K., & Dhingra, S. S. (2012). The relationship of level of positive mental health with current mental disorders in predicting suicidal behavior and academic impairment in college students. *Journal of American College Health, 60*(2), 126–133. <https://doi.org/10.1080/07448481.2011.608393>
- Keyes, C. L. M., Wissing, M., Potgieter, J. P., Temane, M., Kruger, A., & van Rooy, S. (2008). Evaluation of the mental health continuum-short form (MHC-SF) in Setswana-speaking South Africans. *Clinical Psychology & Psychotherapy, 15*(3), 181–192. <https://doi.org/10.1002/cpp.572>
- Kim, J. E., Saw, A., & Zane, N. (2015). The influence of psychological symptoms on mental health literacy of college students. *The American Journal of Orthopsychiatry, 85*(6), 620–30. <https://doi.org/10.1037/ort0000074>
- Kowal, M., Coll-Martín, T., Ikizer, G., Rasmussen, J., Eichel, K., Studzińska, A., ... & Ahmed, O. (2020). Who is the most stressed during the COVID-19 pandemic? Data from 26 countries and areas. *Applied Psychology: Health and Well-Being, 12*(4), 946–966. <https://psycnet.apa.org/doi/10.1111/aphw.12234>
- Kulwicka, K., & Gasiorowska, A. (2023). Depression literacy and misconceptions scale (DepSter): A new two-factorial tool for measuring beliefs about depression. *BMC Psychiatry, 23*(1), 1–20. <https://doi.org/10.1186/s12888-023-04796-8>
- Kutcher, S., Wei, Y., & Coniglio, C. (2016). Mental health literacy: Past, present, and future. *Canadian Journal of Psychiatry, 61*(3), 154–158. <https://doi.org/10.1177/0706743715616609>
- Kwan, J. (2022). Academic burnout, resilience level, and campus connectedness among undergraduate students during the Covid-19 pandemic: Evidence from Singapore. *Journal of Applied Learning and Teaching, 5*(S1), 52–63. <https://doi.org/10.37074/jalt.2022.5.s1.7>
- Lamers, S. M., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. (2011). Evaluating the psychometric properties of the mental health continuum-short form (MHC-SF). *Journal of Clinical Psychology, 67*(1), 99–110. <https://doi.org/10.1002/jclp.20741>
- Lindstrom, D. L., Schmidt-Crawford, D., & Thompson, A. D. (2021). Flexible but languishing: What we've learned about virtual working and learning. *Journal of Digital Learning in Teacher Education, 37*(3), 150–151. <https://doi.org/10.1080.21532974.2021.1936985>
- Lluch, M. T. (1999). *Construcción de una escala para evaluar la salud mental positiva* [Building a scale to assess positive mental health]. University of Barcelona, Faculty of Psychology: PhD thesis. <http://www.tdx.cat/TDX-0331104-104403/>
- Lu, Q., Cai, Z., Chen, B., & Liu, T. (2020). Social policy responses to the COVID-19 crisis in China in 2020. *International Journal of Environmental Research and Public Health, 17*(16). <https://doi.org/10.3390/ijerph17165896>
- McCabe, E., DeSordi, S., Piepmeier, A., & Hall, E. (2023). An exploratory study on student-athlete mental health: Personal and perceived barriers to help-seeking behavior. *American Journal of Undergraduate Research, 20*(2). <https://doi.org/10.33697/ajur.2023.083>
- Miles, R., Rabin, L., Krishnan, A., Grandoit, E., & Kloskowski,

- K. (2020). Mental health literacy in a diverse sample of undergraduate students: Demographic, psychological, and academic correlates. *BMC Public Health*, 20(1). <https://doi.org/10.1186/s12889-020-09696-0>
- Mjøsund, N. H. (2021). A salutogenic mental health model: Flourishing as a metaphor for good mental health. In G. Haugan, M. Eriksson, (Eds.), *Health promotion in health care – vital theories and research*. Springer, Cham. [https://doi.org/10.1007/978-3-030-63135-2\\_5](https://doi.org/10.1007/978-3-030-63135-2_5)
- Moeller, J., von Keyserlingk, L., Spengler, M., Gaspard, H., Lee, H. R., Yamaguchi-Pedroza, K., ... & Arum, R. (2022). Risk and protective factors of college students' psychological well-being during the COVID-19 pandemic: Emotional stability, mental health, and household resources. *Aera Open*, 8. <https://doi.org/10.1177/23328584211065725>
- Mshigeni, S., Sarwar, E., & Kimunai, E. (2021). College students' educational experiences amid COVID-19 pandemic. *Journal of Applied Learning and Teaching*, 4(1), 38-48. <https://doi.org/10.37074/jalt.2021.4.1.20>
- Na, L., Yang, L., Mezo, P. G., & Liu, R. (2022). Age disparities in mental health during the COVID-19 pandemic: The roles of resilience and coping. *Social Science & Medicine*, 305, 115031. <https://doi.org/10.1016/j.socscimed.2022.115031>
- Nealon, M. (2021). *The pandemic accelerant: How COVID-19 advanced our mental health priorities*. <https://www.un.org/en/un-chronicle/pandemic-accelerant-how-covid-19-advanced-our-mental-health-priorities>
- Nes, R. B., Yu, B., Hansen, T., Vedaa, Ø., Røysamb, E., & Nilsen, T. S. (2022). Flattening the quality of life curve? A prospective person-centred study from Norway amid COVID-19. *Quality of Life Research*, 31, 2295-2305. <https://doi.org/10.1007/s11136-022-03113-2>
- Nobre, J., Calha, A., Luis, H., Oliveira, A. P., Monteiro, F., Ferré-Grau, C., & Sequeira, C. (2022). Mental health literacy and positive mental health in adolescents: A correlational study. *International Journal of Environmental Research and Public Health*, 19, 8165. <https://doi.org/10.3390/ijerph19138165>
- Nwachukwu, I., Nkire, N., Shalaby, R., Hrabok, M., Vuong, W., Gusnowski, A., ... & Agyapong, V. I. (2020). COVID-19 pandemic: Age-related differences in measures of stress, anxiety and depression in Canada. *International Journal of Environmental Research and Public Health*, 17(17), 6366. <http://dx.doi.org/10.3390/ijerph17176366>
- O'Connor, M., & Casey, L. (2015). The mental health literacy scale (MHLS): A new scale-based measure of mental health literacy. *Psychiatry Research*, 229(1-2), 511–516. <https://doi.org/10.1016/j.psychres.2015.05.064>
- ONS. (2021, May 23). *Coronavirus and higher education students: England, 4 to 12 May 2021*. *Coronavirus and higher education students*. Office for National Statistics. <https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/healthandwellbeing/bulletins/coronavirusandhighereducationstudents/england4to12may2021>
- Paz, C., Hermosa-Bosano, C., Hidalgo-Andrade, P., García-Manglano, J., Sábada Chalezquer, C., López-Madrigal, C., & Serrano, C. (2022). Self-esteem, happiness, and flourishing in times of COVID-19: A study during the lockdown period in Ecuador. *International Journal of Public Health*, 67. <https://doi.org/10.3389/ijph.2022.1604418>
- Racine, S., Miller, A., Mehak, A., & Trolio, V. (2021). Examining risk and protective factors for psychological health during the COVID-19 pandemic. *Anxiety, Stress, & Coping*, 35(1), 124–140. <https://doi.org/10.1080/10615806.2021.1958789>
- Shafi, A. A., Middleton, T., Millican, R., Templeton, S., Hill, J., & Jones, C. (2023). Learning in a disrupted environment: Exploring higher education student resilience using the dynamic interactive model of resilience. *Journal of Applied Learning and Teaching*, 6(2). <https://doi.org/10.37074/jalt.2023.6.2.18>
- Spiker, D., & Hammer, J. (2019). Mental health literacy as theory: Current challenges and future direction. *Journal of Mental Health*, 28(3), 238-242. <https://doi.org/10.1080/09638237.2018.1437613>
- Takashima, R., Onishi, R., Saeki, K., & Hirano, M. (2020). Perception of COVID-19 restrictions on daily life among Japanese older adults: A qualitative focus group study. *Healthcare*, 8(4). <https://doi.org/10.3390/healthcare8040450>
- Tambling, R. R., D'Aniello, C., & Russell, B. S. (2023). Mental health literacy: A critical target for narrowing racial disparities in behavioral health. *International Journal of Mental Health and Addiction*, 21(3), 1867-1881. <https://doi.org/10.1007/s11469-021-00694-w>
- Tan, E., Mwagwabi, F., Lim, T., & Lim, A. (2023). Graduate employability concerns amidst a crisis: Student perspectives from Singapore on COVID-19. *Industry and Higher Education*, 37(3), 370-383. <https://doi.org/10.1177/09504222221126420>
- Tang, Y., Tang, R., & Gross, J. (2019). Promoting psychological well-being through an evidence-based mindfulness training program. *Frontiers in Human Neuroscience*, 13, 237. <https://doi.org/10.3389/fnhum.2019.00237>
- Tinsley, B. (2020, December 21). *Coronavirus and the impact on students in higher education in England: September to December 2020*. Office for National Statistics.
- Usher, K., Durkin, J., & Bhullar, N. (2020). The COVID-19 pandemic and mental health impacts. *International Journal of Mental Health Nursing*, 29(3), 315–318. <https://doi.org/10.1111/inm.12726>
- Vinko, M., Mikolič, P., Roškar, S., & Jeriček Klanšček, H. (2022). Positive mental health in Slovenia before and during the COVID-19 pandemic. *Frontiers in Public Health*, 10, 963545. <https://doi.org/10.3389/fpubh.2022.963545>
- Visser, M., & Law-van Wyk, E. (2021). University students' mental health and emotional wellbeing during the COVID-19

- pandemic and ensuing lockdown. *South African Journal of Psychology*, 51(2), 229–243. [10.1177/00812463211012219](https://doi.org/10.1177/00812463211012219).
- Wei, Y., McGrath, P., Hayden, J., & Kutcher, S. (2018). The quality of mental health literacy measurement tools evaluating the stigma of mental illness: A systematic review. *Epidemiology and Psychiatric Sciences*, 27(5), 433–462. <https://doi.org/10.1017/s2045796017000178>
- Weich, S., Brugha, T., King, M., McManus, S., Bebbington, P., Jenkins, R., ... & Stewart-Brown, S. (2011). Mental well-being and mental illness: Findings from the adult psychiatric morbidity survey for England 2007. *The British Journal of Psychiatry*, 199(1), 23–28. <https://doi.org/10.1192/bjp.bp.111.091496>
- Wen, F., Zhu, J., Ye, H., Li, L., Ma, Z., Wen, Z., & Zuo, B. (2021). Associations between insecurity and stress among Chinese university students: The mediating effects of hope and self-efficacy. *Journal of Affective Disorders*, 281, 447–453. <https://doi.org/10.1016/j.jad.2020.12.047>
- Willen, S. S. (2022). “Languishing” in critical perspective: Roots and routes of a traveling concept in COVID-19 times. *SSM - Mental Health*, 2. <https://doi.org/10.1016/j.ssmmh.2022.100128>
- Wissing, M. P., Schutte, L., Liversage, C., Entwisle, B., Gericke, M., & Keyes, C. (2021). Important goals, meanings, and relationships in flourishing and languishing states: Towards patterns of well-being. *Applied Research in Quality of Life: The Official Journal of the International Society for Quality-Of-Life Studies*, 16(2), 573–609. <https://doi.org/10.1007/s11482-019-09771-8>
- Wixom, C. (2021, May 24). Opinion: Hope for students languishing in the pandemic. *The Daily Universe*. <https://universe.byu.edu/2021/05/24/opinion-hope-for-students-languishing-in-the-pandemic/>
- Yu, Y., Liu, Z., Hu, M., Liu, X., Liu, H., Yang, J. P., Zhou, L., & Xiao, S. (2015). Assessment of mental health literacy using a multifaceted measure among a Chinese rural population. *BMJ Open*, 5. <https://doi.org/10.1136/bmjopen-2015-009054>
- Zaidlin, G., Konrad, L., Dougherty, B., Cook, N., & Papadopoulos, A. (2022). Utilizing the health belief model to move post-secondary students toward flourishing mental health. *The Journal of Positive Psychology*, 17(3), 430–439. <https://doi.org/10.1080/17439760.2020.1858331>



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Instructors' perceptions on the use of formative assessment and feedback for learning during the COVID-19 pandemic: Another look inside the black box

---

James Kwan<sup>A</sup>

A

*Adjunct Professor, SP Jain School of Global Management*

---

### Keywords

Feedback;  
formative assessment;  
online assessment;  
online peer assessment;  
Singapore.

---

### Correspondence

[jameskwan2014@gmail.com](mailto:jameskwan2014@gmail.com)<sup>A</sup>

---

### Article Info

Received 26 September 2023  
Received in revised form 3 January 2025  
Accepted 6 January 2024  
Available online 6 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.17>

### Abstract

The COVID-19 pandemic has caused a significant disruption in the learning and teaching practices within the higher education sector in Singapore. This study examines the effectiveness of formative assessment, feedback, and peer assessment on undergraduate and postgraduate students' learning outcomes during the pandemic. This study was conducted using a qualitative approach, where semi-structured interviews were conducted with 16 part-time and full-time instructors employed by an American university with an Asia campus in Singapore. The findings revealed that instructors generally felt that feedback improves students' learning, motivation, and engagement. However, many instructors provided a mixed response concerning the benefits and limitations of using peer assessment. For benefits, instructors agreed that peer assessment offers an opportunity for students to acquire essential skills such as critical thinking, communication, teamwork, time management, and collaborative learning. These skills are important learning goals for their future academic and professional careers. In contrast, several instructors observed that peer assessment may not be beneficial when students lack motivation or skills to perform it, and it is time-consuming for students to complete and instructors to review. These findings have more far-reaching implications for instructors and the university in the post-pandemic era.

## Introduction

Higher education institutions (HEI) and educators have experienced many challenges in teaching, assessment, and feedback practices during the tumultuous COVID-19 pandemic. The early outbreak of the pandemic has caused educators to switch from traditional classroom teaching to a blended learning delivery, which demands a change in their teaching style from teacher-centric to student-centric (Tan et al., 2022; Thatsara et al., 2020). Many instructors have little prior experience in online facilitation and providing online assessment. An understanding of e-pedagogy is vital to improving engagement and motivation among students (Harris & Tan, 2020; Zou et al., 2021).

In Singapore, universities and private HEI responded swiftly amidst the pandemic by having all learning activities delivered online and converting all summative assessments to proctored examinations or replaced with individual assignments or team projects (Tan et al., 2022). These changes occurred between 10 February and 1 June 2020, and many students expressed anxiety about the sudden transition to fully online learning and the need to adapt to online assessment. Instructors also felt the stress of converting the curriculum to online delivery and changing the assessments including peer assessment to an online format. While recognising the importance of having assessments that align with the learning outcomes, scholars argued that the opportunity to learn (OTL) is perceived as a threat to test scores' reliability and comparability (DePascale & Gong, 2020). To minimise OTL loss caused by COVID-19 and take into consideration the diverse cultural, social, and learning abilities of students, education assessment scholars reviewed existing literature to identify operational psychometric procedures and (re) design assessments that integrate theoretical concepts and job-related skills, knowledge, and abilities with evidence of fairness, reliability, and validity (Keng et al., 2020). Thus, this study seeks to examine students' perceptions of the effectiveness of formative assessment, feedback, and peer assessment in enhancing students' learning during the pandemic in Singapore.

Against the backdrop of the COVID-19 pandemic, this study addresses some gaps identified from prior literature where instructors' views on the value of formative assessment and feedback are examined, particularly in the higher education (HE) sector in Singapore. This topic is worth investigating for two reasons. First, there have been many changes in the teaching and assessment practices in the HE sector in Singapore amid the pandemic, such as the increasing use of hybrid teaching, blended learning, and online assessment (Ng, 2021; Yeo et al., 2021). Thus, it is believed that this study may provide further insights to teaching faculty and policyholders in the HE sector on the effective use of formative assessment and feedback in different modes and technology platforms to improve student learning during and post-pandemic. Second, the researcher hopes the findings from this study, which is believed to be the first to examine formative assessment from instructors' perspectives in the higher educator sector in Singapore during the pandemic, will gain interest from HE assessment scholars in Singapore and other countries to perform comparative studies and meta-longitudinal studies post-pandemic.

## Literature review

### Formative assessment and online assessment

Formative assessment, also known as assessment for learning, has been defined as "activities undertaken by educators and their students in assessing themselves that provide information to be used as feedback to modify teaching and learning activities" (Black & Wiliam, 2010, p. 82). Formative assessments are broadly categorised into spontaneous and planned (Dixson & Worrell, 2016). Spontaneous formative assessments are impromptu and real-time when a teacher calls on students to answer conceptual questions covered in the previous lesson or engages the class to participate actively in questions raised by students during the lesson. Planned formative assessments include quizzes, homework assignments, and group discussions to assess student progress and improve collaborative learning (Dixson & Worrell, 2016).

Based on the theory of constructivism applied to higher education (HE), assessment is a critical element for learning and teaching for students' reflective construction of knowledge (Ion et al., 2018). This theory suggests that students' active involvement in formative assessment includes a wide range of activities, such as understanding the assessment rubrics, collaboration with instructors in assessment design, participation in peer assessment, and receiving feedback from instructors to improve their learning. In their seminal work on assessment and learning, Black and Wiliam (1998) argued that educational policies in many countries see the classroom as a 'black box' where little attention has been paid to what happens inside the classrooms. Instead, universities pay lots of attention to raising education quality, which involves changing the inputs such as regulation of teachers' qualifications, adjusting student achievement standards, investment in technology, etc., and evaluating the outputs, which include standardised testing for summative assessment, students' performances, and graduate employability (Stančić, 2021).

Prior studies reported that the quality of students' learning may depend on the assessment used (Lynam & Cachia, 2018; Raupach et al., 2013). Biggs and Tang (2011) used the term 'backwash' to refer to the impact of assessment on students' approaches to learning. For instance, formative assessments appear more inclined to promote deep learning, while summative assessments are more conducive to surface learning (Fry et al., 2009). Assessment scholars argued that assessments that involve case studies, simulations, and team presentations should emphasise real-world applications to prepare students to succeed in the workplace in twenty-first-century society (Keppell & Carless, 2006; Libman, 2010).

Over the past two decades, formative assessment has a noticeable intonation in the assessment literature where many universities have adopted the use of online formative assessment instead of continuing with the conventional pen-and-paper summative assessments (Fukuda et al., 2020; Wicking, 2020; Wu & Jessop, 2018). In the context of this study, online formative assessment refers to "the use of information and communication technology to support the iterative process of gathering and analysing information

about student learning by teachers as well as learners and of evaluating it about prior achievement and attainment of intended, as well as unintended learning outcomes" (Pachler et al., 2010, p. 716).

Online formative assessments also benefit instructors and institutions (Baleni, 2015; Or & Chapman, 2022). For instance, having formative online evaluations instead of in-class assessments allows instructors to cover complex areas or spend more time in class to clarify students' queries (Barkley, 2002). Instructors can assess students' performance and promote learning in a psychologically safe environment by having relatively short online formative assessments, such as online quizzes that cover a wide range of topics and permit multiple attempts (Boitshwarelo et al., 2017; Brady, 2005). Online formative assessments also save time and printing costs for instructors and institutions, especially where the cohort of students is extensive and requires frequent assessments (Barkley, 2002; Bloom et al., 2018; Jamil et al., 2012).

The pandemic has opened a flood gate for universities and faculty to re-examine the use of online assessment and feedback to promote students' learning (Almeida & Monteiro, 2021; Meccawy et al., 2021). Online formative assessment may be more prominent as students take classes remotely with minimal physical interaction (Senel & Senel, 2021) and transform teaching and learning by removing time, distance, and space constraints (Cirit, 2015; Lei & Gupta, 2010). During the pandemic, learning management systems such as Canvas, Blackboard, SharePoint, and Moodle have been extensively used for students to access online materials and submit their assignments. There has been a rise in the use of Zoom, Microsoft Teams, and WebEx for synchronous classes and interaction between instructors and students (Koh & Kan, 2020; Nyachwaya, 2020). These platforms provide a fertile ground for formative assessment and instant feedback using online quizzes involving multiple-choice, true-false, and matching questions (Shrago & Smith, 2006). Instructors can use these platforms to monitor students' performance and learning commitment via access rate, the attendance rate for synchronous classes, and participation time and frequency in forum discussions (Murray et al., 2012). The suitability and feasibility of employing these online platforms largely depend on their availability, compatibility with the existing information technology infrastructure and network, storage capacity, and internet connectivity for synchronous sessions (Crawford et al., 2020).

While many universities worldwide have taken active steps to adopt technology to promote online learning, many students and educators have little knowledge and experience in using online assessments (Chien et al., 2014; Fong & Chen, 2019). Instructors also face difficulties in modifying the assessment methods, such as changing the final exam to an online proctored exam or replacing it with a team project or written paper (Carrillo & Flores, 2020; Lee et al., 2022; Nic Dhonncha & Murphy, 2021). Consequently, there were concerns raised by educators and students on cheating and plagiarism, reliability and fairness of assessment, technical and technological issues (Darling-Hammond & Hylar, 2020; Rolim & Isaias, 2019).

## Feedback on student performance

There has been a growing body of literature that discusses the importance of feedback to promote student learning in HE in recent years (Boud & Molloy, 2013; Pentassuglia, 2018; Van Heerden, 2020). Providing feedback is widely regarded as one of the most important and powerful influences on student learning in teaching and assessment practices (Hattie & Timperley, 2007). As feedback may be seen as a multifaceted and complex process that deals with evaluating students' assessment performance and managing their expectations (Nicol & Macfarlane-Dick, 2006; Sadler, 2010, 2013; Sellbjer, 2018), the effectiveness of feedback depends on the teachers' preference of feedback practice, including the use of online feedback (Evans, 2013; Mulliner & Tucker, 2017), timely communication process (Gibbs & Simpson, 2004), depth and quality (Dawson et al., 2018), students' emotions (Jonsson, 2012; Poulos & Mahony, 2008), students' perceived usefulness for improvement and their ability to understand, interpret, and act upon it (Blair & McGinty, 2012; Sadler, 2010; Wei & Xie, 2018).

In recent years, the increasing prominence of technology has provided educators with an alternative to the conventional handwritten or typewritten hardcopy feedback to students: online feedback, which allows them to provide synchronous and asynchronous feedback (Chong, 2019; Shintani & Aubrey, 2016). For this study, online feedback, or e-feedback, follows the definition provided by Tuzi (2004) who referred to "teacher's feedback in digital, written form that is transmitted via the web" (p. 217). Synchronous online feedback is provided when the instructor and students are online simultaneously. The instructor offers instant feedback using the 'comment' function on Google Docs or other word-processing software while the students compose their texts online. In contrast, asynchronous online feedback occurs after the students submit their work electronically. Instructors provide online feedback, which may be provided in word-processing software (e.g. Google Docs, Microsoft OneNote, Turnitin Studio), audio software (e.g. Audacity), and screen capture software (e.g. TechSmith Capture, formerly known as Jing) (Lunt & Curran, 2010).

Results from prior studies on the effectiveness of online feedback were mixed (Deeley, 2018; Ellegaard et al., 2018; Henderson et al., 2019; Shang, 2022). For instance, Chong (2019) examined 93 college students' perceptions of online feedback in Hong Kong. He found that students were more motivated and responded more proactively to the instructor's online feedback as they gained clarity on annotated comments with tracked changes and highlighting, which saved time when revising their work. His findings were also supported by earlier studies conducted by McCabe et al. (2011) and Alvarez et al. (2012).

Studies have reported that audio feedback provides a sense of teachers' presence through their voice (Oyarzun et al., 2017), faster than written feedback (McCarthy, 2015; McCarthy et al., 2022), and more personalised engagement with greater expression, tone, and nuance (Carruthers et al., 2015; Murphy & Barry, 2016; Nicol, 2016), students are more engaged compared to feedback given in written format (Lunt & Curran, 2010). Brearley and Cullen (2012) reported

that audio feedback is most beneficial for draft assignments as students are allowed to revise their work before the final submission. For video feedback, which is considered “the latest development in alternative methods for organising feedback systems” (Denton, 2014, p. 53), studies noted that students value it as instructors may provide feedback through a plethora of ways, including verbal elaborations, written briefs, and displaying of online information to stimulate students to reflect deeply on their learning and continually improve on their work (Scheerer & Jones, 2018). In terms of limitations, scholars noted that online feedback lacks emotional and personalised support when feedback is extracted from a statement bank (Mayordomo et al., 2022). However, audio feedback may also be a challenge for students who face difficulties opening or downloading the file (Henderson & Philips, 2015; McCarthy, 2015), or have a hearing impairment (Lunt & Curran, 2010).

### **Peer assessment**

Peer assessment is defined as an “arrangement in which individuals consider the amount, level, value, worth, quality or success of the products or outcomes of learning of peers of similar status” (Topping, 1998, p. 250). It is commonly a form of a self-regulated learning tool in HE (Liu et al., 2019), which typically involves students to “provide either feedback or grades (or both) to their peers on a product, process, or performance, based on the criteria of excellence for the product” (Falchikov & Boud, 2007, p. 132). Typically, the product would be in writing, portfolios, oral presentations (both individuals and teams), and other performance tasks as prescribed by the instructors (Topping, 2009).

Peer assessment can be summative (provide evaluation and assigning a grade or a score) or formative (provide feedback to support learning and suggest improvement) to promote collaborative learning (Falchikov & Goldfinch, 2000) and self-regulation in learning (Andrade & Valtcheva, 2009; Orsmond et al., 2000). Students are empowered to demonstrate their subject knowledge, reflective and evaluation skills, and critical thinking process while evaluating their peer work, in writing or oral (Barak & Dori, 2009; Nicol et al., 2014; Reinholz, 2016), which deepens their learning (Man et al., 2018). Performing a detailed peer assessment enables students to evaluate other students’ performance from the perspective of an assessor, improves their work and learning quality to a large extent, and promotes independence and task ownership (Bong & Park, 2020; McMahan, 2010; Sluijsmans et al., 2002) in a more varied and timely manner (Boud et al., 1999; Carnell, 2016). As peer assessment enables students to be aware of assessment standards, make an evaluative judgement and provide feedback with a set of rubrics and predefined assessment criteria (Tai et al., 2018), it provides opportunities for students to cultivate a broad range of behavioural, cognitive, and transferable skills such as verbal and written communication, team building, self-awareness, critical thinking, and time management (Tighe-Mooney et al., 2016; Wu et al., 2014; Yucel et al., 2014). These skills are highly valuable for students to acquire to be future career-ready when they gain employment upon graduation (Boud & Soler, 2016; Kearney, 2013; Liu & Carless, 2006; Weaver & Esposto, 2012).

While students and educators see the benefits of peer assessment in promoting self-regulated learning, there are several limitations to peer assessment (Adachi et al., 2018; Boud et al., 2013; Carnell, 2016; Naomi & Boud, 2022). For instance, prior studies reported that students perceived peer assessment as a time-consuming and stressful exercise (Ashenafi, 2017; Nortcliffe, 2012; Patton, 2012; Topping et al., 2000). Students may lack the skills or motivation to provide peer assessment (Hanrahan & Issacs, 2001; Lladó et al., 2014; Stančić, 2021; To & Panadero, 2019; Wanner & Palmer, 2018), they remained sceptical and distrust over their peers’ assessment reliability and accuracy compared to their instructors’ assessment (Kaufman & Schunn, 2011; Wen & Tsai, 2006; Zhou et al., 2020), quality of peer relationship (Panadero & Alonso-Tapia, 2013) and competitive pressure to provide lower assessment grade or peer pressure to give favourable or bias feedback (Chen, 2010).

There has been a substantial body of literature examining students’ perception of peer assessment in HE in recent years (Gaynor, 2020; Huisman et al., 2018; Hoo et al., 2020; Mercader et al., 2020; Li et al., 2020; To & Panadero, 2019; Usher & Barak, 2018; Zhang et al., 2020; Zong et al., 2022; Zou et al., 2018). However, recent empirical studies on faculty’s perceptions of peer assessment are relatively scarce, with the notable exception of Adachi et al. (2018) and a dated study by Liu and Carless (2006). Before the pandemic, Adachi et al. (2018) conducted a qualitative study involving 13 instructors in an Australian HEI to examine the benefits and challenges of peer assessment. They reported seven benefits, which include the development of transferrable skills; preparation of students to be work-ready; lifelong learners; promotion of active learning; improved understanding of standards and assessment criteria; time flexibility for students to provide feedback; skills involved in delivering and receiving feedback; and less input and time required of instructors. Five challenges have been gathered from the study: reliability and accuracy of students’ feedback skills; lack of perceived expertise; power relations between instructors and students; time constraints; and resource constraints. This study did not consider online peer assessment during the pandemic, which caused a significant shift in the HE sector, where many courses and assessments are conducted online. As the instructors are the key assessment designers, examining the effectiveness and challenges of using online peer assessment during the pandemic would be timely.

### **Method**

This study adopted a qualitative approach where the researcher conducted semi-structured interviews with the full-time and adjunct faculty members involved in teaching undergraduate courses at an American university offering undergraduate and postgraduate courses in Singapore (see Interview Guide in Appendix). The reasons for using semi-structured interviews were three-fold. Firstly, based on the preliminary discussion with the instructors, who worked closely with the researcher, many preferred semi-structured interviews instead of questionnaires as they would not want to be restricted by the specific areas spelt out in questionnaires. Secondly, there have been many changes in the teaching and assessment practices in Singapore’s HE



sector amid the pandemic. Semi-structured interviews with the instructors enable the researcher to gain deeper insights into their perceptions of the benefits and challenges of providing formative assessments and feedback via various technological tools. Thirdly, semi-structured interviews allowed the researcher to observe non-verbal cues such as facial expressions, gestures, and other non-verbal communications that may enrich the meaning of the spoken words (Carr & Worth, 2001; Hiller & DiLuzio, 2004). Due to the exploratory nature of this study and the challenges in gathering a large number of interviewees to participate, as they were working from home and have family, social, and other personal commitments, there was no attempt to gather equal representation in full-time and adjunct, years of teaching experience, and gender for the instructors.

A total of 18 instructors (10 full-time and eight adjuncts) within the Business School were invited to participate in the study via email. They were recruited randomly via direct contact from the researcher or referrals from other instructors within the university. Sixteen instructors accepted the invitation (eight full-time and eight adjuncts), which constituted a response rate of 89%. The interviews were conducted between 14 February and 1 April 2022. To provide comfort and ease of sharing of views, all interviews were conducted via MS Teams, and interviewees could switch on the camera if they are comfortable. Table 1 summarises the interviewees' profile, which includes interviewees' identity codes (F represents female, M represents male), interview duration, appointment, gender, number of years of teaching experience, and specialisation that have been placed beside their extracts.

The interview timings varied from 47 minutes to 88 minutes, with an average interview time of approximately 63 minutes. The interviewees' average number of years of teaching experience was 14.3 years. It appears that the length of the interview varied with the years of teaching experience, suggesting that the "senior" faculty were able to provide more insights on the benefits and challenges of using online formative assessment and feedback.

All transcripts were reviewed several times and the researcher examined data contained in individual nodes and at node intersections to allow interpretation of the findings. Thematic analysis was performed based on the interview information gathered and coded. Ontologically, the study is broadly conducted based on realism, where the researcher believes the participants (instructors) are involved in providing formative assessment and feedback in one way or another (Maxwell, 2013).

## Results

### Effectiveness of online assessment

Interviewees were asked about the ease of, and challenges faced using online assessment during the pandemic. In line with the prior studies reported by Baleni (2015), Seifert and Feliks (2019), and Meccawy et al. (2021), several instructors expressed excitement about the use of online assessment as it saves time in marking, provides flexibility in terms of

Table 1. Profile of interviewees.

No.	Interview (minutes)	Full-time/Adjunct	Gender	Experience (years)	Specialisation
F1	44	Full-time	Female	8	Business
F2	57	Adjunct	Female	12	Accounting
F3	66	Full-time	Female	15	Linguistic
F4	64	Adjunct	Female	5	Accounting
F5	53	Adjunct	Female	10	Auditing/Accounting
F6	53	Full-time	Female	6	Economics
M1	88	Adjunct	Male	22	Auditing/Accounting
M2	58	Full-time	Male	7	Business
M3	56	Adjunct	Male	12	Accounting
M4	61	Full-time	Male	20	Economics
M5	61	Adjunct	Male	30	Accounting
M6	47	Full-time	Male	2	Business
M7	51	Adjunct	Male	20	Human Resource
M8	76	Adjunct	Male	26	Business
M9	81	Full-time	Male	25	Accounting
M10	83	Full-time	Male	10	Business

timing and venue, reduces paper wastage, lowers the risk of moving physical copies around resulting in loss or damage, improves efficiency for tech-savvy students, and evaluates students' performance in real-time:

I love online assessments as it helps me to save time in marking, especially for MCQ tests. It allows me to swiftly upload results to the portal without manual inputs into the system. Students also prefer this channel since it is safer to continue learning through digital means instead of taking physical tests during the height of Covid. (F3)

Working from home, I found the online assessments an effective tool as these reduced the inconvenience of keeping hard copies of the papers. It also eliminates the need to transfer the scripts to and from school to home and facilitates access anytime and anywhere. (M4)

From the students' perspectives, online assessment allows them to log in anytime to access the quizzes. The only requirement on my part is to ensure that questions are randomised to prevent cheating. Most of my students are very tech-savvy, so completing quizzes is faster than in the traditional pen-and-paper format. As for me, I advocate "green initiatives", so online assessments save paper and cost too. (M9)

Several instructors expressed concern over the use of online assessments, especially with regard to students' readiness, cheating, internet connectivity, reduced engagement, and administration:

Cheating is my number one concern. Detecting cheating online is more challenging than physical detection. Moreover, not all online proctoring programmes are 100% reliable... Another concern

I have is reduced engagement with students, including feedback and in-class interaction. (M1)

To a large extent, the lack of integrity is a key challenge when using online assessments. Despite online proctoring, the possibility of students attempting to cheat remains. In other instances, internet and wifi connectivity issues could cause disruption and anxiety. It could be more time-wasting for students to log in again to resume the online test. (F2)

Frankly, I do not find online assessment effective or helpful at all! There is more administrative work, from uploading questions to online invigilation, marking, and providing online feedback. There is also the need to deal with security issues and handle students' queries via Moodle, etc. Some of my MBA students are not used to online assessment as they prefer in-class assessments, which reduces their technological anxiety. (M10)

It is telling from the above quotes that there were mixed responses to online assessments. Many instructors shared their views from both instructors' and students' perspectives. Such a problem was widely documented in the literature before the pandemic (Bajjnath & Singh, 2019; Chace, 2012; King et al., 2009; Larkin et al., 2017). It remains to be seen whether online assessments will replace classroom-based assessments after the pandemic and how the university will address the concerns raised by the instructors.

Interestingly, while many instructors valued the benefits of online assessments to improve student learning, they highlighted some key considerations that influence the choice of using different technological tools for teaching and assessment, which were not covered in the interview guide. Essentially, several instructors see the ease of use, cost of the license, availability of technical support, integration with other devices, and students' readiness are critical factors:

Without a doubt, I see the ease of use and cost as two key factors. As a part-time lecturer, I don't have funding or technical support from the university when using these tools. I wouldn't want to bear the cost alone, to pay a couple of hundred for limited time use of the software. If I should lose my teaching job, this would be a waste. (M3)

I am a baby boomer and am not technologically savvy. The ease of use and availability of technical support from the school will be the most crucial for me. (M5)

I used several technological tools such as Kahoot! Mentimeter, Slido, Mural, and Padlet to facilitate my online classes and to engage my learners... it all boils down to the familiarity and ease of use of these tools, for both lecturer and students. (F6)

While some tools are freely available, they may not be easily integrated into students' mobile devices. It may be a concern, especially when students do

not have laptops or when their laptops are down. Other tools may not be user-friendly ... I would tend to avoid using them. (M7)

A closer examination of the above quotes and responses gathered from other instructors revealed that many of them are digital immigrants, a term coined by Prensky (2001), where they started using computers at a later stage of their adult life. Thus, it is interesting that all the interviewees with more than 20 years of teaching experience, including the above quotes from M5 and M7, who are adjunct instructors, expressed concern over the ease of use as one of the critical factors. In addition, it is telling that several adjunct instructors see the lack of technical and financial support from the university as a barrier to using these tools. Such concerns were not raised by full-time faculty as the university paid for the license and provided training and technical support for them.

### **Importance of feedback to support students' learning**

In line with prior studies (Boud & Molley, 2013; Dawson et al., 2018; Hattie & Timperley, 2007), all the instructors unanimously agreed that feedback is crucial to support students' learning and increase their satisfaction levels. Many of the instructors felt that feedback enables instructors to "highlight strengths and areas for improvement" (F2), "provide clarity" (M3), "motivate students and promote students' engagement" (F6), and "justify students' grades" (M10). For online feedback, a few instructors noted that it "reduces workload and saves time" (M5), "detects plagiarism more easily" (M7), and allows "repeated access for students compared to one-off feedback" (M10).

When it comes to the benefit of using audio feedback, the following quote is telling:

Admittedly, I have ugly handwriting and dislike spending time typing feedback to students. I started using audio-recording feedback via Turnitin during the pandemic. I find it convenient to communicate with my students as I do not need to arrange Zoom meetings with more than 100 undergraduates per semester. (F1)

However, two instructors do not see the benefits of audio feedback as they felt there are clarity and misinterpretation issues, and not suitable for students with hearing impairment:

I am not a fan of audio feedback as I find that students may not understand my [American] accent, and I feel that I tend to speak very fast when I am excited. (M6)

Audio feedback may be opened to different interpretations. The tone and delivery could be misunderstood. Lecturers also need to be sensitive to students who may have hearing impairment. I would rather provide typewritten feedback with sufficient depth and explanation. (F5)

As most instructors are unaware of audio feedback or have not explored this option, the real benefits and challenges of using this “less conventional, but yet exciting feedback channel” (M3) have yet to be seen.

### **Value of peer assessment to support students’ learning and challenges faced**

The views on the value of peer assessment were mixed. Several instructors felt that peer assessment provides opportunities for the development of a wide range of transferable, cognitive, and behavioural skills such as “communication, critical thinking, teamwork, time management, collaborative learning” (M4), promoting “active learning where students act as assessors to provide peer feedback” (F5), “raising students’ sense of task ownership” (F6), and “gain a better understanding of the assessment criteria and promotes self-reflection” (M8). These findings were in line with the results gathered from prior studies (Barak & Dori, 2009; Sluijsmans et al., 2002; Zheng et al., 2020).

In contrast, some instructors saw little value in peer assessment:

Though peer assessment helps to develop students’ critical thinking, self-reflection, and communication skills...unfortunately, most of my students lack the skills to provide it. Many are sceptical about the reliability and accuracy of such feedback as they don’t see themselves as teachers who are more experienced and qualified to provide feedback. (F4)

Some of my colleagues see that peer assessment helps to reduce their workload as the students do it. But for me, it takes up more time for me to design, implement, and review their feedback to ascertain whether their assessment is fairly done (M2)

Many students see it as an additional burden on them to do it, and there could also be favouritism or biases among students who may either provide a high rating for their buddies or deliberately give a low rating to their classmates whom they perceive as competitors. (M8)

It appears that instructors perceived students’ lack of motivation or skills to provide peer assessment may impact the reliability of results (Gurbanov, 2016), and the effectiveness of rubrics (Andrade et al., 2008). In addition, it appears that several adjunct faculty instructors expressed concern over the time used to review the peer assessment. Thus, they felt that it was a time-consuming exercise for both students and instructors.

Several instructors related the challenges faced for peer assessment to the technology used, which includes “lack of motivation from students to perform when it is not mandatory” (M3), “requires lots of investment in resources and time” (F5), and “effectiveness of rubrics” (M6), and “time-consuming to learn and evaluate the feedback quality” (M7). They noted that while many students were facing anxiety and stress during the pandemic, and undergraduates and

full-time MBA students placed priority over internship and full-time employment opportunities, they felt that students did not see much value in peer assessment.

## **Discussion**

### **Instructors’ commitment**

As the pandemic was far from over at the time of conducting this study, instructors needed to continue to remain committed to employing e-pedagogies that engage students by encouraging them to interact and participate in online assessment, providing prompt and quality online feedback to them (Müller et al., 2021; Senel & Senel, 2021; Watermeyer et al., 2021). Converting all existing course modules to online delivery requires highly systematic lesson plans and well-structured teaching materials, including multimedia content with strong support from IT staff (Daniel, 2020). For application-based degrees such as science, engineering, dentistry, and medicine that require laboratory practical lessons that enhance students’ hands-on experience, instructors may provide recorded videos that enable students to watch important laboratory experiments remotely (Baltà-Salvador et al., 2021). As active learning may occur online and offline, instructors need to provide the flexibility for students to learn in physical, online, and hybrid settings (Huang et al., 2020).

Working professionals who are pursuing part-time studies with the university may face additional academic burnout and be left with little time for studies during the pandemic as they not only have work, family, and other social commitments, but they could also face financial hardships caused by pay reduction or fear of losing their jobs attributable by the poor financial performance of their employers. As much learning took place online during the pandemic, working professionals need to juggle between attending virtual meetings during office hours and may also need to participate in online classes after work or during weekends. Students need to develop a high level of discipline for self-directed learning (Khodaei et al., 2022). To encourage students to adopt a self-directed learning attitude with a high level of commitment to online learning, it is paramount for instructors to develop an online assessment that strikes a good balance that meets students’ learning outcomes while maintaining their commitment to their studies. In addition, instructors should consider these students’ commitments when designing the course syllabus and ascertain the extent of online learning and assessments. The flexibility of delivering online lectures with a recorded function that allows students who missed the class to follow up, availability of teaching materials and resources on various digital devices (desktop, laptop, mobile phone, tablet, etc.) and not restricted to fixed time slots, and narrated PowerPoint slides that permit self-directed learning will improve students’ satisfaction (Basilaia & Kavadze, 2020). As instructors have little control over students’ commitment and engagement in their online learning environment, they may provide online activities such as forum discussion/posting to promote student engagement outside synchronous online classes (Thathsara et al., 2020). Instructors may perform periodic tracking to monitor students’ participation and engagement in online activities.

Chickering and Gamson (1987) noted that educators should consider seven principles of good teaching and learning practices in higher education, which include ongoing interaction between educators and students, collaboration among students, promoting active learning, providing prompt feedback, emphasise time management, communicating expectations, and mutual respect of diverse ways of learning. These principles have been widely used to evaluate online assessment effectiveness (Tartavulea et al., 2020). Similarly, for online assessments, Morgan and O'Reilly (2005) suggested ten critical qualities, including a clear, rational and consistent pedagogical approach; clear values, aims, criteria and standards; authentic and holistic activities; awareness of students' learning contexts; timely feedback; a highly structured, reasonable amount of assessment; assessment reliability and validity; assurance of students' work, continuous improvement; and quality enhancement.

Developing credible online assessments that meet the course's learning objectives may be one of the most challenging areas the university and educators must address during the pandemic (Halaweh, 2021; Huang et al., 2020). It requires a detailed review of the existing educational assessment policy, which may require changes, and support from the universities' educators, students, and senior management is crucial (Hayashi et al., 2020; Yang et al., 2022). A primary concern from the instructors (interviewees) in this study relates to the issue of cheating. A three-tiered approach offered by Olt (2002) may be considered: (1) highlight to students the moral and ethical severity of cheating (virtues approach), (2) eliminate or minimise opportunities for cheating (prevention approach), and (3) punish those who cheat (police approach). Under the virtues approach, instructors must emphasise that cheating is morally and ethically unacceptable, even though there are opportunities to do so. Cheating tarnishes the university as a whole, reflects poorly on the instructor and the students, and may harm future employment (Larkin et al., 2017). Instructors and universities may need to redefine academic integrity for online assessments and amend university policy accordingly (Reedy et al., 2021). For the prevention approach, Kayed (2013) proposed using multiple assessment techniques, not reusing assignments, and redesigning online take-home tests where students' application and demonstration of critical thinking skills are more essential than reproducing textbook knowledge. Other online formative assessments, such as ungraded randomised online quizzes with multiple attempts, are permitted, and team projects and virtual presentations may also be considered (Mulrooney & Kelly, 2020). Instructors and invigilators should be provided extensive training on cheating techniques students employ for online assessment (Alvarez et al., 2009). Finally, instructors and universities should punish students who are caught cheating to signal the consequences of cheating to other students, especially those who may be tempted to cheat for online or in-class assessments.

As hybrid learning and online assessment may be relatively new to many students, especially those who have never taken any courses under this mode of delivery, tutors need to provide sufficient scaffolding to improve students' engagement and collaborative learning for online assessments (Chao et al., 2006). When designing

online courses, instructors may consider employing Salmon's (2000) five-stage framework in designing online assessments (access and motivation, online socialisation, information exchange, knowledge construction, and review) that motivate students to increase their engagement level via interaction with their peers and tutors (Alebaikan & Troudi, 2010). In addition, students may be facing academic burnout and anxiety during the pandemic, so instructors need to exercise empathy (Crossman, 2007), be sensitive to students' emotions (Ryan & Henderson, 2018; Saplacan et al., 2018), and motivation (Rowe et al., 2017) when providing feedback. Further support may also be provided via email or social media such as WhatsApp, WeChat, or Telegram, and from teaching assistants.

While several instructors acknowledged the benefits of providing online feedback, they need to ensure the feedback is provided promptly, and the quality is on par, if not better, than the face-to-face discussion so that it saves their time and focus on fulfilling other responsibilities. To promote collaborative learning and peer assessment, tutors may encourage students to log in to the LMS at designated time slots, such as weekday evenings or weekends, to interact synchronously on any problems they face or to hold some discussions on specific essential topics (Gilbert, et al., 2007; Moore et al., 2016). Prior studies reported that synchronous interaction enhanced critical thinking skills and promoted collaborative learning effectively (Giesbers et al., 2014; Oztok et al., 2013). During face-to-face teaching, tutors may check with the students to determine whether they are coping well with their studies, particularly online learning and assessment.

Prior studies reported that students who are only concerned with marks may not show a strong interest in reading the feedback (Carless, 2006; Pitt & Norton, 2016). To encourage students to read the feedback and reflect on their learning, instructors may use software that requires students to open the feedback files before releasing the marks (Hepplestone et al., 2011; Parkin et al., 2012). Despite some concerns over audio feedback, instructors may still consider using it or in conjunction with video feedback to improve student-instructor interactions (Thompson & Lee, 2012; West & Turner, 2016).

Due to the restrictions imposed by the government, where students may not always attend physical classes during the pandemic, instructors may be unable to conduct face-to-face feedback. Thus, audio-recorded feedback may be an expedient substitute for face-to-face feedback (Lunt & Curran, 2010; Mahoney et al., 2019; Ryan & Henderson, 2018). However, as most students have returned to campus since April 2022, instructors should remain committed to integrating the online assessment with face-to-face teaching. Learning on two separate platforms with little or no integration could make students feel disengaged. As adjunct instructors do not have the authority to design the course and online activities, it is essential for the course leader and the full-time faculty to develop the course to ensure that it will link online assessment with classroom teaching. In addition, the course leaders should communicate more with the adjunct instructors by setting their expectations from the outset. They should be open to students' feedback gathered

by the adjunct instructors to improve students' engagement and motivation in learning.

To address the reported challenges of using peer assessment, educational scholars proposed several recommendations for more effective peer assessment implementation and execution, which include designing peer assessment criteria that address the learning process and outcome, such as communication skills and respect for others (Boud et al., 1999), provide multiple, significant and specific criteria on the assessment instrument or scale (Dancer & Kamvounias, 2005; Willey & Gardner 2010), be familiar with the process of peer assessment before its use (Ballantyne et al., 2002; Sluijsmans et al., 2001), provide exemplars of excellent or poor works for students (Hanarahan & Issacs 2001), and offer numerous opportunities for peer assessment and feedback (Nicol et al., 2014; Sadler 2010).

### University support

Faculty members are the main teaching pedagogy implementation decision-makers (Graham & Robinson, 2007). Universities seeking to revise the instructional delivery of the courses with little support and commitment from faculty members and staff are more likely to fail (Christo-Baker, 2004). Recent studies reported that faculty members may resist hybrid or online delivery due to time constraints on converting the content and assessment to digital mode and also face difficulties in adjusting to the use of more sophisticated online technologies (Ali, 2020; Blankenberger & Williams, 2020). Thus, the university may provide incentives to instructors such as financial rewards, funding for software purchases, additional off-in-lieu for online proctoring, promotion and lengthier tenure, and technical support (Garrison & Kanuka, 2004; Shea, 2007). This is particularly relevant in this study as many of the instructors are part-time faculty holding full-time jobs elsewhere. They have to balance their full-time jobs and increased interaction with students under the online teaching and learning model (Graham et al., 2003).

The interaction with the full-time and adjunct instructors revealed that many of them are novice of online teaching and possess little experience in using online technology for online assessment and feedback. Thus, the university should continue to invest in faculty training and professional development to equip tutors with the skills and knowledge to support student learning, as satisfaction is crucial in providing a successful quality hybrid learning MBA and undergraduate programmes (Kenney & Newcombe, 2011; Kim & Bonk, 2006). The university may engage hybrid learning course developers and online assessment specialists to train all tutors in e-pedagogy, deliver online lectures using various online platforms such as Zoom, Microsoft Teams, and WebEx, and develop and utilise interactive online materials, assessments, and feedback. The university may extend existing software licenses to adjunct instructors or provide funding support for new purchases of technological tools that enhance their online teaching and assessment. As the university would like to enrich student's learning experience with this new delivery method, which is in line with Graham's (2006) transformative learning, it is of paramount

importance that it should continuously review the existing teaching pedagogy and make significant improvements to engage students actively in the construction of knowledge in both the online and face-to-face learning.

To minimise student cheating, online proctoring may be one possible alternative. Operationally, the university needs to take into account logistic, infrastructure, and financial constraints (Lassoued et al., 2020; Rahim, 2020), faculty's digital competencies and readiness (Bao, 2020; Rapanta et al., 2020), systems support and staff availability (Elzainy et al., 2020; Joshi et al., 2020).

As the qualitative findings suggest that many instructors were unaware of audio feedback, the university may encourage instructors to employ audio feedback in conjunction with face-to-face and written feedback. However, instructors may be concerned about using technology for audio feedback (Cann, 2014) and finding a quiet environment to record their feedback (Henderson & Philips, 2015). Alternatively, using various meeting platforms such as Zoom, MS Teams, and Google Meet may be viable for instructors to provide feedback and allow students to clarify any doubts. This alternative may not be effective for experienced or full-time instructors with large classes as it is time-consuming. Thus, the university may lower the instructor-to-student ratios by hiring more adjunct instructors or teaching assistants to support full-time instructors, notwithstanding the budgetary concerns it may face (Crook & Bligh, 2016).

### Conclusion

This study is believed to be the first in Singapore to examine the effectiveness of formative assessment, feedback, and peer assessment to promote student learning during the pandemic from the instructors' perspective. While instructors acknowledged the benefits of online assessment, feedback, and peer assessment, they recognised some challenges faced in administering them. They also highlighted some key considerations when using technological tools to provide formative assessment and feedback. These findings have more far-reaching implications for instructors and the university in the post-pandemic era.

The findings and implications gathered from the study presented some limitations. Essentially, the interviewees selected were based on the premise that they possessed the necessary knowledge and relevant experience to discuss the research questions. However, due to the small sample size, the views expressed by the interviewees cannot be generalised to all instructors within and outside the university in Singapore and elsewhere. For instance, due to confidentiality reasons, several adjunct faculty members declined to comment on the extent of funding and technical support for using technological tools in assessment and feedback. Furthermore, some interviewees could not provide insights on the peer assessment as they acknowledged that they did not use peer assessment for their students or felt that it was too lengthy and detailed to be elaborated on in a single interview. A few interviewees cited disruptions from work or a less conducive environment to engage in 'shorter than expected' interviews. Thus, the views expressed by the

instructors may be incomplete or lack the depth required to address the research questions identified in the study.

Another limitation of this study is that the questions did not seek to cover all aspects of assessment and feedback. For instance, the study did not address assessment and feedback provided by employers during students' internships. In addition, due to the course requirements, peer assessment only applies to team projects but not formative individual evaluations. Finally, as the pandemic was far from over after the interviews, there was no follow-up with the interviewees on further development concerning online assessment and feedback post-pandemic. This area may be of interest to researchers to consider in the future.

While this study focuses on the instructors' perceptions of the value of formative assessment, feedback, and peer assessment to students' learning during the pandemic, other relevant areas have yet to be fully explored in Singapore. Firstly, longitudinal studies may be conducted to evaluate to what extent the perceived benefits of online assessments and feedback on students' learning and academic performance during and post-pandemic (Slack & Priestley, 2022). Secondly, the study may also be extended to other countries where factors such as government support, cultural dimensions such as those propounded by Hofstede (1994, 2001) and Hampden-Turner and Trompennars (2000), students' resilience (Ahmed-Shafi et al., 2023; Millican et al., 2023), hybrid learning, and changes in assessment structure and feedback mechanisms may have an impact on students' performance during and post-pandemic. Thirdly, focused group interviews may be conducted with assessment scholars, curriculum specialists, and department heads from various divisions and schools to gain deeper insights into how learning and teaching practices may impact assessment changes in the HE sector.

The pandemic is unprecedented in its scale and has provided opportunities for HEI to relook into their existing learning and teaching, assessment, and feedback practices. Given the ambiguity in the epidemiological and economic outlook, predicting when all conventional educational activities can resume is difficult. Any changes in educational policies and assessment practices must be supported by the government, organisational (professional and private), faculty, educational designer, and educational technologist. Future developments such as the 5G network and artificial intelligence-powered technology, including ChatGPT, Bard, Bing, Ernie, HIX.AI, and LaMDA may enable universities to implement more sophisticated online learning and assessment tools that enhance students learning (Mills et al., 2023; Rudolph et al., 2023; That'sara et al., 2020). Such technologies may play a pivotal role in online assessment and feedback in a student-centric learning environment in the HE sector in Singapore (Kwan, 2022). They may be the new standard in the post-pandemic era for universities.

## References

Adachi, C., Tai, J. H-M., & Dawson, P. (2018). Academics' perceptions of the benefits and challenges of self and peer assessment in higher education. *Assessment & Evaluation in*

*Higher Education*, 43(2), 294-306. <https://doi.org/10.1080/02602938.2017.1339775>

Ahmed-Shafi, A., Middleton, T., Millican, R., Templeton, S., Hill, J., & Jones, C. (2023). Learning in a disrupted environment: Exploring higher education student resilience using the Dynamic Interactive Model of Resilience. *Journal of Applied Learning and Teaching*, 6(2), 172-186. <https://doi.org/10.37074/jalt.2023.6.2.18>

Alebaikan, R., & Troudi, S. (2010). Blended learning in Saudi universities: Challenges and perspectives. *ALT-J, Research in Learning Technology*, 18(1), 49-59. <https://doi.org/10.1080/09687761003657614>

Ali, W. (2020). Online and remote learning in higher education institutes: A necessity in light of COVID-19 pandemic. *Higher Education Studies*, 10(3), 16-25. <http://dx.doi.org/10.5539/hes.v10n3p16>

Almeida, F., & Monteiro, J. (2021). The challenges of assessing and evaluating the students at distance. *Journal of Online Higher Education*, 5(1), 3-10.

Alvarez, I., Espasa, A., & Guasch, T. (2012). The value of feedback in improving collaborative writing assignments in an online learning environment. *Studies in Higher Education*, 37(4), 387-400. <https://doi.org/10.1080/03075079.2010.510182>

Alvarez, I., Guasch, T., & Espasa, A. (2009). University teacher roles and competencies in online learning environments: a theoretical analysis of teaching and learning practices. *European Journal of Teacher Education*, 32(3), 321-336. <http://dx.doi.org/10.1080/02619760802624104>

Andrade, H., Ding, Y., & Wang, X. (2008). Putting rubrics to the test: The effect of a model, criteria generation, and rubric-referenced self-assessment on elementary school students' writing. *Educational Measurement and Issues*, 27(2), 3-13. <http://dx.doi.org/10.1111/j.1745-3992.2008.00118.x>

Andrade, H., & Valtcheva, A. (2009). Promoting learning and achievement through self-assessment. *Theory into Practice*, 48(1), 12-19. <https://doi.org/10.1080/00405840802577544>

Ashenafi, M. (2017). Peer-assessment in higher education – twenty-first century practices, challenges and the way forward. *Assessment & Evaluation in Higher Education*, 42(2), 226-251. <https://doi.org/10.1080/02602938.2015.1100711>

Bajjnath, N., & Singh, D. (2019). Examination cheating: Risks to the quality and integrity of higher education. *South African Journal of Science*, 115(11/12), 1-6. <http://dx.doi.org/10.17159/sajs.2019/6281>

Baleni, Z. (2015). Online formative assessment in higher education: Its pros and cons. *The Electronic Journal of e-Learning*, 13(4), 228-236.

Ballantyne, R., Hughes, K., & Mylonas, A. (2002). Developing procedures for implementing peer assessment in large classes using an action research process. *Assessment &*

- Evaluation in Higher Education*, 27(5), 427-441. <https://doi.org/10.1080/0260293022000009302>
- Baltà-Salvador, R., Olmedo-Torre, N., Peña, M., & Renta-Davids, A.-I. (2021). Academic and emotional effects of online learning during the COVID-19 pandemic on engineering students. *Education and Information Technologies*, 26, 7407-7434. <https://doi.org/10.1007/s10639-021-10593-1>
- Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking university. *Human Behavior and Emerging Technologies*, 2(2), 113-115. <https://doi.org/10.1002/hbe2.191>
- Barak, M., & Dori, Y. J. (2009). Enhancing higher order thinking skills among in-service science teachers via embedded assessment. *Journal of Science Teacher Education*, 20(5), 459-474. <http://dx.doi.org/10.1007/s10972-009-9141-z>
- Barkley, A. (2002). An analysis of online examinations in college courses. *Journal of Agricultural and Applied Economics*, 34(3), 445-458.
- Basilaia, G., & Kvavadze, D. (2020). Transition to online education in schools during a SARS-CoV-2 Coronavirus (COVID-19) pandemic in Georgia. *Pedagogical Research*, 5(4), 1-9. <https://doi.org/10.29333/pr/7937>
- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at university*. Open University Press.
- Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, 5(1), 7-74. <https://doi.org/10.1080/0969595980050102>
- Black, P., & Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment. *Phi Delta Kappan*, 92(1), 81-90. <http://dx.doi.org/10.1177/003172171009200119>
- Blair, A., & McGinty, S. (2012). Feedback-dialogues: Exploring the student perspective. *Assessment & Evaluation in Higher Education*, 38(4), 466-476. <https://doi.org/10.1080/02602938.2011.649244>
- Blankenberger, B., & Williams, A. M. (2020). COVID and the impact on higher education: The essential role of integrity and accountability. *Administrative Theory & Praxis*, 42(3), 404-423. <https://doi.org/10.1080/10841806.2020.1771907>
- Bloom, T., Rich, W. D., Olson, S. M., & Adams, M. L. (2018). Perceptions and performance using computer-based testing: One institution's experience. *Currents in Pharmacy Teaching and Learning*, 10(2), 235-242. <https://doi.org/10.1016/j.cptl.2017.10.015>
- Boitshwarelo, B., Reedy, A. K., & Billany, T. (2017). Envisioning the use of online tests in assessing twenty-first century learning: A literature review. *Research and Practice in Technology Enhanced Learning*, 12(1), 1-16. <https://doi.org/10.1186/s41039-017-0055-7>
- Bong, J., & Park, M. S. (2020). Peer assessment of contributions and learning processes in group projects: An analysis of information technology undergraduate students' performance. *Assessment & Evaluation in Higher Education*, 45(8), 1155-1168. <https://doi.org/10.1080/02602938.2020.1727413>
- Boud, D., Cohen, R., & Sampson, J. (1999). Peer learning and assessment. *Assessment & Evaluation in Higher Education*, 24(4), 413-426. <http://dx.doi.org/10.1080/0260293990240405>
- Boud, D., Lawson, R., & Thompson, D. G. (2013). Does student engagement in self-assessment calibrate their judgement over time? *Assessment & Evaluation in Higher Education*, 38(8), 941-956. <https://doi.org/10.1080/02602938.2013.769198>
- Boud, D., & Molly, E. (2013). Rethinking models of feedback for learning: The challenge of design. *Assessment & Evaluation in Higher Education*, 38(6), 698-712. <https://doi.org/10.1080/02602938.2012.691462>
- Boud, D., & Soler, R. (2016). Sustainable assessment revisited. *Assessment & Evaluation in Higher Education*, 41(3), 400-413. <http://dx.doi.org/10.1080/02602938.2015.1018133>
- Brady, A.-M. (2005). Assessment of learning with multiple-choice questions. *Nurse Education in Practice*, 5, 238-242. <https://doi.org/10.1016/j.nepr.2004.12.005>
- Brearley, F., & Cullen, W. R. (2012). Providing students with formative audio feedback. *Bioscience Education*, 20(1), 22-36. <https://doi.org/10.11120/beej.2012.20000022>
- Cann, A. (2014). Engaging students with audio feedback. *Bioscience Education*, 22(1), 31-41. <https://doi.org/10.11120/beej.2014.00027>
- Carless, D. (2006). Differing perceptions in the feedback process. *Studies in Higher Education*, 31(2), 219-233. <https://doi.org/10.1080/03075070600572132>
- Carnell, B. (2016). Aiming for autonomy: Formative peer assessment in a final-year undergraduate course. *Assessment & Evaluation in Higher Education*, 41(8), 1269-1283. <https://doi.org/10.1080/02602938.2015.1077196>
- Carr, E., & Worth, A. (2001). The use of the telephone interview for research. *Nursing Times Research*, 6, 511-524. <http://dx.doi.org/10.1177/136140960100600107>
- Carrillo, C., & Flores, M. A. (2020). COVID-19 and teacher education: A literature review of online teaching and learning practices. *European Journal of Teacher Education*, 43(4), 466-487. <https://doi.org/10.1080/02619768.2020.1821184>
- Carruthers, C., McCarron, B., Bolan, P., Devine, A., McMahon-Beattie, U., & Burns, A. (2015). 'I like the sound of that' – an evaluation of providing audio feedback via the virtual learning environment for summative assessment. *Assessment & Evaluation in Higher Education*, 40(3), 352-370. <https://doi.org/10.1080/02602938.2014.917145>

- Chace, W. (2012). Cover story: A question of honor: Cheating on campus undermines the reputation of our universities and the value of their degrees. Now is the time for students themselves to stop it. *Am Scholar*, 81(2), 20-32. <https://www.jstor.org/stable/i40070051>
- Chao, T., Saj, T., & Tessier, F. (2006, 27 July). Establishing a quality review for online courses. *Educause Review*, 32-39.
- Chen, C. (2010). The implementation and evaluation of a mobile self- and peer-assessment system. *Computers & Education*, 55(1), 229-236. <https://doi.org/10.1016/j.compedu.2010.01.008>
- Chickering, A., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 3-7.
- Chien, S.-P., Wu, H.-K., & Hsu, Y.-S. (2014). An investigation of teachers' beliefs and their use of technology-based assessments. *Computers in Human Behavior*, 31, 198-210. <https://doi.org/10.1016/j.chb.2013.10.037>
- Chong, S. (2019). College students' perception of e-feedback: A grounded theory perspective. *Assessment & Evaluation in Higher Education*, 44(7), 1090-1105. <https://doi.org/10.1080/02602938.2019.1572067>
- Christo-Baker, E. (2004). *College and university faculty attitude, incivilities and barriers towards distance education*. [Bowling Green State University: Unpublished thesis Ph.D].
- Cirit, N. C. (2015). Assessing ELT pre-service teachers via Web 2.0 tools: Perceptions toward traditional, online and alternative assessment. *Turkish Online Journal of Educational Technology-TOJET*, 14(3), 9-19.
- Crawford, J., Butler-Henderson, K., Rudolph, J., Malkawi, B., Glowatz, M., Burton, R., & Lam, S. (2020). COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *Journal of Applied Learning & Teaching*, 3(1), 9-28. <https://doi.org/10.37074/jalt.2020.3.1.7>
- Crook, C., & Bligh, B. (2016). Technology and the displacing of learning in educational futures. *Learning, Culture and Social Interaction*, 11, 162-175. <http://dx.doi.org/10.1016/j.lcsi.2016.09.001>
- Crossman, J. (2007). The role of relationships and emotions in student perceptions of learning and assessment. *Higher Education Research & Development*, 26(3), 313-327. <https://doi.org/10.1080/07294360701494328>
- Dancer, D., & Kamvounias, P. (2005). Student involvement in assessment: A project designed to assess class participation fairly and reliably. *Assessment & Evaluation in Higher Education*, 30(4), 445-454. <http://dx.doi.org/10.1080/02602930500099235>
- Daniel, J. (2020). Education and the Covid-19 pandemic. *Prospects*, 1-6. <https://doi.org/10.1007/s11125-020-09464-3>
- Darling-Hammond, L., & Hyler, M. E. (2020). Preparing educators for the time of COVID ... and beyond. *European Journal of Teacher Education*, 43(4), 457-465. <https://doi.org/10.1080/02619768.2020.1816961>
- Dawson, P., Henderson, M., Mahoney, P., Phillips, M., Ryan, T., Boud, D., & Molloy, E. (2018). What makes for effective feedback: Staff and student perspectives. *Assessment & Evaluation in Higher Education*, 44(1), 25-36. <https://doi.org/10.1080/02602938.2018.1467877>
- Deeley, S. (2018). Using technology to facilitate effective assessment for learning and feedback in higher education. *Assessment & Evaluation in Higher Education*, 43(5), 439-448. <https://doi.org/10.1080/02602938.2017.1356906>
- Denton, D. W. (2014). Using screen capture feedback to improve academic performance. *TechTrends*, 58(6), 51-56. <https://doi.org/10.1007/s11528-014-0803-0>
- DePascale, C., & Gong, B. (2020). Comparability of individual students' scores on the "same test". In E. H. A. I. Berman (Ed.), *Comparability of large-scale educational assessments: Issues and recommendations* (pp. 25-48). Washington, DC: National Academy of Education.
- Dixon, D. D., & Worrell, F. C. (2016). Formative and summative assessment in the classroom. *Theory Into Practice*, 55(2), 153-159. <https://doi.org/10.1080/00405841.2016.1148989>
- Ellegaard, M., Damsgaard, L., Bruun, J., & Johannsen, B. F. (2018). Patterns in the form of formative feedback and student response. *Assessment & Evaluation in Higher Education*, 43(5), 727-744. <https://doi.org/10.1080/02602938.2017.1403564>
- Elzainy, A., Sadik, A. E., & Abdulmonem, W. A. (2020). Experience of e-learning and online assessment during the COVID-19 pandemic at the College of Medicine, Q assim University. *Journal of Taibah University Medical Sciences*, 15(6), 456-462. <https://doi.org/10.1016/j.jtumed.2020.09.005>
- Evan, C. (2013). Making sense of assessment feedback in higher education. *Review of Educational Research*, 83(1), 70-120. <https://doi.org/10.3102/0034654312474350>
- Falchikov, N., & Boud, D. (2007). *Rethinking assessment in higher education* (1st ed.). Routledge.
- Falchikov, N., & Goldfinch, J. (2000). Student peer assessment in higher education: A meta-analysis comparing peer and teacher marks. *Review of Educational Research*, 70(3), 287-322. <https://doi.org/10.3102/00346543070003287>
- Foung, D., & Chen, J. (2019). A learning analytics approach to the evaluation of an online learning package in a Hong Kong University. *Electronic Journal of e-Learning*, 17(1), 11-24.
- Fry, H., Ketteridge, S., & Marshall, S. (2009). *A handbook for teaching and learning* (3rd ed.). Routledge.
- Fukuda, S., Lander, B. W., & Pope, C. J. (2020). Formative assessment for learning how to learn: Exploring university



- student learning experiences. *RELC Journal*, 53(1), 118-133. <http://dx.doi.org/10.1177/0033688220925927>
- Garrison, D., & Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *Internet and Higher Education*, 7, 95-105. <https://doi.org/10.1016/j.iheduc.2004.02.001>
- Gaynor, J. (2020). Peer review in the classroom: Student perceptions, peer feedback quality and the role of assessment. *Assessment & Evaluation in Higher Education*, 45(5), 758-775. <https://doi.org/10.1080/02602938.2019.1697424>
- Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education*, 1, 3-31. <http://dx.doi.org/10.1007/978-3-8348-9837-1>
- Giesbers, B., Rienties, B., Tempelaar, D., & Gijssels, W. (2014). A dynamic analysis of the interplay between asynchronous and synchronous communication in online learning: The impact of motivation. *Journal of Computer Assisted Learning*, 30(1), 30-50. <https://doi.org/10.1111/jcal.12020>
- Gilbert, J., Morton, S., & Rowley, J. (2007). e-Learning: The student experience. *British Journal of Educational Technology*, 38(4), 560-573. <https://doi.org/10.1111/j.1467-8535.2007.00723.x>
- Graham, C. (2006). Blended learning systems: Definitions, current trends and future directions. In C. J. Bonk & G. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 3-21). Pfeiffer.
- Graham, C., Allen, S., & Ure, D. (2003). *Blended learning environments: A review of the research literature*. Provo, UT: Unpublished manuscript.
- Graham, C., & Robinson, R. (2007). Realizing the transformational potential of blended learning: Comparing cases of transforming blends and enhancing blends in higher education. In A. Picciano (Ed.), *Blended learning: Research perspectives* (pp. 83-110). Needham: Sloan Consortium.
- Gurbanov, E. (2016). The challenge of grading in self and peer-assessment (undergraduate students' and university teachers' perspectives). *Journal of Education in Black Sea Region*, 1(2), 97-107. <http://dx.doi.org/10.31578/jrebs.v1i2.21>
- Halaweh, M. (2021). Are universities using the right assessment tools during the pandemic and crisis time? *Higher Learning Research Communications*, 11, 1-9. <http://dx.doi.org/10.18870/hlrc.v11i0.1184>
- Hampden-Turner, C., & Trompenaars, F. (2000). *Building cross-cultural competence: How to create wealth from conflicting values*. Yale University Press.
- Hanrahan, S., & Issacs, G. (2001). Assessing self- and peer-assessment: The students' views. *Higher Education Research & Development*, 20(1), 53-70. <https://doi.org/10.1080/07294360123776>
- Harris, C., & Tan, H. (2020). You can teach old dogs new clicks - the importance of teacher use of online content in a blended higher education course in Singapore. *Journal of Applied Learning & Teaching*, 3(2), 59-70. <https://doi.org/10.37074/jalt.2020.3.2.9>
- Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, 77(1), 81-112. <https://doi.org/10.3102/003465430298487>
- Hayashi, R., Garcia, M., & Maddawin, A. (2020). Online learning in Sri Lanka's higher education institutions during the COVID-19 pandemic. *ADB Briefs*, 1-12.
- Henderson, M., & Phillips, M. (2015). Video-based feedback on student assessment: Scarily personal. *Australasian Journal of Educational Technology*, 31(1), 51-66. <https://doi.org/10.14742/ajet.1878>
- Henderson, M., Ryan, T., & Philips, M. (2019). The challenges of feedback in higher education. *Assessment & Evaluation in Higher Education*, 44(8), 1237-125. <https://doi.org/10.1080/02602938.2019.1599815>
- Hepplestone, S., Holden, G., Irwin, B., Parkin, H. J. , & Thorpe, L. (2011). Using technology to encourage student engagement with feedback: A literature review. *Research in Learning Technology Aquatic Insects*, 19(2), 117-127. <https://doi.org/10.3402/rlt.v19i2.10347>
- Hiller, H., & DiLuzio, L. (2004). The interviewee and the research interview: Analysing a neglected dimension in research. *Canadian Review of Sociology and Anthropology*, 41(1), 1-26. <https://psycnet.apa.org/doi/10.1111/j.1755-618X.2004.tb02167.x>
- Hofstede, G. (1994). The business of international business is culture. *International Business Review*, 3(1), 1-14. [https://doi.org/10.1016/0969-5931\(94\)90011-6](https://doi.org/10.1016/0969-5931(94)90011-6)
- Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations* (2nd ed.). SAGE Publications.
- Hoo, H.-T., Tan, K., & Deneen, C. (2020). Negotiating self- and peer-feedback with the use of reflective journals: An analysis of undergraduates' engagement with feedback. *Assessment & Evaluation in Higher Education*, 45(3), 431-446. <https://doi.org/10.1080/02602938.2019.1665166>
- Huang, R., Liu, D. J., Zhan, T., Amelina, N., Yang, J. F., Zhang, R. X., & Cheng, W. (2020). *Guidance on active learning at home during educational disruption: Promoting student's self-regulation skills during COVID-19 outbreak*. Beijing: Smart Learning Institute of Beijing Normal University.
- Huisman, B., Saab, N., van Driel, J., & van den Broek, P. (2018). Peer feedback on academic writing: Undergraduate students' peer feedback role, peer feedback perceptions and essay performance. *Assessment & Evaluation in Higher Education*, 43(6), 955-968. <https://doi.org/10.1080/02602938.2018.1424318>

- Ion, G., Marti, A. S., & Morell, I. A. (2018). Giving or receiving feedback: Which is more beneficial to students' learning? *Assessment & Evaluation in Higher Education*, 44(1), 124-138. <https://doi.org/10.1080/02602938.2018.1484881>
- Jamil, M., Tariq, R. H., & Shami, P. A. (2012). Computer-based vs paper-based examinations: Perceptions of university teachers. *Turkish Online Journal of Educational Technology-TOJET*, 11(4), 371-381.
- Jonsson, A. (2012). Facilitating productive use of feedback in higher education. *Active Learning in Higher Education*, 14(1), 63-76. <https://doi.org/10.1177/1469787412467125>
- Joshi, A., Vinay, M., & Bhaskar, P. (2020). Impact of coronavirus pandemic on the Indian education sector: Perspectives of teachers on online teaching and assessments. *Interactive Technology and Smart Education*, 18(2), 205-226. <http://dx.doi.org/10.1108/ITSE-06-2020-0087>
- Kaufman, J., & Schunn, C. D. (2011). Students' perceptions about peer assessment for writing: Their origin and impact on revision work. *Instructional Science*, 39, 387-406. <https://doi.org/10.1007/s11251-010-9133-6>
- Kayed, R. (2013). Integrating e-learning into higher education. *Palestinian Journal for Open Learning & e-Learning*, 4(7), 1-28. <http://dx.doi.org/10.12816/0016343>
- Kearney, S. (2013). Improving engagement: The use of 'authentic self-and peer-assessment for learning' to enhance the student learning experience. *Assessment & Evaluation in Higher Education*, 38(7), 875-891. <https://doi.org/10.1080/02602938.2012.751963>
- Keng, L., Boyer, M., & Marion, S. (2020). Into the unknown: Assessments in spring 2021. *Educational Measurement: Issues and Practice*, 39(3), 53-59. <https://psycnet.apa.org/doi/10.1111/emip.12362>
- Kenney, J., & Newcombe, E. (2011). Adopting a blended learning approach: Challenges encountered and lessons learned in an action research study. *Journal of Asynchronous Learning Networks*, 15(1), 45-57. <http://dx.doi.org/10.24059/olj.v15i1.182>
- Keppell, M., & Carless, D. (2006). Learning-oriented assessment: A technology-based case study. *Assessment in Education*, 13(2), 179-191. <http://dx.doi.org/10.1080/09695940600703944>
- Khodaei, S., Hasanvand, S., Gholami, M., Mokhayeri, Y., & Amini, M. (2022). The effect of the online flipped classroom on self-directed learning readiness and metacognitive awareness in nursing students during the COVID-19 pandemic. *BMC Nursing*, 21(22), 1-10. <https://doi.org/10.1186/s12912-022-00804-6>
- Kim, K., & Bonk, C. J. (2006). The future of online teaching and learning in higher education: The survey says. *Educause Quarterly*, 29(4), 22-30.
- King, C., Guyette, R. W. Jr., & Piotrowski, C. (2009). Online exams and cheating: An empirical analysis of business students' views. *The Journal of Educators Online*, 6(1), 1-11. <http://dx.doi.org/10.9743/JEO.2009.1.5>
- Koh, J., & Kan, R. Y. P. (2020). Perceptions of learning management system quality, satisfaction, and usage: Differences among students of the arts. *Australasian Journal of Educational Technology*, 36(3), 26-40. <http://dx.doi.org/10.14742/ajet.5187>
- Kwan, J. (2022). Academic burnout, resilience level, and campus connectedness among undergraduate students during the COVID-19 pandemic: Evidence from Singapore. *Journal of Applied Learning & Teaching*, 5(1), 52-63. <https://doi.org/10.37074/jalt.2022.5.s1.7>
- Larkin, C., Szabo, S., & Mintu-Wimsatt, A. (2017). Academic integrity of graduate online students in a curriculum and instruction program. *International Research in Higher Education*, 2(4), 1-8. <http://dx.doi.org/10.5430/irhe.v2n4p1>
- Lassoued, Z., Alhendawi, M., & Bashitialshaer, R. (2020). An exploratory study of the obstacles for achieving quality in distance learning during the COVID-19 pandemic. *Education Science*, 10(9), 1-13. <https://doi.org/10.3390/educsci10090232>
- Lee, V., Lam, P. L. C., Lo, J. T. S., Lee, J. L. F., & Li, J. T. S. (2022). Rethinking online assessment from university students' perspective in COVID-19 pandemic. *Cogent Education*, 9(1), 1-13. <https://doi.org/10.1080/2331186X.2022.2082079>
- Lei, S., & Gupta, R. K. (2010). College distance education courses: Evaluating benefits and costs from institutional, faculty and students' perspectives. *Education*, 130(4), 3-13. [https://eric.ed.gov/?redir=http%3a%2f%2fwww.projectinnovation.biz%2feducation\\_2006.html](https://eric.ed.gov/?redir=http%3a%2f%2fwww.projectinnovation.biz%2feducation_2006.html)
- Li, H., Xiong, Y., Hunter, C. V., Guo, X., & Tywoniw, R. (2020). Does peer assessment promote student learning? *Assessment & Evaluation in Higher Education*, 45(2), 193-211. <https://doi.org/10.1080/02602938.2019.1620679>
- Libman, Z. (2010). Alternative assessment in higher education: An experience in descriptive statistics. *Studies in Educational Evaluation*, 36(1-2), 62-68. <https://doi.org/10.1016/j.stueduc.2010.01.002>
- Liu, J., Guo, X., Guo, R., Fram, P., Ling, Y., Zhang, H., & Wang, J. (2019). Students' learning outcomes and peer rating accuracy in compulsory and voluntary online peer assessment. *Assessment & Evaluation in Higher Education*, 44(6), 835-847. <https://doi.org/10.1080/02602938.2018.1542659>
- Liu, N.-F., & Carless, D. (2006). Peer feedback: The learning element of peer assessment. *Teaching in Higher Education*, 11(3), 279-290. <https://doi.org/10.1080/13562510600680582>
- Lladó, A., Soley, L., Sansbelló, R., Pujolras, G., Planella, J., Martínez, J., & Moreno, L. (2014). Student perceptions of peer assessment: An interdisciplinary study. *Assessment & Evaluation in Higher Education*, 39(5), 592-610. <https://doi.org/10.1080/02602938.2014.948881>

- Lunt, T., & Curran, J. (2010). "Are you listening please?" The advantages of electronic audio feedback compared to written feedback. *Assessment & Evaluation in Higher Education*, 35(7), 759-769. <https://doi.org/10.1080/02602930902977772>
- Lynam, S., & Cachia, M. (2018). Students' perceptions of the role of assessments at higher education. *Assessment & Evaluation in Higher Education*, 43, 1-12. <https://doi.org/10.1080/02602938.2017.1329928>
- Mahoney, P., MacFarlane, S., & Ajjawi, R. (2019). A qualitative synthesis of video feedback in higher education. *Teaching in Higher Education*, 24(8), 1-23. <https://doi.org/10.1080/13562517.2018.1471457>
- Man, D., Xu, Y., & O'Toole, J. M. (2018). Understanding autonomous peer feedback practices among postgraduate students: A case study in a Chinese university. *Assessment & Evaluation in Higher Education*, 43(4), 527-536. <http://dx.doi.org/10.1080/02602938.2017.1376310>
- Maxwell, J. (2013). *Qualitative research design: An interactive approach (Applied social research methods)* (3rd ed.). SAGE Publications.
- Mayordomo, R., Espasa, A., Guasch, T., & Martínez-Melo, M. (2022). Perception of online feedback and its impact on cognitive and emotional engagement with feedback. *Education and Information Technologies*, 27, 7947-7971. <https://doi.org/10.1007/s10639-022-10948-2>
- McCabe, J., Doerflinger, A., & Fox, R. (2011). Student and faculty perceptions of E-feedback. *Teaching of Psychology*, 38(3), 173-179. <http://dx.doi.org/10.1177/0098628311411794>
- McCarthy, J. (2015). Evaluating written, audio and video feedback in higher education summative assessment tasks. *Issues in Educational Research*, 25(2), 153-169.
- McCarthy, K., Wilkerson, D., & Ashirifi, G. (2022). Student and faculty perceptions on feedback in a graduate social work distance education program. *Journal of Teaching in Social Work*, 42(4), 392-408. <http://dx.doi.org/10.1080/08841233.2022.2102103>
- McMahon, T. (2010). Peer feedback in an undergraduate programme: Using action research to overcome students' reluctance to criticise. *Educational Action Research*, 18(2), 273-287. <http://dx.doi.org/10.1080/09650791003741814>
- Meccawy, Z., Meccawy, M., & Alsobhi, A. (2021). Assessment in 'survival mode': Student and faculty perceptions of online assessment practices in HE during Covid-19 pandemic. *International journal for Educational Integrity*, 17(16), 1-24. <https://edintegrity.biomedcentral.com/articles/10.1007/s40979-021-00083-9>
- Mercader, C., Ion, G., & Díaz-Vicario, A. (2020). Factors influence students' peer feedback uptake: Instructional design matters. *Assessment & Evaluation in Higher Education*, 45(8), 1169-1180. <https://doi.org/10.1080/02602938.2020.1726283>
- Millican, R., Templeton, S., & Hill, J. L. (2023). Exploring the impact of disruption on university staff resilience using the dynamic interactive model of resilience. *Journal of Applied Learning and Teaching*, 7(1), 112-124. <https://doi.org/10.37074/jalt.2023.6.1.19>
- Mills, A., Bali, M., & Eaton, L. (2023). How do we respond to generative AI in education? Open educational practices give us a framework for an ongoing process. *Journal of Applied Learning and Teaching*, 6(1), 16-30. <https://doi.org/10.37074/jalt.2023.6.1.34>
- Moore, G., Warner, W. J., & Jones, D. J. J. (2016). Student-to-student interaction in distance education classes: What do graduate students want? *Journal of Agricultural Education*, 57(2), 1-13.
- Morgan, C., & O'Reilly, M. (2005). Ten key qualities of assessment online. In M. & Hricko (Ed.), *Online assessment and measurement: Foundations and challenges* (pp. 86-101). IGI Global. <http://dx.doi.org/10.4018/9781591407201.ch004>
- Müller, A., Goh, C., Lim, L. Z., & Gao, X. (2021). COVID-19 emergency eLearning and beyond: Experiences and perspectives of university educators. *Education Sciences*, 11(1), 1-15. <https://doi.org/10.3390/educsci11010019>
- Mulliner, E., & Tucker, M. (2017). Feedback on feedback practice: Perceptions of students and academics. *Assessment & Evaluation in Higher Education*, 42(2), 266-288. <http://dx.doi.org/10.1080/02602938.2015.1103365>
- Mulrooney, H., & Kelly, A. F. (2020). COVID-19 and the move to online teaching: Impact on perceptions of belonging in staff and students in a UK widening participation university. *Journal of Applied Learning & Teaching*, 3(2). <https://doi.org/10.37074/jalt.2020.3.2.15>
- Murphy, K., & Barry, S. (2016). Feed-forward: Students gaining more from assessment deeper engagement in video-recorded presentations. *Assessment & Evaluation in Higher Education*, 41(2), 213-227. <https://doi.org/10.1080/02602938.2014.996206>
- Murray, M., Pérez, J., Geist, D., & Hedrick, A. (2012). Student interaction with online course content: Build it and they might come. *Journal of Information Technology Education: Research*, 11, 125-140.
- Naomi, W., & Boud, D. (2022). The need to disentangle assessment and feedback in higher education. *Studies in Higher Education*, 47(3), 656-667. <https://doi.org/10.1080/03075079.2020.1779687>
- Ng, P. (2021). Timely change and timeless constants: COVID-19 and educational change in Singapore. *Educational Research for Policy and Practice*, 20, 19-27. <https://doi.org/10.1007/s10671-020-09285-3>
- Nic Dhonncha, E., & Murphy, M. (2021). Learning new ways of teaching and assessment: The impact of COVID-19

- on undergraduate dermatology education. *Clinical and Experimental Dermatology*, 46(1), 170-171. <https://doi.org/10.1111/ced.14364>
- Nicol, D. (2016). From monologue to dialogue: Improving written feedback processes in mass higher education. *Assessment & Evaluation in Higher Education*, 35(5), 501-517. <https://doi.org/10.1080/02602931003786559>
- Nicol, D., & Macfarlane-Dick, D. (2006). Formative assessment and self-regulated learning: A model and seven principles of good feedback practice. *Studies in Higher Education*, 31(2), 199-218. <https://doi.org/10.1080/03075070600572090>
- Nicol, D., Thomson, A., & Breslin, C. (2014). Rethinking feedback practices in higher education: A peer review perspective. *Assessment & Evaluation in Higher Education*, 39(1), 102-122. <https://doi.org/10.1080/02602938.2013.795518>
- Nortcliffe, A. (2012). Can students assess themselves and their peers?: A five year study. *Student Engagement and Experience Journal*, 1(2), 1-17. <https://shura.shu.ac.uk/7610/>
- Nyachwaya, J. (2020). Teaching general chemistry (I) online during COVID-19. Process, outcomes, and lessons learned: A reflection. *Journal of Chemistry Education*, 97(9), 2935-2939. <https://doi.org/10.1021/acs.jchemed.0c00891>
- Olt, M. (2002). Ethics and distance education: Strategies for minimizing academic dishonesty in online assessment. *Online Journal of Distance Learning Administration*, 5(3), 1-6.
- Or, C., & Chapman, E. (2022). Development and acceptance of online assessment in higher education: Recommendations for further research. *Journal of Applied Learning & Teaching*, 5(1), 10-26. <http://dx.doi.org/10.37074/jalt.2022.5.1.6>
- Orsmond, P., Merry, S., & Reiling, K. (2000). The use of student derived marking criteria in peer and self-assessment. *Assessment & Evaluation in Higher Education*, 25(1), 23-38. <https://doi.org/10.1080/02602930050025006>
- Oyarzun, B., Conklin, S. A., & Barreto, D. (2017). Instructor presence. In P. F. Vu (Ed.), *Handbook of research on innovative pedagogies and technologies for online learning in higher education* (pp. 108-126). IGI Global.
- Oztok, M., Zingaro, D., Brett, C., & Hewitt, J. (2013). Exploring asynchronous and synchronous tool use in online courses. *Computers & Education*, 60(1), 87-94. <https://doi.org/10.1016/j.compedu.2012.08.007>
- Pachler, N., Daly, C., Mor, Y., & Mellar, H. (2010). Formative e-assessment: Practitioner cases. *Computers & Education*, 54(3), 715-721. <https://doi.org/10.1016/j.compedu.2009.09.032>
- Panadero, E., & Alonso-Tapia, J. (2013). Self-assessment: Theoretical and practical connotations. When it happens, how is it acquired and what to do to develop it in our students. *Electronic Journal of Research in Educational Psychology*, 11(2), 551-576.
- Parkin, H., Hepplestone, S., Holden, G., Irwin, B., & Thorpe, L. (2012). A role for technology in enhancing students' engagement with feedback. *Assessment & Evaluation in Higher Education*, 37(8), 963-973. <https://doi.org/10.1080/02602938.2011.592934>
- Patton, C. (2012). Some kind of weird, evil experiment: Student perceptions of peer assessment. *Assessment & Evaluation in Higher Education*, 37(6), 719-731. <https://doi.org/10.1080/02602938.2011.563281>
- Pentassuglia, M. (2018). Inside the 'body box': Exploring feedback in higher education. *Assessment & Evaluation in Higher Education*, 43(5), 683-696. <https://doi.org/10.1080/02602938.2017.1396442>
- Pitt, E., & Norton, L. (2016). 'Now that's the feedback I want!' Students' reactions to feedback on graded work and what they do with it. *Assessment & Evaluation in Higher Education*, 42(4), 1-18. <https://doi.org/10.1080/02602938.2016.1142500>
- Poulos, A., & Mahony, M. J. (2008). Effectiveness of feedback: The students' perspective. *Assessment & Evaluation in Higher Education*, 33(2), 143-154. <https://doi.org/10.1080/02602930601127869>
- Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9(5), 1-6. <https://marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf>
- Rahim, A. (2020). Guidelines for online assessment in emergency remote teaching during the COVID-19 pandemic. *Education in Medical Journal*, 12(2), 59-68. <https://doi.org/10.21315/eimj2020.12.2.6>
- Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: Refocusing teacher presence and learning activity. *Postdigital Science and Education*, 2, 923-945. <https://doi.org/10.1007/s42438-020-00155-y>
- Raupach, T., Brown, J., Anders, S., Hasenfuss, G., & Harendza, S. (2013). Summative assessments are more powerful drivers of student learning than resource intensive teaching formats. *BMC Medicine*, 11(61), 1-10. <http://dx.doi.org/10.1186/1741-7015-11-61>
- Reedy, A., Wurm, P. A. S., Janssen, A., & Lockley, A. (2021). A community of practice approach to enhancing academic integrity policy translation: A case study. *International Journal for Educational Integrity*, 17(12), 1-20. <https://edintegrity.biomedcentral.com/articles/10.1007/s40979-021-00080-y>
- Reinholz, D. (2016). The assessment cycle: A model for learning through peer assessment. *Assessment & Evaluation in Higher Education*, 41(2), 301-315. <https://doi.org/10.1080/02602938.2015.1008982>
- Rolim, C., & Isaias, P. (2019). Examining the use of e-assessment in higher education: Teachers and students' viewpoints. *British Journal of Educational Technology*, 50(2),

1785-1800. <https://doi.org/10.1111/bjet.12669>

Rowe, D., Mazzotti, V. L., Ingram, A., & Lee, S. (2017). Effects of goal-setting instruction on academic engagement for students at risk. *Career Development and Transition for Exceptional Individuals*, 40(1), 25-35. <https://psycnet.apa.org/doi/10.1177/2165143416678175>

Rudolph, J., Tan, S., & Tan, S. (2023). War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *Journal of Applied Learning and Teaching*, 6(1), 364-389. <https://doi.org/10.37074/jalt.2023.6.1.23>

Ryan, T., & Henderson, M. (2018). Feeling feedback: Students' emotional responses to educator feedback. *Assessment & Evaluation in Higher Education*, 43(6), 880-892. <https://doi.org/10.1080/02602938.2017.1416456>

Sadler, D. (2010). Beyond feedback: Developing student capability in complex appraisal. *Assessment and Evaluation in Higher Education*, 35, 535-550. <https://doi.org/10.1080/02602930903541015>

Salmon, G. (2000). *E-moderating: The key to teaching and learning online*. Kogan Page.

Saplacan, D., Herstad, J., & Pajalic, Z. (2018). Feedback from digital systems used in higher education: An inquiry into triggered emotions. In G. D. Craddock (Ed.), *Transforming our world through design, diversity and education* (pp. 421-430). Proceedings of Universal Design and Higher Education in Transformation Congress 2018. <http://urn.nb.no/URN:NBN:no-71908>

Scheerer, N., & Jones, J. A. (2018). The role of auditory feedback at vocalization onset and mid-utterance. *Frontiers in Psychology*, 9, 1-9. <https://doi.org/10.3389/fpsyg.2018.02019>

Seifert, T., & Feliks, O. (2019). Online self-assessment and peer-assessment as a tool to enhance student-teachers' assessment skills. *Assessment & Evaluation in Higher Education*, 44(2), 169-185. <https://doi.org/10.1080/02602938.2018.1487023>

Sellbjer, S. (2018). "Have you read my comments? It is not noticeable. Change!" An analysis of feedback given to students who have failed examinations. *Assessment & Evaluation in Higher Education*, 43(2), 163-174. <https://doi.org/10.1080/02602938.2017.1310801>

Senel, S., & Senel, H. C. (2021). Remote assessment in higher education during COVID-19 pandemic. *International Journal of Assessment Tools in Education*, 8(2), 181-199. <http://dx.doi.org/10.21449/ijate.820140>

Shang, H.-F. (2022). Exploring online peer feedback and automated corrective feedback on EFL writing performance. *Interactive Learning Environments*, 30(1), 4-16. <https://doi.org/10.1080/10494820.2019.1629601>

Shea, P. (2007). Bridges and barriers to teaching online college

courses: A study of experienced online faculty in thirty-six colleges. *Journal of Asynchronous Learning Networks*, 11(2), 73-128. <http://dx.doi.org/10.24059/olj.v11i2.1728>

Shintani, N., & Aubrey, S. (2016). The effectiveness of synchronous and asynchronous written corrective feedback on grammatical accuracy in a computer-mediated environment. *The Modern Language Journal*, 100(1), 296-319. <https://doi.org/10.1111/modl.12317>

Shrago, J., & Smith, M. K. (2006). Online assessment in the K-12 classroom: A formative assessment model for improving student performance on standardized tests. In L. S. M. Hricko (Ed.), *Online assessment and measurement: Case studies from higher education, K-12 and corporate* (pp. 181-195). Information Science Publishing. <http://dx.doi.org/10.4018/978-1-59140-497-2.ch013>

Slack, H., & Priestley, M. (2022). Online learning and assessment during the COVID-19 pandemic: Exploring the impact on undergraduate student well-being. *Assessment & Evaluation in Higher Education*, 1-17. <https://doi.org/10.1080/02602938.2022.2076804>

Sluijsmans, D., Brand-Gruwei, S., & Van Merriënboer, J. (2002). Peer assessment training in teacher education: Effects on performance and perceptions. *Assessment & Evaluation in Higher Education*, 27(5), 443-454. <https://doi.org/10.1080/0260293022000009311>

Sluijsmans, D., Moerkerke, G., Van Merriënboer, J., & Dochy, F. (2001). Peer assessment in problem based learning. *Studies in Educational Evaluation*, 27, 153-173. [https://doi.org/10.1016/S0191-491X\(01\)00019-0](https://doi.org/10.1016/S0191-491X(01)00019-0)

Stančić, M. (2021). Peer assessment as a learning and self-assessment tool: A look inside the black box. *Assessment & Evaluation in Higher Education*, 46(6), 852-864. <https://doi.org/10.1080/02602938.2020.1828267>

Tai, J., Ajjwai, R., Boud, D., Dawson, P., & Panadero, E. (2018). Developing evaluative judgement: Enabling students to make decisions about the quality of work. *Higher Education*, 76, 467-481. <https://doi.org/10.1007/s10734-017-0220-3>

Tan, S., Rudolph, J., Crawford, J., & Butler-Henderson, K. (2022). Emergency remote teaching or andragogical innovation? Higher education in Singapore. *Journal of Applied Learning & Teaching*, 5(1), 64-80. <https://doi.org/10.37074/jalt.2022.5.s1.8>

Tartavulea, C., Albu, C. N., Albu, N., Dieaconescu, R. I., & Petre, S. (2020). Online teaching practices and the effectiveness of the educational process in the wake of the COVID-19 pandemic. *Amfiteatru Economic*, 22(55), 920-936. <http://dx.doi.org/10.24818/EA/2020/55/920>

Thathsara, D., Maddumapatabandi, & Gamage, K. A. A. (2020). Novel coronavirus (COVID-2019) pandemic: Common challenges and responses from higher education providers. *Journal of Applied Learning & Teaching*, 3(2), 41-50. <https://doi.org/10.37074/jalt.2020.3.2.20>

- Thompson, R., & Lee, M. (2012). Talking with students through screencasting: Experiments with video feedback to improve student learning. *The Journal of Interactive Technology & Pedagogy*, 1(1). [https://digitalcommons.tacoma.uw.edu/ias\\_pub/229](https://digitalcommons.tacoma.uw.edu/ias_pub/229)
- Tighe-Mooney, S., Bracken, M., & Dignam, B. (2016). Peer assessment as a teaching and learning process: The observations and reflections of three facilitators on a first-year undergraduate critical skills module. *All Ireland Journal of Teaching and Learning in Higher Education*, 8(2), 2831-2847. <https://doi.org/10.62707/aishej.v8i2.283>
- To, J., & Panadero, E. (2019). Peer assessment effects on the self-assessment process of first-year undergraduates. *Assessment & Evaluation in Higher Education*, 44(6), 920-932. <https://doi.org/10.1080/02602938.2018.1548559>
- Topping, K. (1998). Peer assessment between students in colleges and universities. *Review of Educational Research*, 68, 249-276. <https://doi.org/10.3102/00346543068003249>
- Topping, K. (2009). Peer assessment. *Theory into Practice*, 48(1), 20-27. <https://doi.org/10.1080/00405840802577569>
- Topping, K., Smith, E., Swanson, I., & Elliot, A. (2000). Formative peer assessment of academic writing between postgraduate students. *Assessment & Evaluation in Higher Education*, 25(2), 149-169. <http://dx.doi.org/10.1080/713611428>
- Tuzi, F. (2004). The impact of e-Feedback on the revisions of L2 writers in an academic writing course. *Computers and Composition*, 21(2), 217-235. <https://doi.org/10.1016/j.compcom.2004.02.003>
- Usher, M., & Barak, M. (2018). Peer assessment in a project-based engineering course: Comparing between on-campus and online learning environments. *Assessment & Evaluation in Higher Education*, 43(5), 745-759. <https://doi.org/10.1080/02602938.2017.1405238>
- Van Heerden, M. (2020). It has a purpose beyond justifying a mark: Examining the alignment between the purpose and practice of feedback. *Assessment & Evaluation in Higher Education*, 45(3), 359-371. <https://doi.org/10.1080/02602938.2019.1644602>
- Wanner, T., & Palmer, E. (2018). Formative self-and peer assessment for improved student learning: The crucial factors of design, teacher participation and feedback. *Assessment & Evaluation in Higher Education*, 43(7), 1032-1047. <https://doi.org/10.1080/02602938.2018.1427698>
- Watermeyer, R., Crick, T., & Knight, C. (2021). Digital disruption in the time of COVID-19: Learning technologists' accounts of institutional barriers to online learning, teaching and assessment in UK universities. *International Journal for Academic Development*, 27(2), 148-162. <https://doi.org/10.1080/1360144X.2021.1990064>
- Weaver, D., & Esposto, A. (2012). Peer assessment as a method of improving student engagement. *Assessment & Evaluation in Higher Education*, 37(7), 805-816. <https://doi.org/10.1080/02602938.2011.576309>
- Wei, W., & Xie, Y. (2018). University teachers' reflections on the reasons behind their changing feedback practice. *Assessment & Evaluation in Higher Education*, 43(6), 867-879. <http://dx.doi.org/10.1080/02602938.2017.1414146>
- Wen, M., & Tsai, C.-C. (2006). University students' perceptions of and attitudes toward (online) peer assessment. *The International Journal of Higher Education and Educational Planning*, 51(1), 27-44. <https://doi.org/10.1007/s10734-004-6375-8>
- West, J., & Turner, W. (2016). Enhancing the assessment experience: Improving student perceptions, engagement and understanding using online video feedback. *Innovations in Education and Teaching International*, 53(4), 1-11. <https://doi.org/10.1080/14703297.2014.1003954>
- Wicking, P. (2020). Formative assessment of students from a Confucian heritage culture: Insights from Japan. *Assessment & Evaluation in Higher Education*, 45(2), 180-192. <https://doi.org/10.1080/02602938.2019.1616672>
- Willey, K., & Gardner, A. (2010). Investigating the capacity of self and peer assessment activities to engage students and promote learning. *European Journal of Engineering Education*, 35(4), 429-443. <http://dx.doi.org/10.1080/03043797.2010.490577>
- Wu., C., Chanda, E., & Willison, J. (2014). Implementation and outcomes of online self and peer assessment on group based honours research projects. *Assessment & Evaluation in Higher Education*, 39(1), 21-37. <https://doi.org/10.1080/02602938.2013.779634>
- Wu, Q., & Jessop, T. (2018). Formative assessment: Missing in action in both research-intensive and teaching focused universities. *Assessment & Evaluation in Higher Education*, 43(7), 1091-1031. <https://doi.org/10.1080/02602938.2018.1426097>
- Yang, D., Tang, Y. M., Hayashi, R., Ra, S., & Lim, C. P. (2022). Supporting inclusive online higher education in developing countries: Lessons learnt from Sri Lanka's university closure. *Education Sciences*, 12, 1-11. <https://doi.org/10.3390/educsci12070494>
- Yeo, S., Lai, C. K. Y., Tan, J., & Gooley, J. J. (2021). A targeted e-learning approach for keeping universities open during the COVID-19 pandemic while reducing student physical interactions. *PLoS ONE*, 16(4), 1-17. <https://doi.org/10.1371/journal.pone.0249839>
- Yucel, R., Bird, F. L., Young, J., & Blanksby, T. (2014). The road to self-assessment: Exemplar marking before peer review develops first-year students' capacity to judge the quality of a scientific report. *Assessment & Evaluation in Higher Education*, 39(8), 971-986. <https://doi.org/10.1080/02602938.2014.880400>
- Zhang, F., Schuun, C., Li, W., & Long, M. (2020). Changes in the reliability and validity of peer assessment across the

college years. *Assessment & Evaluation in Higher Education*, 45(8), 1037-1087. <http://dx.doi.org/10.1080/02602938.2020.1724260>

Zheng, L., Zhang, X., & Cui, P. (2020). The role of technology-facilitated peer assessment and supporting strategies: A meta-analysis. *Assessment & Evaluation in Higher Education*, 45(3), 372-386. <https://doi.org/10.1080/02602938.2019.1644603>

Zhou, J., Zheng, Y., & Tai, J. H.-M. (2020). Grudges and gratitude: The social-affective impacts of peer assessment. *Assessment & Evaluation in Higher Education*, 45(3), 345-358. <http://dx.doi.org/10.1080/02602938.2019.1643449>

Zong, Z., Schunn, C., & Wang, Y. (2022). What makes students contribute more peer feedback? The role of within-course experience with peer feedback. *Assessment & Evaluation in Higher Education*, 47(6), 972-983. <https://doi.org/10.1080/02602938.2021.1968792>

Zou, M., Kong, D., & Lee, I. (2021). Teacher engagement with online formative assessment in EFL writing during COVID-19 pandemic: The case of China. *Asia-Pacific Educational Research*, 30(6), 487-498. <https://doi.org/10.1007/s40299-021-00593-7>

Zou, Y., Schunn, C. D., Wang, Y., & Zhang, F. (2018). Student attitudes that predict participation in peer assessment. *Assessment & Evaluation in Higher Education*, 43(5), 800-811. <https://doi.org/10.1080/02602938.2017.1409872>

## Appendix

### Interview Guide

1. Tell me your teaching and assessment (designing and marking) experiences with the university you are currently engaged with.
2. What major challenges do you face in designing, administering (e.g., invigilation), and marking the assessments (formative and summative) before and during the COVID-19 pandemic?
3. What type of assessments would you believe are effective in promoting students' learning?
4. What are your views on using online assessments and the challenges involved?
5. What support would you like the university to provide for online assessments?
6. To what extent do you see the importance of feedback (written, audio, video, face-to-face) to students learning?



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Adapting and thriving: From emergency remote teaching to blended learning

---

Vienne Lin<sup>A</sup>

A

*Centre for Learning Enhancement and Research, Chinese University of Hong Kong*

Paul Lam<sup>B</sup>

B

*Centre for Learning Enhancement and Research, Chinese University of Hong Kong*

---

### Keywords

---

Blended learning;  
case study;  
emergency remote teaching;  
Hong Kong higher education;  
outside the classroom.

### Abstract

---

The COVID-19 pandemic has had a profound and lasting impact on education, with change and consequences that extend beyond its duration. The emergency remote teaching (ERT), the sudden shift from face-to-face to online instruction, left many educators worldwide unprepared. While cases of ERT abound, existing literature focuses primarily on ERT in the classroom setting. There is also a paucity of studies exploring the longer-term impact of ERT on the educational landscape. This case study interrogates how educators in the context of Hong Kong higher education navigated and advanced teaching beyond the classroom during ERT. It further explores the transition and lasting impact of pandemic-implicated educational practices. As diversity is the primacy underlying the case study approach (Stake, 1995), four cases were selected based on various disciplines, technologies, and pandemic-implicated educational practices in Hong Kong. The findings reveal that these pandemic-implicated practices do not simply revert to the normal after the pandemic, which was the original face-to-face instruction. Instead, they evolve into blended learning practices at various levels, including activity-level blending, course-level blending, and programme-level blending. The paper concludes by discussing the pedagogical implications of the "new normal" when blended learning becomes a prevalent form of teaching.

---

### Correspondence

viennelin@cuhk.edu.hk <sup>A</sup>

---

### Article Info

Received 5 March 2024  
Received in revised form 2 October 2024  
Accepted 1 December 2024  
Available online 2 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.2>



## Introduction

The COVID-19 pandemic has had a profound and lasting impact on education, with change and consequences that extend beyond its duration. More precisely, the pandemic has forced stakeholders worldwide to act and react swiftly, radically, and arduously in unprecedented times of emergency. When face-to-face teaching was halted in the early months of the pandemic and intermittently during subsequent waves, many higher education (HE) institutions transitioned to emergency remote teaching (ERT). Due to the far-reaching effects of the pandemic, a large body of ERT literature has flourished. Some literature collected perspectives from students and parents during the pandemic (Ewing & Cooper, 2020; Mshigeni et al., 2021; Seabra et al., 2022) while others chronicled the lived experiences of practitioners globally as they navigated ERT, both individually and collectively (Alterri et al., 2020; Anzovino et al., 2020; Mahaffey, 2020; Mulrooney & Kelly, 2020; Linden & Gonzalez, 2021; Usher et al., 2021).

The existing ERT literature has effectively captured the immediate changes brought about by the pandemic, such as the temporary transition to online teaching (O'Dea & Stern, 2022), and a range of success and bittersweet stories during ERT (Appel & Robbins, 2021; Shinaset al., 2022; Vanleeuwen et al., 2020). Nevertheless, three issues regarding the impact of the pandemic on education remain under-addressed. First, the majority of the literature primarily focuses on ERT *in* the classroom setting. In other words, learning that occurs *outside* the classroom is largely unknown. Second, there is also a paucity of empirical studies exploring the *evolving* educational practices *beyond* ERT. While the ERT paradigm rests not on *sustainability* but on the *temporality* of teaching practices (Hodges et al., 2020; Iglesias-Pradas et al., 2021), many ERT practices, in fact, have been much improved through periodic feedback loops over the past two years (Moore et al., 2021). As such, there is a potential for pandemic-implicated educational practices to be continued or sustained after the initial times of emergency (Moore et al., 2021). Third, the discourse in the ERT literature often concentrates on the overall change in the mode of instruction but fails to address the specific areas of change and how change took place when the teaching modality shifted.

This paper seeks to address the three research gaps aforementioned by examining how educators in the context of Hong Kong HE navigated and advanced teaching outside the classroom in the pandemic and beyond. Specifically, drawing inspiration from the influential Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006; Shulman, 1986, 1987), this study investigates changes and adaptations that occurred within three knowledge domains, namely content, pedagogy, and technology, during ERT. This theoretical framework is chosen for its suitability and immediate relevance to the study, precisely because of its focus on teacher knowledge. In fact, teaching requires high cognitive skills, where teachers simultaneously leverage their knowledge of subject matter, teaching methods, and technology (ibid.). Such knowledge enables them to navigate in the unexpected situations, as in the case of the pandemic. The two research questions (RQs)

are:

RQ1. In what ways did educators modify their content, pedagogical approaches, and utilisation of technology during the period of Emergency Remote Teaching (ERT)?

RQ2. How and why have pandemic-implicated educational practices been sustained?

## Literature review

### Emergency remote teaching

The COVID-19 pandemic upended higher education (HE) institutions worldwide from early 2020 and throughout the two subsequent years, with potential effects that may persist for years to come. In early 2020, a myriad of social distancing policies was in place to mitigate the spread of the coronaviruses. Of particular significance to the HE was the policy of transition from face-to-face to online instruction. As highlighted by Hodges et al. (2020), there is a glaring difference between online teaching as a planned and structured approach and the abrupt and temporary shift in teaching modality during the pandemic. More concretely, such temporality of change from face-to-face, hybrid, or blended courses to fully online instruction should be distinctively referred to as emergency remote teaching (ERT). This distinction is necessary precisely because online teaching involves careful and coherent design and planning which is in stark contrast to ERT where teachers scrambled to teach remotely without sufficient time for necessary amendments (Hodges et al., 2020; Moore et al., 2021; Iglesias-Pradas et al., 2021).

Due to the abrupt shift in the teaching modality, many teachers were left unprepared. Teachers' high level of unpreparedness can be attributed to a lack of practicality, such as the unfamiliarity with using technology-enhanced educational or communication tools or having limited or no prior experience in teaching remotely (Appel & Robbins, 2021; Khan, 2021; Maddumapatabandi & Gamage, 2020; Vanleeuwen et al., 2020). However, at a more fundamental level, the lack of readiness can be attributed to the perceptual shift in the teaching paradigm. Traditionally, the classroom has been viewed as a closed system, with teaching and learning confined to a physical space. In contrast, e-learning operates as an open system that allows students to learn without temporal and spatial limitations (Khan, 2021). This shift raises important questions and challenges for teachers, such as what to expect in the online learning environment, what forms of interaction hold significance, or even how to gauge student engagement when their cameras are turned off.

In the context of higher education in Hong Kong, universities underwent an ERT seesaw situation in response to different epidemiological waves of the pandemic in the city. The word 'seesaw' epitomises the constantly swinging modes of instruction that occurred from February 2020 to May 2023. It shall follow that while each university in Hong Kong has its own administrative policies, institutional agendas, priorities, and teaching calendars, they followed similar timelines

for implementing ERT practices during the pandemic. The timelines that follow are based on the experience of a particular university as an illustrative example. In the second term of the 2019-2020 academic year, all local universities implemented their first ERT where all teaching was moved until further notice (The Chinese University of Hong Kong [CUHK], 2020). When the COVID-19 situation improved, Hong Kong higher education institutions returned to face-to-face instruction in the first term of the 2021-2022 academic year (CUHK, 2021). However, ERT was reintroduced when the Omicron variant had a significant impact locally and globally (CUHK, 2022a). Following the Omicron-induced wave, face-to-face teaching resumed starting from the 2022-2023 academic year onwards (CUHK, 2022b). Despite a recent uptick in Hong Kong from April to May 2023, no emergency measures or ERT were restored (CUHK, 2022c).

The ERT seesaw situation in Hong Kong confirms a fundamental assumption underlying ERT, which suggests that the original teaching modality will generally be resumed once the crisis subsides (Hodges et al., 2020). However, it raises the question of whether pandemic-implicated educational practices can be fully returned to their original state.

## The present study

The present study is part of a larger cross-institutional project which explores different virtual teaching and learning (VTL) strategies adopted beyond the classroom in four public universities in Hong Kong. The project encompasses three main areas of investigation, including VTL educational practices concerning new learning venues, internationalisation, and extracurricular activities. Informed by Stake (1995), the present study adopts an instrumental collective case study approach to deriving a general understanding of the lived experience of educators who transitioned into and beyond ERT.

## Method

### Participants

Four participants, also referred to as cases, were recruited by the project lead and co-leads from four different public universities in Hong Kong through the cross-institutional project. All four public universities are research-intensive and have student enrolments ranging from 6,000 to 20,000. While most students are local Chinese from Hong Kong, there are also non-local students, including international and Mainland Chinese students. There were general and specific sampling criteria. The first general criterion required participants to be involved in virtual teaching and learning (VTL) roles within the four universities under study. The second general criterion was that participants must have experienced the transition to ERT where they carried out pandemic-implicated educational practices. This means that the participants had either adapted their practices or adopted new initiatives during ERT. As balance and variety are essential in case selection (Stake, 1995), specific criteria were established to recruit participants from various disciplines and

across different types of curricula, including both curricular and extra-curricular activities, as well as different forms of VTL, such as simulated or online approaches. Guided by the sampling criteria, potential participants were identified through the professional networks of the project lead and co-leads, as well as desktop research on university websites, including annual teaching and learning conferences. Prior to data collection, ethical approval was obtained from the research ethics committee. Initial contact was then made with the four participants to explain the purposes of the study and to confirm their willingness to participate. A consent form detailing participants' rights, such as the ability to withdraw from the study, confidentiality, and anonymity, as well as how data would be stored, was provided.

Table 1 specifies the demographics of each participant, including their institutions, pandemic-implicated practices, disciplines, teaching experiences, and examples of courses they teach or projects they manage. In particular, teaching experiences are not solely confined to the act of teaching but also include the commitment to supporting student learning and experiences through various initiatives, such as research, professional development, and reflection (Advance HE, 2020). Each participant was assigned a pseudonym to protect their identities.

Table 1. Participant demographics.

Cases	Institutions	Pandemic-implicated practices	Disciplines	Teaching experiences	Examples of courses/projects
Roger	A	E-learning student ambassador programme	Information Technology	15 years +	Gamification and digital learning applications
Katie	B	VR job interview practice tool	Language Education	7 years +	Business communication; Cultures and beliefs
Bonnie	C	Online exchange project	Linguistics and Translation	15 years +	Linguistics; language pedagogy
Hudson	D	Online peer mentoring service-learning project	Communication	3 years +	Public speaking; Interpersonal communication

### Data collection

Upon obtaining the ethical approval, qualitative data were collected between December 2021 and June 2023 using semi-structured interviews. Each of the four participants underwent two interviews: one pre-interview and one post-interview. The pre-interview instrument contained six questions related to the course or programme design, teaching and learning strategies, and future plans for the courses or programmes. The post-interview instrument included two sets of questions. The first set, consisting of five questions, was used if the participants had continued the pandemic-implicated practices discussed in the pre-interviews. For example, one question asked, "Have you expanded the scope of your initiative or made changes to it? How and why?" The second set of post-interview questions, covering four questions, explored why the participants did not continue their pandemic-implicated practices. However, since all participants in this study continued their practices, only the first set of interview questions was used.

All pre-interviews were conducted either face-to-face or online, with an average duration of 50 minutes. For the post-interviews, three out of the four were conducted online, while one was conducted in a written format due to a scheduling conflict. The post-interviews were intentionally designed to be shorter than the pre-interviews, with an average duration of 25 minutes. Such design was to focus specifically on following up with the participants regarding the changes and sustainability of their previously discussed pandemic-implicated practices, rather than starting anew with questions about their practices. This approach sought to build rapport with the interviewees by demonstrating familiarity with and appreciation for their work. Although the post-interviews did not repeat some background questions about their work, participants were free to describe or mention what they did as they wished. All interviews were audio-recorded and subsequently transcribed for data analysis purposes.

### Data analysis

Thematic analysis was chosen as the method for analysing the data because it provides the researchers with the flexibility to make sensible choices about how analysis can be conducted, with the caveat that thematic analysis is not an 'anything goes' approach (Antaki et al., 2003). In Braun and Clarke's (2006, p. 79) words, "[t]hematic analysis is a method for identifying, analysing and reporting patterns (themes) within data". It also explores patterns and shared meaning across the datasets which can address the two research questions. Specifically, data were analysed both deductively and inductively. As for the theoretical frameworks, this study used two coding schemes for the two respective RQs. The first RQ was guided by the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006; Shulman, 1986, 1987) where data were analysed according to themes regarding content, pedagogy, and technology. The second RQ followed Graham's (2006) proposition of blended learning models, namely activity-level, course-level, and programme-level blending, as well as some major benefits for the blends.

Apart from the deductive approach, data were also examined inductively following the six stages of analysis. These stages include familiarisation of data, generation of initial codes, development of themes, theme reviews, theme naming, and report writing (Braun & Clarke, 2006, 2020). The data were read and re-read to gain insights into the subject matter. Notes and key points were taken to capture some early observations. For example, phrases, such as "(a) synchronized participation" (Bonnie), "visit this material again and again" (Roger), and "practise anytime" (Katie) highlighted that technologies could move learning beyond temporal and spatial limitations and were subsequently coded and clustered under the theme of the value of blended learning. Referencing Graham's (2006) suggested rationales for blended learning, possible sub-themes of the value of blended learning could be enhanced access and added flexibility. However, this study identified that the benefits of blended learning are not confined to time and space, but also extend to people, such as "across continents" (Bonnie). Therefore, a sub-theme of expanding the parameters of

learning (see below) was used.

## Results

### RQ1. In what ways did educators modify their content, pedagogical approaches, and utilisation of technology during the period of Emergency Remote Teaching (ERT)?

The first research question was addressed using data collected from the pre-interviews. This paper reveals that all participants made adaptations within the three knowledge domains. In the content domain, educators modified the sequencing and quantity of their teaching content. They also created opportunities for student-generated content. Within the pedagogy domain, a student-centred learning approach was adopted in the pandemic-implicated initiatives. In terms of the technology domain, Information Communication Technology (ICT) and Virtual Reality (VR) were utilised. Table 2 below provides a summary of the four pandemic-implicated practices and the corresponding areas of adaptation.

Table 2. An overview of the four pandemic-implicated practices and the corresponding areas of adaptation.

Cases	Institutions	Disciplines	Pandemic-implicated practices	Modality	Adaptation in terms of		
					Content	Pedagogy	Technology
Roger	A	Information Technology	E-learning student ambassador programme	ERT	Sequencing	Student-centred (student-student)	ICT (Zoom)
Katie	B	Language Education	VR job interview practice tool	ERT	Quantity	Student-centred (student-computer)	VR
Bonnie	C	Linguistics and Translation	Online exchange project	ERT	Role of content generation	Student-centred (student-student)	ICT (Zoom)
Hudson	D	Communication	Online peer mentoring service-learning project	ERT	Role of content generation	Student-centred (student-student)	ICT (Zoom)

### The adaptation of content

During the transition to ERT, educators in the four datasets implemented various adaptations in terms of content. The adaptations encompassed three different approaches: change in content sequencing, adjustments in content quantity, and the facilitation of student-generated content.

#### Change in content sequencing

The sequential change in content is exemplified in Roger's e-learning student ambassador programme. This programme provides students with opportunities to enhance their skills in information technology (IT), media, communication, as well as teamwork to support peers in the wider community. The training includes essential IT and digital skills, such as multimedia editing, desktop publishing, web design, basic programming, and digital animation. By design, the training sessions were intended to take place face-to-face

on campus. The first training session on the introduction to photography was conducted in-person. However, due to the transition to ERT, all in-person instruction was moved online until further notice. In the original plan, the second and third training sessions were dedicated to videography and audio recording, as well as lighting techniques. This sequencing was based on the shared foundational principles between photography and videography, particularly in terms of lighting and focusing. Nevertheless, these sessions were swapped with sessions on audio editing and video editing. This adjustment allowed students to engage in hands-on practice remotely with their own digital electronic devices.

### ***Adjustments in content quantity***

The increase in the number of practice content is particularly evident in the case of Katie's VR job interview practice tool. The VR tool is specifically designed for a business communication course which seeks to enhance the learning needs of students in job searching and the early stages of their careers. The course and the tool introduce strategies for navigating various communication challenges that new graduates may encounter in various workplace settings. In the initial design, only one lesson was allocated for the in-person job interview practice due to various constraints, such as the already packed teaching schedules, limited in-class time, and a large cohort of students. The high demand for more job interview practice was reflected in Katie's mid-term and end-of-term course evaluations, as many students remarked that "more interview practice please as it is very valuable". With the introduction of the VR practice tool, students now have access to a significantly greater number of practice opportunities as they can learn anytime and anywhere. For instance, students using this tool can engage in extensive practice and repetition through the built-in exercises, which cover fifteen types of professions, three levels of difficulty, and three types of duration. This allows students to enhance their interviewing skills through repeated practice and exposure to different scenarios.

### ***The facilitation of student-generated content***

Students took the initiative to generate content in the two outside-classroom learning opportunities. Bonnie's online exchange project was developed as an internationalisation-at-home initiative to address the prolonged suspension of physical exchanges due to the pandemic. Students from Hong Kong and Turin, Italy, were given both structured and unstructured opportunities to interact through online meetings and WhatsApp where they gained insights into their respective linguistic and intercultural differences. Specifically, participants from both sides were tasked with collecting photos that showcased the linguistic landscapes of their respective cities. These photos were then presented and discussed in virtual classes. In Hudson's online peer mentoring service-learning project, university students serving as mentors took an active role in content creation. The mentors attended training to enhance their academic and psychological awareness in areas such as examinations, university interviews, time management, self-efficacy, confidence, peer communication, and more, so that they can

better equip themselves to answer potentially challenging questions raised by their fellow mentees. Upon completion of the training, the mentors designed a set of common admission interview questions, conducted two online communication training workshops, and facilitated seven mock university interviews with their mentees. This mentored initiative aimed to enhance the mentees' interviewing skills while providing valuable guidance and support during the university admission process.

### **The adaptation of pedagogy**

Under the theme of the adaptation of pedagogy, teachers' efforts to promote student-centred learning become prominent across the four cases. In particular, the core notion of the student-centred learning is to design learning that facilitates students' active engagement where they have the ownership and autonomy of their learning (Arman, 2018; Hoidn, 2017). In this case study, students' role in their own learning is evident through two significant forms of interaction, namely student-student interaction, and student-computer interaction.

#### ***Student-student interaction***

Opportunities for student-student interaction were actively constructed in various ways. For example, Roger's e-learning student ambassador programme aimed to equip a cohort of eight to ten students with some fundamental digital skills so that they could create a supportive digital learning experience for their peers at the university. Bonnie's online exchange project provided a rich platform for student-student interaction at an international level. Students from Hong Kong and Turin had designated time for icebreaking conversations in order to establish connections and foster cross-cultural understanding. Additionally, they collaborated on a project focused on exploring the linguistic landscape of their respective cities. Hudson's online peer mentoring service-learning project facilitated student-student interaction across educational sectors. A group of 30 university students served as mentors and provided communication training specific to university interviews to a cohort of 30 secondary school students. This service-learning project was significant because it provided additional support and resources necessary for students with little cultural and economic capital to thrive in their educational pursuits.

#### ***Student-computer interaction***

Katie's VR job interview practice tool places a strong emphasis on empowering students and cultivating their sense of autonomy and ownership in their learning process. This application sought to enhance students' job interview skills by providing them with valuable support, including built-in interview exercises and mini lessons. With the VR tool, students were granted unlimited opportunities to practise job interviews and received immediate feedback on their performance. They could self-assess their performance while benefiting from auto-generated feedback tailored to

their specific selections of scenarios. This iterative process enabled students to continuously refine their interview skills and gain self-awareness. In addition to the interview exercises, the tool offered a range of mini lessons. These self-directed learning materials, such as pre-recorded videos on job-seeking, enriched students' learning experiences by allowing them to engage with these resources anytime and anywhere.

### The adaptation of technology

To aid the transition into ERT, the use of technology can be broadly categorised into two types. The first and most prevalent type of technology was the use of Information Communication Technology (ICT). In the three cases examined, namely Roger's e-learning student ambassador programme, Bonnie's online exchange project, and Hudson's online peer mentoring service-learning project, were mediated by the videoconferencing tool, Zoom. Educators, students, and peers were able to interact with each other by speaking up in online meetings, sharing their screens to display documents or presentations, having access to the instant chat function, and casually providing feedback by pressing the thumb-ups or emojis. The second type of technology identified in one of the cases was Katie's incorporation of Virtual Reality (VR) into a course. VR technology created simulated 3D environments for students to practise interviews with an avatar interviewer. The immersive setting also allowed students to develop a sense of presence as if they were actually participating in authentic job interviews.

### RQ2. How and why have pandemic-implicated educational practices been sustained?

The second research question was answered by analysing data collected from the post-interviews. Different from the pre-interviews, the post-interviews focused on the development of the previously discussed pandemic-implicated educational practices. This study identifies one overarching theme that emerged across all four datasets, namely the notion of continuity and sustainability through blended learning. In other words, educators in the post-pandemic era have adopted blended learning as their prevailing teaching modality. Within this overarching theme, there are two salient sub-themes, which are the levels and the value of blended learning. Blended learning can take various forms and operate at different levels (Graham, 2006). From the four cases examined, three levels of blending have been identified. These blends include activity-level blending, course-level blending, and programme-level blending. A summary of the cases can be found in Table 3.

### The levels of blends

#### *Blended learning at the activity level*

Activity-level blending refers to a learning activity which involves both face-to-face and computer-mediated components (Graham, 2006). In this case study, Bonnie's

Table 3. The continuity and sustainability of the pandemic-implicated educational practices.

Cases	Pandemic-implicated practices	Relation to the pandemic	Transition trajectories (pre- and peri-pandemic)	Current teaching modality (post-pandemic)	Levels of blending
Roger	E-learning student ambassador programme	Pandemic-adapted	Face-to-face → ERT	Blended	Programme-level
Katie	VR job interview practice tool	Pandemic-adapted	Face-to-face → ERT	Blended	Course-level
Bonnie	Online exchange project	Pandemic-derived	ERT new initiative	Blended	Activity-level
Hudson	Online peer mentoring service-learning project	Pandemic-derived	ERT new initiative	Blended	Course-level

online exchange project is incorporated as an activity-level blending component in the current instruction. While the online exchange project was developed as a rescue plan during the pandemic, this initiative has proved to be an effective learning activity for students to participate in cross-cultural communication remotely and safely. The partnership between Hong Kong and Turin, Italy remains unchanged. Students of both sides share the same learning opportunity as the previous cohort. What changes in the current teaching is the physical location of the online exchange. In the post-pandemic era where in-person teaching has resumed, Bonnie now brings participants from Turin at a distance into the lecture hall where the Hong Kong cohort is located. Students in Hong Kong now have the opportunity to engage in learning not only with peers and the teacher face-to-face, but also simultaneously interact with peers overseas by computer-mediated technology.

#### *Blended learning at the course level*

Course-level blending consists of both face-to-face instruction and computer-mediated activities within a specific course or learning experience (Graham, 2006). A range of classes or learning components are arranged and sequenced chronically or simultaneously to achieve the intended learning objectives (Graham, 2006). Two cases, namely Katie's VR job interview practice tool and Hudson's online service-learning project, have evolved into examples of course-level blending in the post-pandemic era. For example, Katie's VR job interview application continues to serve as a supplementary practice tool in the compulsory language course once face-to-face teaching resumes. Another instance of course-level blending is Hudson's online service-learning project. This project, which has been embedded within a course on interpersonal communication, continues to operate as a course-level blending approach. Originally designed and delivered entirely online, the project has now transitioned to a blended model that combines 80% online and 20% offline components. The orientation meetings between mentors and mentees and the online workshops and training provided by the university students remain unchanged and continue to be conducted remotely. These online components ensure that the project maintains its accessibility and flexibility which allows participants to engage in collaborative and interactive activities regardless of their physical locations. The 20% offline component of the project refers to the closing ceremony. After working together remotely on the online learning components, the

student groups now come together for a two-hour face-to-face event as part of the closing ceremony.

### ***Blended learning at the programme level***

While programme-level blending is frequently referred to as a degree programme (Graham, 2006), in this case study, a programme is defined as a range of online and offline activities, tasks, or resources that are offered within a particular timeframe. In the case of Roger's e-learning student ambassador programme, face-to-face training sessions have resumed after the pandemic. However, the programme utilises a learning management system to host a variety of supplementary learning materials. These online resources, curated based on training topics such as photography, videography, and video and audio editing, serve as valuable supplements to the face-to-face training sessions and would not replace the training *per se*. Roger added, "Just because we finished with the pandemic, it doesn't mean that we finished with Zoom or online learning. But it will keep continuing. It will keep evolving because I don't think online learning will just end it like that. I think offline and online will work together". As the e-learning student ambassador programme is now blended, students can revise and revisit the materials according to their own interests, needs, and time alongside the in-person training classes. Additionally, the online repository serves as a contingency plan in the event of future emergencies, such as the need for another round of ERT if there is a sharp uptick in confirmed COVID-19 cases. This added flexibility enables teachers to seamlessly deliver teaching content either online or offline, depending on the circumstances.

### **The value of blended learning**

In response to the evolving educational practices influenced by the pandemic, the reasons for changes are often mentioned during the interviews. This brings the value of blended learning to the fore. Three prominent sub-themes are identified, including expanding the parameters of learning, improving inclusivity, as well as enhancing pedagogy.

#### ***Expanding the parameters of learning***

The traditional notion of learning has long been associated with a physical classroom where teaching and learning take place (Khan, 2021). However, this case study demonstrates a departure from this conventional approach by offering a range of learning opportunities beyond the confines of a physical classroom. Students no longer learn with temporal, spatial, or participatory restrictions. For instance, Roger's e-learning student ambassador programme provides students with supplementary learning resources so that they can conduct self-study at their own pace. Similarly, Katie's VR job interview practice tool enables students to gain additional practice anytime and anywhere. Furthermore, Bonnie's online exchange project offers students across continents to participate in (a)synchronised activities and cross-cultural communication. Likewise, Hudson's online

peer mentoring service-learning project brings together university and secondary school students from different educational sectors to co-construct learning. The parameters of learning in terms of time (anytime), place (anywhere), and people (anyone) are thus extended.

#### ***Improving inclusivity***

The notion of creating a more inclusive and equitable learning experience for students of diverse backgrounds, be they socio-economically, linguistically, or academically, prevails across the datasets. Bonnie's online exchange project is a vivid case in point. Not all students are financially prepared for a physical exchange, according to Bonnie in charge of the project. The project would allow students from less fortunate background to experience cross-cultural and cross-institutional collaboration without incurring additional costs. Another example is Hudson's online peer mentoring service-learning project. This initiative specifically targets disadvantaged secondary school students and provides them with valuable insights and practice for navigating highly competitive university entrance interviews. Hudson recalled that there was a "significant variation of language proficiencies among the [mentees]. This is something that I did not expect... very unfortunately, several [mentees] could not even introduce themselves properly in English. ... [But] this is the real taste. At least they know their ... I can't say, I can't use the word defects, but at least they know their weakness. Right? So they can better prepare themselves at least a year earlier." This community service is a crucial initiative to widen access in higher education precisely because students from disadvantaged backgrounds often lack the information and support essential for them to navigate choices (Bowl, 2003; Marshall, 2016).

#### ***Enhancing pedagogy***

Pedagogy refers to "the instructional techniques and strategies that allow learning to take place" (Siraj-Blatchford et al., 2002, p. 10). Hudson's online peer mentoring service-learning project highlights the role of student involvement and participation in its course design. Students were provided with opportunities to take on active roles as mentors by leading workshops and creating learning materials for the course. Hudson remarked that the course would not have been possible without the students' leadership and contributions. He said, "I can't do this project without the help of my students because I just serve as the role as a teacher. I give them some guidance, some advice, but they are the one who listen to my advice and tailor make some training materials for their mentees. They are not using my own, lecture handouts. No, they created their own and delivered the concept maybe in an easy or more friendly manner". Likewise, Katie's VR job interview practice tool exemplifies an effective pedagogical practice. With a large cohort of over 100 students, providing timely and personalised feedback on interview performance would have been challenging with limited human resources. However, the utilisation of an auto-generated feedback system enables students to receive valuable feedback promptly.

## Discussion

The findings of this study revealed two significant patterns in the pandemic-implicated educational practices that took place outside the classroom. First, there are four interconnected aspects of change and adaptation observed across the cases. More concretely, as the pandemic upended the educational landscape at both local and global levels, the most prominent change was the immediate and temporary shift in teaching modality and its primary role in inducing change in the three elements of knowledge bases, namely content, pedagogy, and technology. To emphasise its importance, the gear representing ERT, as the teaching modality, in Figure 1 below is depicted as the largest. In other words, the change in modality becomes the decisive factor in engendering change and adaptation in the other three aspects.

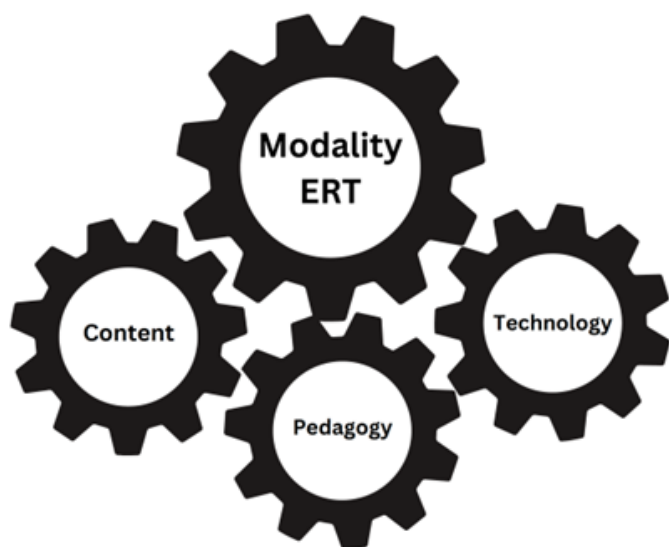


Figure 1. Imagining gears in motion—The four interlocked aspects of change and adaptation during ERT.

In contrast to the extensive focus on technological pedagogical content knowledge, as highlighted by Mishra and Koehler (2006), Koehler et al. (2007), and numerous other scholars (Zimmermann et al., 2021; Valtonen et al., 2020; Joo et al., 2018), this paper shifts its attention towards identifying specific aspects of change and adaptation within the three fundamental knowledge domains during the pandemic. The change and adaptation examined in this study, as addressed in Research Question 1, encompass areas such as content sequencing, content quantity, the role of content generation, the enhancement of student-student and student-computer interaction, as well as the utilisation of information communication technology and virtual reality.

As in Figure 1 above, the three other interconnected aspects of change and adaptation are content, pedagogy, and technology. The gears representing these knowledge domains are of equal size, emphasising the equal importance of content, pedagogy, and technology in recognising the dynamic adaptation that occurred across the cases. In the wider ERT literature, some studies have examined a particular knowledge domain, such as how instructional strategies

facilitated the transition to ERT (Bao, 2020). Others have analysed challenges pertinent to technologies, content, students, pedagogy, and time management (Jung et al., 2021). Our study aligns with the ERT literature in highlighting Zoom as one of the most widely used ICTs when instruction moved online abruptly (Oliveira et al., 2021).

The second pattern observed in this study revolves around the sustainability of these pandemic-implicated educational practices. They continue as blended learning at three levels, which are the activity-level, course-level, and programme-level blending. In essence, the four cases, whether derived or adapted from the COVID-19 pandemic, did not simply revert to their original forms. This finding is particularly valuable, considering that consistent patterns or long-term sustainable changes have not been found in the ERT literature (O’Dea & Stern, 2022). One salient reason for the continued practice is the *recognition of value* associated with the blended learning approach. For example, blended learning improves pedagogy by creating opportunities for students to actively engage in and take ownership of their own learning, as evident in some other work (Northey et al., 2015; Bradey, 2015; de Brito Lima et al., 2021; Chen, 2022). Blended learning also constructs an inclusive learning environment for students (Walldorf et al., 2016; Siergiejczyk, 2020). Another possible explanation for the sustainability of these pandemic-implicated practices is the duration of the pandemic, which has allowed for continuous feedback loops (Moore et al., 2021). As a critical accelerator, the pandemic has driven many educators to engage in trial and error and to discover the value and possibilities of integrating different teaching modalities. The extended timeframe has provided educators with the necessary time and space to explore and refine their approaches.

As blended learning becomes a prevalent form of teaching in the new normal, there are three general yet practical pedagogical implications to consider, including why to blend, what to blend, and how to blend. The reasons for blending and the content to be blended are closely intertwined. Educators are advised to reflect on the purpose behind each blend. For instance, can incorporating an online learning component address specific challenges in teaching, such as enhancing student engagement or performance, facilitating higher-order thinking, or managing large class sizes? If blending can improve teaching and learning, educators can subsequently design courses and programmes that align with the intended learning outcomes. Determining how to blend would be more complex. Educators should consider the roles of blended components, such as whether the online learning component will complement, supplement, or potentially replace certain aspects of teaching and learning content. As educators interact with diverse students and pedagogical contexts, there is no recipe for a ‘perfect’ blend. However, it is essential to establish a system or channel that enables open and timely feedback loops. Formative assessments, rather than relying solely on summative evaluations, can come in handy. Periodic feedback can be gathered from students and co-developers where appropriate and applicable, or through critical self-reflection.

Additionally, three specific factors that should be taken into account for out-of-class blended activities. Time and effort are often two key resources. It is not difficult to imagine that blended teaching and learning would demand extra time and workload, as each element of blends requires thoughtful design and thinking (Tomei, 2004, 2006). However, it would be useful if such additional inputs are evaluated against the *value* of blended initiatives. In other words, do the blends add value and meaning to student learning? This consideration is exemplified by Hudson's candid remark. He commented, "There are seven sections of mock interviews. Personally, I think this is time-consuming for me because each interview section lasts 45 minutes .... [But] I want to create a more authentic experience for them, so I must organize this number of sections—seven sections". Students' reception should also be considered. Non-classroom activities typically anticipate more engagement and involvement from students, as compared with traditional lecture halls and tutorials. In the words of Claiborne et al. (2020), these experiences can be "student-centric". Given that some students may not be comfortable or familiar with being the focus of attention or being active participants beyond the classroom, it would be beneficial for these non-classroom activities to be *co-created* with students, rather than *created for them*.

## Conclusion and limitation

This case study seeks to explore how educators in the context of Hong Kong HE adapted and advanced teaching practices outside the classroom during the pandemic and beyond. Two significant patterns were identified from the cases. First, ERT as the provisional teaching modality played a pivotal role in driving changes in content, pedagogy, and technology. Second, the pandemic-implicated educational practices do not revert to the original form but instead continue to evolve into a blended learning approach. Three levels of blends are identified, including activity-level, course-level, and programme-level blending. The decision to blend also sheds light on the different advantages of the mixed modes. These benefits are expanded learning parameters, improved inclusivity, and enhanced pedagogy.

One potential limitation of this case study is its small sample size, as only four cases were examined. Therefore, caution should be exercised when generalising the findings to other contexts. However, this study places emphasis on the concept of particularisation, which can effectively capture the unique essence of each case. Due to the rich contextual information provided, readers can comprehend and make informed decisions regarding the relevance of the findings to their own pedagogical contexts (Stake, 1995). To address the limitation of the small sample size, this study capitalises on balance and variety of pandemic-implicated practices across different institutions, disciplines, and types of curricula (Stake, 1995).

Seventeen years ago, various e-learning researchers envisioned the future of education to be centred around blended learning (Massy, 2006). Graham (2006, p. 28) made a notable remark: "[a]lthough it is impossible to see entirely what the future holds, we can pretty certain that the trend

toward blended learning systems will increase. It may even become so ubiquitous that we will eventually drop the word *blended* [emphasis in original] and just call it learning ...". And now, after three years of the pandemic, it is safe to reaffirm that blended learning is the optimal approach to take.

## Acknowledgments

This work is supported by the University Grants Committee Funding Scheme for the Inter-institutional Collaborative Activities entitled Establishing Effective Virtual Teaching Strategies to Support Learning beyond the Classroom from 2021 to 2023. We would like to thank the inter-institutional teams for conducting interviews with the participants, as well as the anonymous reviewers for their comments on the earlier draft.

## References

- Advance HE. (2020). *Fellowship*. <https://www.advance-he.ac.uk/fellowship>.
- Alterri, D., Hindi, M., AlMarar, R., & Shubair, R. M. (2020). Transition to distance learning during the COVID-19 pandemic: Efforts within the Higher Education sector in the United Arab Emirates. *Journal of Applied Learning & Teaching*, 3(2), 31–39. <https://doi.org/10.37074/jalt.2020.3.2.17>
- Antaki, C., Billig, M., & Potter, J. (2003). Discourse analysis means doing analysis: A critique of six analytic shortcomings. *Athenea Digital*, 1(3). 14–35. <https://doi.org/10.5565/rev/athenead/v1n3.64>
- Anzovino, M. E., Mallia, V. A., Morton, M. S., Barker Paredes, J. E., Pennington, R., Pursell, D. P., Rudd, G. E. A., Shepler, B., Villanueva, O., & Lee, S. (2020). Insights and initiatives while teaching organic Chemistry I and II with laboratory courses in the time of COVID-19. *Journal of Chemical Education*, 97(9), 3240–3245. <https://doi.org/10.1021/acs.jchemed.0c00766>
- Appel, C., & Robbins, J. (2022). Language teaching in times of COVID-19: The emotional rollercoaster of lockdown. In J. Chen (Ed.), *Emergency remote teaching and beyond: Voices from world language teachers and researchers* (pp. 3–22). Springer International Publishing.
- Arman, M. S. (2018). Student-centered approach to teaching: It takes two to tango. *The Ahfad Journal*, 35(2), 64–71. <https://www.proquest.com/openview/1ad110e1597a2cdd0618543ed76062e1/1?pq-origsite=gscholar&cbl=5287>
- Bao, W. (2020). COVID-19 and online teaching in higher education: A case study of Peking University. *Human Behavior and Emerging Technologies*, 2(2), 113–115. <https://doi.org/10.1002/hbe2.191>
- Bowl, M. (2003). *Non-traditional entrants to higher education: They talk about people like me*. Trentham Books.



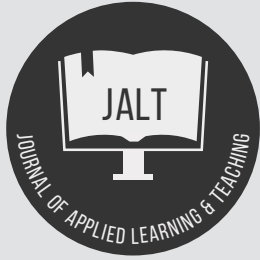
- Bradey, S. (2015, November). Tensions and turning points: Exploring teacher decision-making in a complex eLearning environment. In *Proceedings of the ASCILITE 2015 conference proceedings: Globally connected, digitally enabled* (pp. 31–42). <https://doi.org/10.14742/apubs.2015.993>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2020). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology*, 18(3), 328–352. <https://doi.org/10.1080/14780887.2020.1769238>
- Chen, J. (2022). Effectiveness of blended learning to develop learner autonomy in a Chinese university translation course. *Education and Information Technologies*, 27(9), 12337–12361. <https://doi.org/10.1007/s10639-022-11125-1>
- Claiborne, L., Morrell, J., Bandy, J., Bruff, D., Smith, G., & Fedesco, H. (2020). *Teaching outside the classroom*. Vanderbilt University Center for Teaching. <https://cft.vanderbilt.edu/guides-sub-pages/teaching-outside-the-classroom/>
- de Brito Lima, F., Lautert, S. L., & Gomes, A. S. (2021). Contrasting levels of student engagement in blended and non-blended learning scenarios. *Computers and Education*, 172, 104241. <https://doi.org/10.1016/j.compedu.2021.104241>
- Ewing, L. A., & Cooper, H. B. (2021). Technology-enabled remote learning during Covid-19: Perspectives of Australian teachers, students and parents. *Technology, Pedagogy and Education*, 30(1), 41–57. <https://doi.org/10.1080/1475939X.2020.1868562>
- Graham, C. R. (2006). Blended learning systems. In C. J. Bonk, & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 3–21). Pfeiffer.
- Hodges, C. B., Moore, S., Lockee, B. B., Trust, T., & Bond, M. A. (2020, March 27). *The difference between emergency remote teaching and online learning*. EDUCAUSE. <https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning#fn14>
- Hoidn, S. (2017). *Student-centered learning environments in higher education classrooms*. Palgrave Macmillan. <https://doi.org/10.1057/978-1-349-94941-0>
- Iglesias-Pradas, S., Hernández-García, Á., Chaparro-Peláez, J., & Prieto, J. L. (2021). Emergency remote teaching and students' academic performance in higher education during the COVID-19 pandemic: A case study. *Computers in Human Behavior*, 119, 106713–106713. <https://doi.org/10.1016/j.chb.2021.106713>
- Joo, Y. J., Park, S., & Lim, E. (2018). Factors influencing preservice teachers' intention to use technology: TPACK, teacher self-efficacy, and technology acceptance model. *Educational Technology & Society*, 21(3), 48–59. <https://www.jstor.org/stable/26458506>
- Jung, I., Omori, S., Dawson, W. P., Yamaguchi, T., & Lee, S. J. (2021). Faculty as reflective practitioners in emergency online teaching: An autoethnography. *International Journal of Educational Technology in Higher Education*, 18(1), 30. <https://doi.org/10.1186/s41239-021-00261-2>
- Khan, B. H. (2021). A global framework for e-learning. In B. H. Khan, S., Affouneh, S. H. Salha, & Z. N. Khlaif (Eds.), *Challenges and opportunities for the global implementation of e-learning frameworks* (pp. 1–14). IGI Global. <https://doi.org/10.4018/978-1-7998-7607-6.ch001>
- Koehler, M. J., Mishra, P., & Yahya, K. (2007). Tracing the development of teacher knowledge in a design seminar: Integrating content, pedagogy and technology. *Computers in Education*, 49(3), 740–762. <https://doi.org/10.1016/j.compedu.2005.11.012>
- Linden, K., & Gonzalez, P. (2021). Zoom invigilated exams: A protocol for rapid adoption to remote examinations. *British Journal of Educational Technology*, 52(4), 1323–1337. <https://doi.org/10.1111/bjet.13109>
- Maddumapatabandi, T. D., & Gamage, K. A. A. (2020). Novel coronavirus (COVID-2019) pandemic: Common challenges and responses from higher education providers. *Journal of Applied Learning & Teaching*, 3(2), 40–50. <https://journals.sfu.ca/jalt/index.php/jalt/article/view/263/263>
- Mahaffey, A. L. (2020). Chemistry in a cup of coffee: Adapting an online lab module for teaching specific heat capacity of beverages to health sciences students during the COVID pandemic. *Biochemistry and Molecular Biology Education*, 48(5), 528–531. <https://doi.org/10.1002/bmb.21439>
- Marshall, C. A. (2016). Barriers to accessing higher education. In C. A. Marshall, S. J. Nolan, & D. P. Newton (Eds.), *Widening participation, higher education and non-traditional students* (pp. 1–18). Palgrave Macmillan.
- Massy, J. (2006). The integration of learning technologies into Europe's education and training systems. In C. J. Bonk, & C. R. Graham (Eds.), *The handbook of blended learning: Global perspectives, local designs* (pp. 419–431). Pfeiffer.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054. <https://doi.org/10.1111/j.1467-9620.2006.00684.x>
- Moore, S., Trust, T., Lockee, B., Bond, A., & Hodges, C. (2021, November 10). *One year later . . . and counting: Reflections on emergency remote teaching and online learning*. <https://er.educause.edu/articles/2021/11/one-year-later-and-counting-reflections-on-emergency-remote-teaching-and-online-learning>
- Mshigeni, S., Sarwar, E., & Kimunai, E. (2021). College students' educational experiences amid COVID-19 pandemic. *Journal of Applied Learning & Teaching*, 4(1), 38–48. <https://doi.org/10.37074/jalt.2021.4.1.20>

- Mulrooney, H. M., & Kelly, A. F. (2020). COVID-19 and the move to online teaching: Impact on perceptions of belonging in staff and students in a UK widening participation university. *Journal of Applied Learning & Teaching*, 3(2), 17–30. <https://doi.org/10.37074/jalt.2020.3.2.15>
- Northey, G., Bucic, T., Chylinski, M., & Govind, R. (2015). Increasing student engagement using asynchronous learning. *Journal of Marketing Education*, 37(3), 171–180. <https://doi.org/10.1177/0273475315589814>
- O’Dea, X. C., & Stern, J. (2022). Virtually the same?: Online higher education in the post Covid-19 era. *British Journal of Educational Technology*, 53(3), 437–442. <https://doi.org/10.1111/bjet.13211>
- Oliveira, G., Teixeira, J. G., Torres, A., & Morais, C. (2021). An exploratory study on the emergency remote education experience of higher education students and teachers during the COVID-19 pandemic. *British Journal of Educational Technology*, 52(4), 1357–1376. <https://doi.org/10.1111/bjet.13112>
- Seabra, F., Abelha, M., Teixeira, A., & Aires, L. (2022). Learning in troubled times: Parents’ perspectives on emergency remote teaching and learning. *Sustainability*, 14(1), 301. <https://doi.org/10.3390/su14010301>
- Shinas, V. H., Ly, C. N., & Ozden, S. Y. (2022). *Cases on practical applications for remote, hybrid, and hyflex teaching*. IGI Global. <https://www.igi-global.com/book/cases-practical-applications-remote-hybrid/276085>
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14. <https://doi.org/10.3102/0013189X015002004>
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, 57(1), 1–22. <https://doi.org/10.17763/haer.57.1.j463w79r56455411>
- Siergiejczyk, G. (2020). Virtual international exchange as a high-impact learning tool for more inclusive, equitable and diverse classrooms. *European Journal of Open, Distance and E-Learning*, 23(1), 1–17. <https://doi.org/10.2478/eurodl-2020-0001>
- Siraj-Blatchford, I., Sylva, K., Muttock, S., Gilden, R., & Bell, D. (2002). *Brief No: 356 researching effective pedagogy in the early years*. <https://dera.ioe.ac.uk/id/eprint/4650/1/RR356.pdf>
- Stake, R. E. (1995). *The art of case study research*. Sage Publications.
- Tomei, L. A. (2004). The impact of online teaching on faculty load: Computing the ideal class size for traditional, online, and hybrid courses. *International Journal of Instructional Technology and Distance Learning*, 1(1), 39–50. <https://doi.org/10.4018/IJOPCD.2019070101>
- Tomei, L. A. (2006). The impact of online teaching on faculty load: Computing the ideal class size for online courses. *Journal of Technology and Teacher Education*, 14(3), 531–541. <https://doi.org/10.4018/IJOPCD.2019070101>
- The Chinese University of Hong Kong [CUHK]. (2020, January 31). *CUHK to start online teaching on 17 February and extend the work-from-home arrangement for staff to 9 February*. <https://www.cpr.cuhk.edu.hk/en/announcement/cuhk-to-start-online-teaching-on-17-february-and-extend-the-work-from-home-arrangement-for-staff-to-9-february/>
- The Chinese University of Hong Kong [CUHK]. (2021, June 16). *Teaching arrangements for term 1 2021-22*. <https://www.cpr.cuhk.edu.hk/en/announcement/teaching-arrangements-for-term-1-2021-22/>
- The Chinese University of Hong Kong [CUHK]. (2022a, January 23). *Important announcement: Online learning and work-from-home*. <https://www.iso.cuhk.edu.hk/eDM/202201/0123/english.html>
- The Chinese University of Hong Kong [CUHK]. (2022b, May 13). *Teaching arrangements for term 1 2022-23 and updates on vaccine pass*. <https://www.cpr.cuhk.edu.hk/en/announcement/teaching-arrangements-for-term-1-2022-23-and-updates-on-vaccine-pass/>
- The Chinese University of Hong Kong [CUHK]. (2022c, December 23). *Teaching arrangements for term 2, 2022-23*. [https://www.gs.cuhk.edu.hk/general\\_announcements/TeachingArrangementsforTerm2202223](https://www.gs.cuhk.edu.hk/general_announcements/TeachingArrangementsforTerm2202223)
- Usher, M., HersHKovitz, A., & Forkosh-Baruch, A. (2021). From data to actions: Instructors’ decision-making based on learners’ data in online emergency remote teaching. *British Journal of Educational Technology*, 52(4), 1338–1356. <https://doi.org/10.1111/bjet.13108>
- Valtonen, T., Leppänen, U., Hyypiä, M., Sointu, E., Smits, A., & Tondeur, J. (2020). Fresh perspectives on TPACK: Pre-service teachers’ own appraisal of their challenging and confident TPACK areas. *Education and Information Technologies*, 25(4), 2823–2842. <https://doi.org/10.1007/s10639-019-10092-4>
- VanLeeuwen, C. A., Veletsianos, G., Johnson, N., & Belikov, O. (2021). Never-ending repetitiveness, sadness, loss, and “juggling with a blindfold on”: Lived experiences of Canadian college and university faculty members during the COVID-19 pandemic. *British Journal of Educational Technology*, 52(4), 1306–1322. <https://doi.org/10.1111/bjet.13065>
- Walldorf, J., Jähnert, T., Berman, N. B., & Fischer, M. R. (2016). Using foreign virtual patients with medical students in Germany: Are cultural differences evident and do they

impede learning? *Journal of Medical Internet Research*, 18(9), e260–e260. <https://doi.org/10.2196/jmir.6040>

Zimmermann, F., Melle, I., & Huwer, J. (2021). Developing prospective Chemistry teachers' TPACK—A comparison between students of two different universities and expertise levels regarding their TPACK self-efficacy, attitude, and lesson planning competence. *Journal of Chemical Education*, 98(6), 1863–1874. <https://doi.org/10.1021/acs.jchemed.0c01296>

Copyright: © 2025. Vienne Lin and Paul Lam. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Exploring the digital divide among students of diverse demographic backgrounds: A survey of UK undergraduates

---

Xue Zhou <sup>A</sup>	A	<i>School of Business and Management, Queen Mary, University of London, United Kingdom</i>
Lei Fang <sup>B</sup>	B	<i>School of Mathematical Sciences, Queen Mary, University of London, United Kingdom</i>
Kumaran Rajaram <sup>C</sup>	C	<i>Nanyang Business School, Nanyang Technological University, Singapore</i>

---

### Keywords

---

Digital divide;  
digital literacy;  
digital resources;  
inclusive education;  
widening participants.

### Abstract

---

This research investigates the digital divide among undergraduate students across various demographic backgrounds at UK universities, focusing on the progression of this gap over three academic years. Through the theoretical lens of connectivism and analyzing data from 595 students in two business schools via a survey, this study explores the disparity in digital literacy between widening and non-widening participants between domestic and international students. Our findings indicate that Year 2 students display peak confidence in their digital abilities, which notably declines by Year 3. The digital divide between widening participants and their counterparts progressively exacerbates throughout the undergraduate journey. Distinctly, the division between home and international students is highlighted by their proficiency in particular digital skills, where each group excels in specific areas. Furthermore, we observe that formal educational resources do not meet the diverse needs of all student groups, thus potentially broadening the digital divide. In contrast, widening participants and international students often resort to online resources over traditional educational support. Drawing on these insights, we advocate for strategies that include continuous self-assessment, tailored support, and adaptability enhancement to bridge this digital divide and advance inclusive education.

---

### Correspondence

lei.fang@qmul.ac.uk <sup>B</sup>

---

### Article Info

Received 10 September 2024  
Received in revised form 17 January 2025  
Accepted 22 January 2025  
Available online 12 February 2025

DOI: <https://doi.org/10.37074/jalt.2025.8.1.22>

## Introduction

The digital divide — the gap between those who have ready access to digital technologies and those who do not — has been a focal point of scholarly inquiry for decades (e.g., Afzal et al., 2023; Clarke, 2012; Cruz-Jesus et al., 2016; Gorski, 2005; Hartnett, 2017; Teo & Divakar, 2021; Youssef et al., 2022). With the rapid evolution of technology and digital learning being part of the ecosystem of modern higher education (Alenezi, 2023; Rajaram, 2023), understanding this divide has become crucial, especially within the context of higher education (Van de Werfhorst et al., 2022; Yelland & Neal, 2013). This divide not only encompasses access to digital devices and the internet (Clarke, 2012; Hartnett, 2017) but also includes disparities in digital literacy and the effective use of technology for learning and professional development (Jaggars et al., 2021; Morgan et al., 2022).

Recent global events, particularly the COVID-19 pandemic and digital transformation in higher education driven by technological advancement, have intensified the reliance on digital technologies for educational purposes (De Nito et al., 2023; Peres et al., 2023; Sanni et al., 2022; Sato et al., 2023; Rajaram, 2021; Zhou et al., 2023; Zhou & Wolstencroft, 2020). This shift has spotlighted and potentially widened disparities among students from various demographic backgrounds (Jamil & Muschert, 2024; Karakose, 2021), as the digital divide is closely linked to broader societal inequalities (Tewathia et al., 2020). Lack of access to digital technologies and skills exacerbates disadvantages in both education and future employment (Vasilescu et al., 2020), which would have severe ramifications in the larger context of society and its growth, potentially widening social and economic inequalities, and hindering the development of a digitally skilled workforce. Therefore, bridging this gap is crucial for promoting educational equity and socio-economic mobility (Cheshmehzangi et al., 2023; Ucar et al., 2021). In the UK, concerns about equitable access to digital education are particularly pronounced among diverse undergraduate students, raising questions about inclusivity and fairness in educational outcomes (QAA, 2023; Rudolph, 2023, p. 242).

Despite the breadth of studies on the digital divide, there is a notable scarcity of focused research investigating these disparities among UK university students across different years of study and demographic features, particularly concerning widening and non-widening participants and between home and international students. In the context of Connectivism, learning is not only about acquiring information, but about navigating and forming connections within a network of digital resources, tools, and communities (Siemens, 2005). This theory emphasizes that disparities in access to digital tools and skills can limit students' capacity to build and leverage these networks effectively, thereby impacting their learning outcomes. Hence, it is essential to ensure that primary learning resources are readily accessible and that students have ease of mobility within digital networks to facilitate their academic and personal growth. This access supports their engagement and integration into the learning environment, ultimately contributing to optimal student development (Rajaram, 2023). The distinct impact of formal educational resources, like institutional

support versus self-learning and online resources, on digital disparities has not been thoroughly examined. To address this gap, we address the following research questions:

(1) Is there a digital divide among undergraduate students across different academic years, between widening and non-widening participants, and between home and international students?

According to Connectivism, a student's ability to access and interact with digital learning communities directly influences their learning potential (Siemens et al., 2020), because the connection empowers students to actively engage in collaborative learning, develop essential digital competencies, and apply knowledge in practical contexts.

(2) What are the support systems available to enhance digital skills? Specifically, how do formal educational resources, like institutional support, compare to self-learning and online resources in mitigating or exacerbating this digital divide? Investigating these support systems aligns with the principles of Connectivism by promoting equitable access to knowledge networks.

In pursuit of answers, we conducted a survey assessing digital literacy, information and communication technologies (ICT) attitudes, and access to digital resources among 595 undergraduate students from various UK business schools. Drawing on Connectivism theory, we conceptualize the digital divide as a multidimensional gap encompassing three dimensions. The first dimension, digital literacy, is essential for students to effectively engage with networked educational environments, serving as the basis for their interaction within digital learning communities (Siemens et al., 2020). The second dimension, students' ICT attitudes, impact their willingness and motivation to form and sustain connections within these communities (Chatterjee & Correia, 2020). The third dimension, access to digital resources, such as institutional support and self-directed online learning tools, supports the students' participation and successful connection to the learning networks (Alam, 2023).

The organization of this paper is as follows: Section Two reviews the existing literature pertinent to the topic. Section Three outlines the research methodology employed in this study. Section Four details the results and subsequent analysis. Section Five discusses the findings, and Section Six concludes the paper by summarizing key insights and suggesting directions for future research.

## Literature review

### Digital divide among different demographic groups of students

The concept of the digital divide has evolved in recent years, expanding beyond the basic question of access to digital tools (Clarke, 2012; Hartnett, 2017; Yelland & Neal, 2013) and incorporating more nuanced dimensions such as digital skills, proficiency, and effective utilization across various demographic groups (e.g., Afzal et al., 2023; Youssef et al., 2022; Lee, 2024). Inequalities in the usage of digital equipment continue to persist globally (Jamil &

Muschert, 2024; Van de Werfhorst et al., 2022), leading to differentiated educational outcomes (Jaggars et al., 2021; Morgan et al., 2022). The inequalities extend beyond access and competence. According to Ervianti et al. (2023), Morgan (2022), and Pala and Başıbüyük (2023), digital literacy plays a crucial role in determining academic performance. Students with lower digital proficiency face significant hurdles in their educational journey, further compounding pre-existing disadvantages (Karakose, 2021).

These disparities are often tied to socio-economic and educational backgrounds. For example, students from lower-income families often lack adequate access to digital devices, which limits their opportunities to practice and develop digital skills compared to their more privileged peers (Reddick et al., 2020). Additionally, students from educationally underprivileged backgrounds—such as those who attended schools in rural areas with limited technological resources—may not receive sufficient digital training during their early education, resulting in lower proficiency and confidence in using technology for academic purposes (Di Pietro, 2021). These disparities collectively widen the digital divide, limiting students' opportunities for academic achievement and reducing their ability to engage in digital learning environments effectively (Chinta et al., 2024).

### **Debate on the impact of digital transformation on educational equity**

There is an ongoing debate on whether digital transformation in higher education serves to bridge or widen the gap between disadvantaged students and their more privileged peers. On one hand, proponents argue that digital transformation represents a significant opportunity to democratize education, making it more accessible and equitable. Researchers like Clarke (2012), Habashi et al. (2023), Tartaglia (2020), and Yelland and Neal (2013) emphasize that the integration of digital tools in education can offer broader access to learning resources, flexible learning environments, and personalized learning experiences that can benefit all students, especially those who have historically been marginalized. These scholars highlight the potential for digital education to level the playing field by removing traditional barriers to learning, such as geographical limitations, financial constraints, and rigid scheduling.

On the other hand, critics argue that digital transformation may inadvertently perpetuate or even exacerbate the existing digital divide (Chinta et al., 2024; Scatiggio, 2020; Van de Werfhorst et al., 2022). For example, Chinta et al. (2024) caution that AI-driven educational systems and digital platforms may reinforce inequities, leading to discriminatory outcomes against marginalized groups. James et al. (2023) warn that algorithmic decision-making in digital education environments risks reinforcing inequities if not carefully monitored. This debate has gained more attention following the COVID-19 pandemic, which accelerated the transition to online learning and highlighted the existing digital divide, with some researchers warning that these disparities may have been intensified (Karakose, 2021; Jamil & Muschert, 2024).

### **Connectivism and the digital divide**

Connectivism provides a valuable lens for understanding the influence of digital access and networked knowledge on educational outcomes. As proposed by Siemens (2005), Connectivism suggests that knowledge is distributed across a web of connections, and that learning occurs as individuals interact, grow, and adapt within this network. According to Connectivism, knowledge resides in diverse opinions and that learning often happens outside the individual—within digital tools, networks, and other non-human appliances (Goldie, 2016; Siemens, 2004). The ability to form and maintain connections with specialized nodes or information sources is crucial, as is the capacity to locate knowledge ("know-where") rather than merely acquiring information ("know-what" and "know-how") (Siemens, 2004, 2005). In an education setting, a digital divide can emerge when some students lack the access or skills necessary to participate fully in these digital networks, thereby limiting their learning opportunities (Downes, 2022; Siemens et al., 2020).

Existing research underscores how the digital divide affects widening participation students—those from disadvantaged socio-economic backgrounds—often face barriers to accessing digital resources, which restricts their ability to engage with collaborative and networked learning environments (Clarke, 2012; Chinta et al., 2024). These barriers prevent them from effectively connecting with essential knowledge nodes, undermining their educational experience and potential outcomes. Similarly, international students frequently encounter challenges due to unfamiliarity with local digital tools and platforms, compounded by potential gaps in digital literacy shaped by their previous educational systems (Chang et al., 2014; Van De Werfhorst, 2022). From a Connectivism standpoint, the digital divide thus limits these students' ability to connect within the learning network, further widening the gap.

### **Resources and support to narrow the digital divide**

Connectivism advocates for equitable access to digital resources and networked learning opportunities, emphasizing the need for targeted interventions that address the distinct needs of these groups (Downes, 2022). While digital transformation has the potential to either bridge or widen educational gaps, the effectiveness of this process largely depends on the availability and quality of support and resources tailored to the needs of disadvantaged students. The importance of tailored support and resources in addressing the digital divide is underscored by various studies that examine the role of digital tools and strategies in mitigating educational disparities. Clarke (2012) and Tartaglia (2020) highlight that disadvantaged students often turn to online resources as a critical compensatory mechanism to overcome the barriers they face in digital literacy, effectively using digital resources themselves to narrow the existing digital divide.

Moreover, Yelland and Neal (2013) discuss the alignment of digital and social inclusion, emphasizing the need for equitable access to digital tools and resources. Their research demonstrates that providing access to technology is not

enough; there must be a concerted effort to integrate these tools into the broader educational context to ensure that disadvantaged students can fully benefit. This perspective is supported by McAleavy et al. (2020), who argue that in times of crisis, such as during the COVID-19 pandemic, it is crucial for governments and educational institutions to systematically audit the digital divide and implement distance learning regimes that are contextually appropriate. This approach ensures that all students, regardless of background, have access to quality education, even in challenging circumstances. A specific example of digital learning resources is the educational integration on mobile devices. Albert Gómez et al. (2018) illustrate how mobile digital resources (MDR) can enhance the motivation and engagement of students from disadvantaged backgrounds. By leveraging the ubiquity and accessibility of mobile technology, these resources provide a flexible and inclusive learning environment that caters to the needs of students who might otherwise be excluded from digital learning communities.

### Gaps in the current literature

While the digital divide between various student groups has been widely studied (e.g., Yelland & Neal, 2013; Afzal et al., 2023; Jamil & Muschert, 2024; Van de Werfhorst et al., 2022), there is still a shortage of empirical research, especially through the Connectivism lens, to explore the current state of digital divide in higher education, with an emphasis on inclusive education (Boyras & Ocak, 2021; Goldie, 2016; QAA, 2023). Additionally, the evolution of this digital divide over the three academic years has been largely overlooked. Moreover, there is a notable shortage of studies on the effectiveness of resources designed to support various demographic groups, especially disadvantaged students, in navigating and benefiting from digital resources (Selwyn, 2024). Existing literature on the digital divide often assumes a straightforward correlation between access to digital resources and improved educational outcomes, implying that simply providing technology can bridge educational gaps. Through the lens of Connectivism, we illustrate that true digital competency involves not only access but also the ability to effectively engage with and navigate digital networks (Siemens, 2005; Downes, 2022). Widening participation and international students, despite having access to digital tools, often lack the confidence and competencies to integrate fully into these learning networks.

## Methodology

### Research design and respondents

Our study employed a survey-based design to investigate the impact of digital literacy and ICT attitudes among undergraduate business students in the UK. A total of 595 students from Years 1 to 3 across two UK business schools participated in the survey, with data collected over the period from 2021 to 2023. A random sampling method was used to select participants, ensuring diverse representation across demographic backgrounds.

Demographic information was first collected to capture a comprehensive profile of the participants, including gender, age, English fluency, home student status, and ethnicity, as shown in Figure 1. This chart reveals a nearly equal gender split among participants, with 53.0% male and 46.6% female. Most respondents are aged 19-24 years (91.4%). A significant proportion of the participants are international students (60.3%) and fluent in English (69.8%). Ethnicity data shows a diverse cohort, predominantly Chinese (39.0%), Asian / Asian British (31.6%), and White (13.4%), with other ethnic groups making up a smaller percentage. The survey also investigated whether participants met any widening participation criteria, such as being the first in their family to attend higher education, receiving free school meals, or living in social housing. Figure 2 summarizes these metrics. Notably, 35.8% speak English as a second language, and 15.1% are the first in their family to attend higher education. Other categories, such as those living in social housing (3.4%) and those with a learning difficulty or disability (2.2%), are also represented.

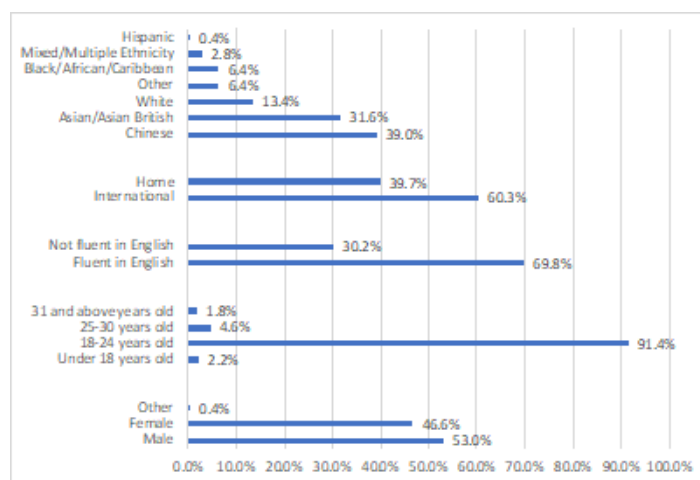


Figure 1. Distribution of participants by gender, age, course, English fluency, home student status, and ethnicity.

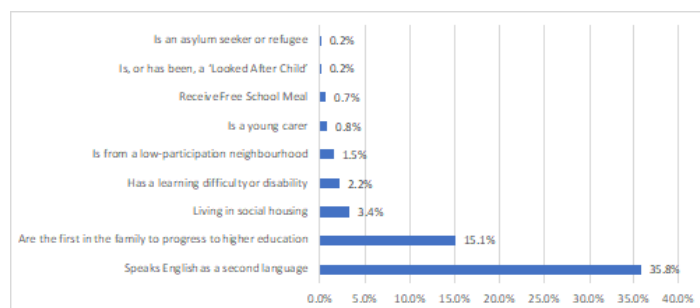


Figure 2. Distribution of participants meeting widening participation criteria.

### Measures and instrumentation

Data collection was conducted online to enhance accessibility and encourage participation. We used Qualtrics, an online survey platform, to collect and host the survey data.

Questions regarding digital literacy are detailed in Appendix (Table A1), scaled to a range of 0 to 5 for comparison. We designed our survey questions using a methodological framework informed by the JISC 2019 report (JISC, 2019).

Firstly, students self-assessed their overall digital literacy (Q1) to provide a baseline of their perceived capabilities. Secondly, attitudes towards digital learning were explored through questions (Q2\_1 to Q2\_7) gauging agreement with statements about ICT in learning, covering aspects like enjoyment, interest, motivation, self-directed learning, and the need for more ICT use by teachers. Thirdly, learning dimensions of digital literacy were examined through questions assessing confidence in technical skills, ability to learn new technologies, familiarity with various ICT tools, and collaboration skills using ICT (Q3\_1 to Q3\_5 and Q4\_1 to Q4\_5). The survey also evaluated proficiencies in ICT-based technologies across three categories: productivity tools (Q5\_1 to Q5\_8), creative tools (Q6\_1 to Q6\_4), and communication and collaboration tools (Q7\_1 to Q7\_4).

Finally, two open-ended questions provided deeper insights into the participants' challenges and the resources they use related to digital literacy and technology. The first question, "Have you encountered technical problems using the technologies? If yes, how did you resolve the problem?" (Q8\_1) aimed to understand the challenges faced by students and the strategies they employed to overcome these issues. The second question, "How do you gain your digital skills?" (Q8\_2) explored their learning processes and resources. A thematic analysis of these responses identified recurring themes, uncovering patterns and insights.

### Procedures and ethical considerations

Prior to the large-scale data collection, a pilot test was conducted to refine the survey and ensure the clarity of the questions. Ethical approval was obtained from the two participating institutions. Measures were in place to protect the anonymity and confidentiality of respondents, fostering an environment conducive to honest responses. Informed consent was obtained from all participants before the survey.

### Data analysis strategy

The quantitative data was processed to draw insights into digital literacy levels across demographic groups, focusing on widening participants vs. non-widening participants and home vs. international students. ANOVA and t-tests were utilized to compare digital literacy across students from various academic years and among distinct demographic groups. Thematic analysis was applied to open-ended responses, which helped in identifying patterns in students' digital skill acquisition and problem-solving strategies.

## Findings

### Existence of the digital divide

We find there is an existence of a digital divide across different demographic groups, particularly across different academic years, between widening and non-widening participants, and between international and home students.

### Digital divide across years

We find a significant gap across students of different years. The detailed results are presented in Table 1, where we used ANOVA to compare the three groups. The significant colour coding in Table 1 indicates significance levels, with lighter colours representing higher significance: dark grey for non-significance, light grey for significance at 5%, and white for significance at 1%. Figure 3 displays the mean values for all questions across the three academic years.

Table 1. ANOVA results comparing digital literacy across students from different academic years.

Variable	Year 1 Mean	Year 2 Mean	Year 3 Mean	F-statistic	p-value	Multiple Comparisons
Overall digital literacy	3.1524	3.3620	3.1076	3.4469	0.0325	Year 2>Year 1>Year 3
Students' attitudes to digital learning						
Q2_1	3.5084	3.4041	3.3247	1.7859	0.1686	Year 1=Year 2=Year 3
Q2_2	3.5142	3.2363	3.1477	1.8050	0.1654	Year 1=Year 2=Year 3
Q2_3	3.5344	3.4000	3.3867	1.6697	0.1893	Year 1=Year 2=Year 3
Q2_4	3.2956	3.2086	3.1881	0.7957	0.4518	Year 1=Year 2=Year 3
Q2_5	3.4610	3.5613	3.3757	1.4772	0.2292	Year 2=Year 1=Year 3
Q2_6	3.8349	3.9502	3.9196	0.7767	0.4604	Year 2=Year 1=Year 3
Q2_7	3.5026	3.5438	3.3927	1.0587	0.3476	Year 2=Year 1=Year 3
Learning dimensions of digital literacy						
Q3_1	2.9153	3.2354	2.9137	6.8824	0.0011	Year 2>Year 1>Year 3
Q3_2	3.3504	3.5356	3.2583	3.2996	0.0376	Year 2>Year 1>Year 3
Q3_3	3.3060	3.4724	3.1906	3.3718	0.0350	Year 2>Year 1>Year 3
Q3_4	2.9157	3.2618	2.7717	9.3168	0.0001	Year 2>Year 1>Year 3
Q3_5	3.1527	3.4456	3.2722	3.3929	0.0345	Year 2>Year 1>Year 3
Q4_1	3.0233	3.5621	3.1450	16.7813	0.0000	Year 2>Year 1>Year 3
Q4_2	3.4267	3.8512	3.3848	16.4801	0.0000	Year 2>Year 1>Year 3
Q4_3	3.3583	3.8009	3.2194	18.2353	0.0000	Year 2>Year 1>Year 3
Q4_4	3.5323	3.8744	3.4893	9.0534	0.0001	Year 2>Year 1>Year 3
Q4_5	3.2851	3.4003	3.2201	1.2088	0.2993	Year 2=Year 1=Year 3
Productivity tools						
Q5_1	2.9573	3.5322	3.2139	13.9462	0.0000	Year 2>Year 1>Year 3
Q5_2	2.6122	3.0146	2.9067	8.6517	0.0002	Year 2>Year 1>Year 3
Q5_3	3.1214	3.5829	3.3553	12.0525	0.0000	Year 2>Year 1>Year 3
Q5_4	3.2878	3.6579	3.2286	9.5293	0.0001	Year 2>Year 1>Year 3
Q5_5	3.4960	3.8533	3.4226	10.7020	0.0000	Year 2>Year 1>Year 3
Q5_6	3.3216	3.6233	3.4293	5.6284	0.0038	Year 2>Year 1>Year 3
Q5_7	3.4229	3.7849	3.4083	9.1011	0.0001	Year 2>Year 1>Year 3
Q5_8	3.2612	3.4958	3.4471	3.5313	0.0302	Year 2>Year 1>Year 3
Creative tools						
Q6_1	3.0348	3.1294	3.1395	0.6999	0.4971	Year 1=Year 2=Year 3
Q6_2	2.1114	2.2340	2.2492	0.9467	0.3886	Year 1=Year 2=Year 3
Q6_3	1.4971	1.6350	1.6921	1.7636	0.1724	Year 3=Year 2=Year 1
Q6_4	3.0571	3.4929	3.2574	7.6445	0.0005	Year 2>Year 1>Year 3
Communication and collaboration tools						
Q7_1	3.5566	4.0362	3.4486	17.6294	0.0000	Year 2>Year 1>Year 3
Q7_2	3.7743	4.1424	3.7818	8.0106	0.0004	Year 2>Year 1>Year 3
Q7_3	3.7932	4.1385	3.7458	8.8358	0.0002	Year 2>Year 1>Year 3
Q7_4	3.2142	3.5319	3.3615	5.2903	0.0053	Year 2>Year 1>Year 3

Note: A lighter colour implies higher significance. Dark grey cells imply non-significance, light grey cells imply significance at 5%, and white cells imply significance at 1%.

Year 2 students exhibited the highest digital literacy (Q1) with an average score of 3.3620, exceeding Year 1's 3.1524 and Year 3's 3.1076, a statistically significant outcome (p=0.0325). This unexpected result suggests that Year 2 students, having adjusted to the university's digital resources, are not yet challenged by the complexities of Year 3, where students nearing the workforce perceive a skills gap.

Students' attitudes towards digital learning (questions Q2\_1 through Q2\_7) showed no notable yearly changes, suggesting consistent ICT exposure across academic years.

In digital learning dimensions (Q3\_1 to Q4\_5), Year 2 students again scored highest. Notably, in ICT problem-solving (Q3\_1) and creating digital artifacts (Q3\_5), they scored 3.2354 and 3.4456 respectively, outperforming other years. This high performance did not carry into Year 3, potentially due to an increased focus on imminent job market challenges and perceived gaps in practical applications of their skills.

Productivity tools usage was highest in Year 2 across all tasks, with word processing (Q5\_1) scoring 3.5322. This peak performance extends to their use of spreadsheets and presentations. Year 3's lower scores reflect a focus shift toward final projects and job preparations.

Creative tools such as video and photo editing showed no significant yearly differences, maintaining consistently low confidence levels across all academic years. The lack of



improvement in creative skills, notably in video and photo editing, suggests inadequate integration of creative ICT tools in the curriculum.

For communication and collaboration tools, Year 2 scored highest at 4.0362 in using social media for education, emphasizing effective engagement and collaboration. Year 3's lower scores may indicate prioritization of individual job readiness over collaborative skills, indicating a need for enhancing participation in digital learning communities in the final year.

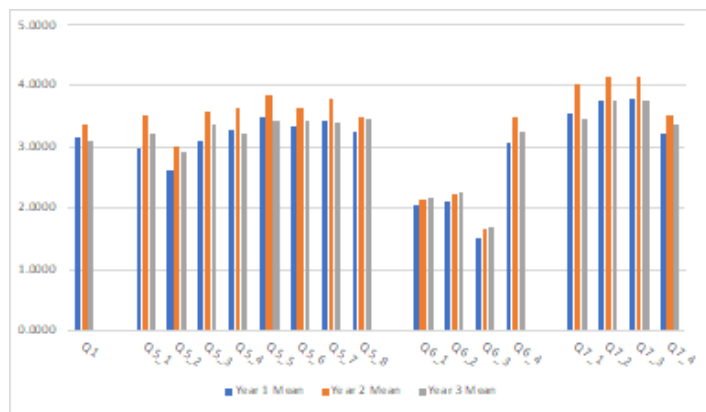


Figure 3. Comparison of the scores in proficiency of ICT-based technologies and digital literacy.

These results highlight the digital proficiency gap between different years, with Year 2 students generally exhibiting higher confidence and skills in digital literacy.

### Enlarging digital divide between widening and non-widening participants

T-tests were conducted for each question to assess disparities in digital literacy between widening and non-widening participants. The results, shown in Figure 4, use bar colour intensity to signify statistical significance: darker bars indicate significant differences at the 5% level, and lighter bars denote non-significance. Organized by academic year, the top, middle, and bottom plots of Figure 4 represent Year 1, Year 2, and Year 3 students, respectively. Each pair of bars has a 95% confidence interval, emphasizing the variability around the mean differences, with corresponding p-values displayed above. Standardizing all values to a 0-5 scale facilitates direct comparison across questions.

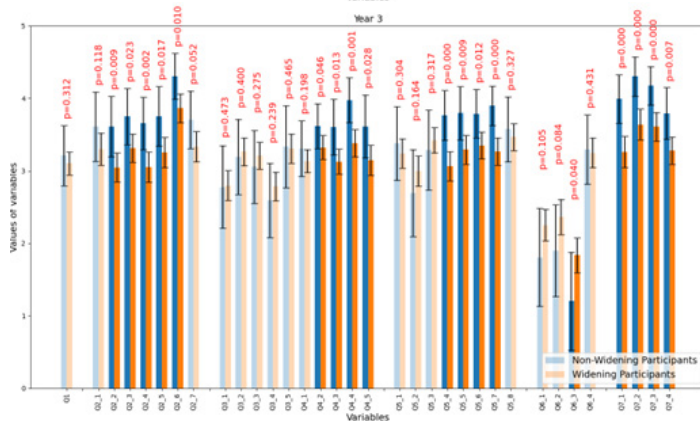
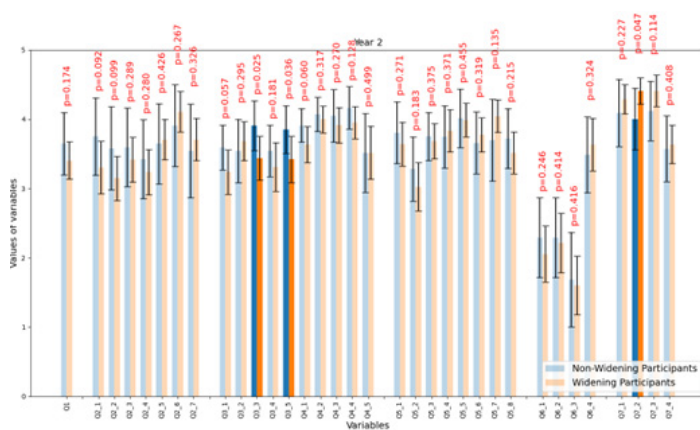
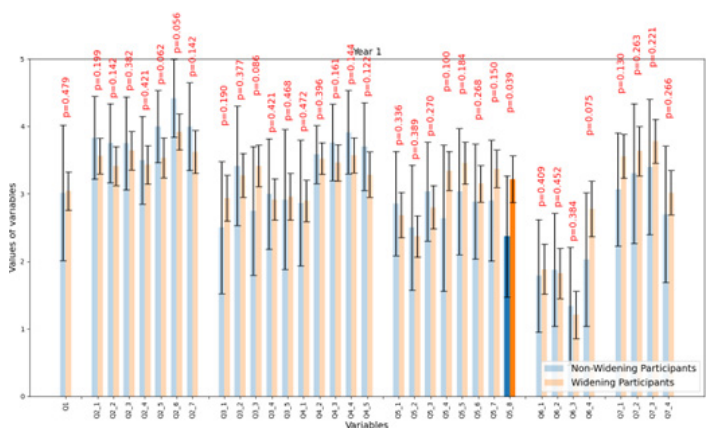


Figure 4. Temporal analysis of the enlarging digital divide between widening and non-widening participants across three academic years.

Note: Darker-coloured bars denote significant differences at the 5% level, while lighter-coloured bars represent non-significant outcomes. The top plot depicts Year 1 students, the middle plot for Year 2, and the bottom for Year 3. The height of the bars shows the mean value. A 95% confidence interval accompanies each pair of bars for the questions, and the p-values from the t-tests are prominently displayed above these bars. All values have been rescaled to a 0-5 range.

Year 1 students displayed minimal differences in digital literacy between widening and non-widening groups, with a notable exception in Q5\_8, where widening participants excelled in using learning management systems, such as Moodle, Locate, or the University student portal.

For Year 2 students, significant differences shifted towards learning dimensions of digital literacy and communication tools. Non-widening participants performed enhanced abilities in adapting to new technologies (Q3\_3) and using ICT for learning and creating digital artifacts (Q3\_5). Conversely, widening participants exhibited superior skills in instant messaging technologies (Q7\_2), reflecting a stronger inclination towards maintaining social connections digitally, which is less academically focused.

In Year 3, the disparity widened significantly, with non-widening participants excelling in 17 out of 34 metrics. This suggests that educational support systems are benefiting non-widening participants more, allowing them to advance more rapidly in areas ranging from basic digital literacy (Q1) to

ICT competencies across multiple domains such as attitudes to digital learning (Q2\_1 to Q2\_7), learning dimensions of digital literacy (Q3\_1 to Q3\_5, Q4\_1 to Q4\_5), and proficiency in productivity and creative tools (Q5\_1 to Q5\_8, Q6\_1, Q6\_2, Q6\_4). The exception was Q6\_3, concerning web design software, where widening participants scored higher.

The initial uniformity in digital skills suggests an equitable beginning; however, the trajectory favouring non-widening participants raises questions about the inclusivity and effectiveness of current educational strategies aimed at widening participants.

### Digital divide between international and home students

We conducted a similar analysis comparing the digital literacy and proficiency of home versus international students (see Figure 5) but did not examine trends across the three academic years due to the absence of a clear temporal pattern.

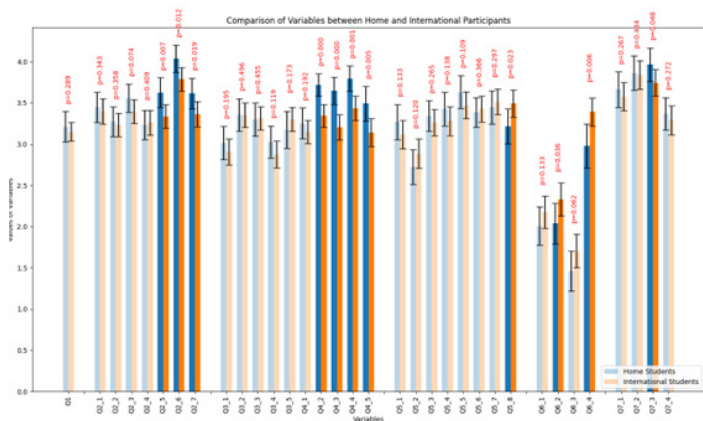


Figure 5. The digital divide between home and international students.

Note: Darker-coloured bars denote significant differences at the 5% level, while lighter-coloured bars represent non-significant outcomes. The height of the bars shows the mean value. A 95% confidence interval accompanies each pair of bars for the questions, and the p-values from the t-tests are prominently displayed above these bars. All values have been rescaled to a 0-5 range.

Home students demonstrated a robust foundation in digital literacy, excelling in areas such as self-directed learning through ICT, leveraging mobile technologies for learning, and advocating for more ICT integration by teachers, as evidenced by their higher scores in Q2\_5, Q2\_6, and Q2\_7. Furthermore, their proficiency in navigating web-based resources, evidenced by higher scores in Q4\_2, Q4\_3, and Q4\_4, and their adeptness at collaborating online, as seen in Q4\_5 and Q7\_3, underscore their stronger foundation in digital literacy. This advantage is likely due to consistent exposure to the national education system aligned with their university's digital tools.

International students outperformed in productivity and creative tools such as using learning management systems (Q5\_8), photo and image editing software like Photoshop

(Q6\_2), and content marketing skills involving blog posts and YouTube (Q6\_4), reflecting their diverse educational backgrounds might emphasize practical digital tool usage. However, they faced challenges in self-directed learning and ICT integration.

### Digital literacy-related support and resources

The former findings highlighted a significant digital divide between widening and non-widening participants, as well as between home and international students. These gaps underscore the need for tailored support mechanisms that can bridge these divides and ensure equitable access to digital competencies. This section delves into the types of support and resources that are currently in place and evaluates their effectiveness.

### Encountering and resolving technical problems using technologies

The survey responses to Q8\_1, "Have you encountered technical problems using the technologies? If yes, how did you resolve the problem?", reveal significant insights into the experiences of widening and non-widening participants across different academic years. The themes derived from thematic analysis and the comparison of technical problem resolution between widening and non-widening participants for Year 1 and Year 3 are reported in Figure 6.

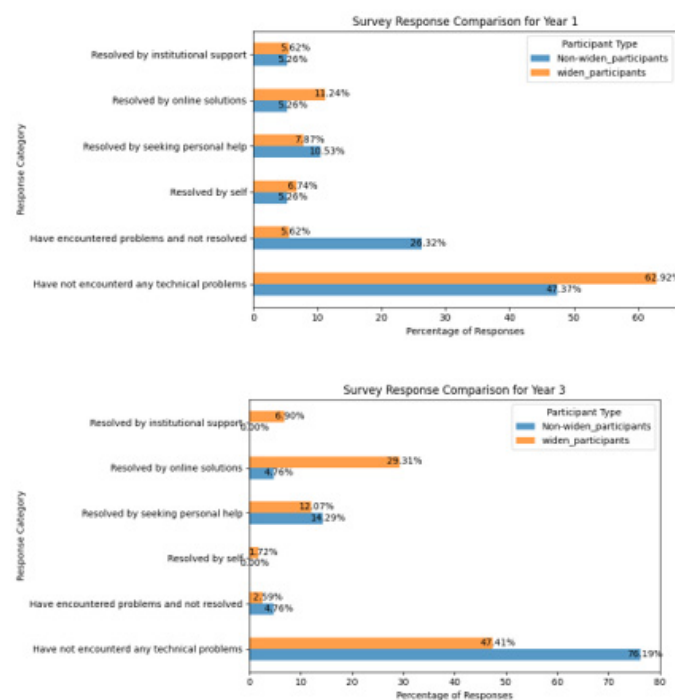


Figure 6. Comparison of technical problem resolution between widening and non-widening participants for Year 1 and Year 3.

In Year 1, widening and non-widening participants had similar rates of resolving technical issues through institutional support and personal help. However, a notable difference was observed in the "have not encountered any technical

problems” category, with 62.92% of widening participants reporting no issues compared to only 47.37% of non-widening participants. Additionally, a significant disparity was seen in unresolved problems—26.32% of non-widening participants did not resolve their issues, compared to only 5.62% of widening participants. Widening participants also utilized online solutions for problem resolution (11.24%) more frequently compared to non-widening participants (5.26%).

By Year 3, the disparity widened: 76.19% of widening participants reported no technical problems, significantly higher than 47.41% of non-widening participants. The use of online solutions increased markedly for widening participants to 29.31%, compared to just 4.76% for non-widening participants. The findings suggest a growing proficiency and proactive approach among widening participants in using online resources to resolve issues, contrasting with higher unresolved problems among non-widening participants.

Both groups similarly addressed technical issues, though widening participants showed a more proactive approach in Year 1. By Year 3, a notable shift occurred: a greater share of widening participants reported no technical issues and made more use of online solutions. This increase might seem to *contradict* the observed broadening digital divide from earlier sections, where widening participants appeared disadvantaged. However, these earlier assessments involved comprehensive digital literacy aspects such as overall proficiency and specific skill sets, while Q8\_1 focused solely on technical problem-solving. Widening participants have developed effective strategies for dealing with technical issues via online solutions, even if their general digital proficiency remained lower. Further discussion on the apparent contradiction will be discussed in Section 4.2.2.

Figure 7 reports on how international and home students tackled technical issues during their studies. For Year 1 students, more international students (63.33%) did not have technical problems than home students (55.32%). Both groups were similarly inclined to seek personal help, around 8.3% each, but international students more frequently resolved issues online (12.77% vs. 8.33%). They also outpaced home students in self-resolving issues (10.64% vs. 3.33%).

For Year 3 students, the usage of online solutions rose for international students (28.87%) compared to home students (17.50%), and the gap in encountering no technical problems closed between the groups. Consistently, around 12.4% of each group sought personal help. Minor differences in institutional support usage persisted, and fewer students from both groups resolved issues independently, with international students at 1.72% and home students at none. The percentage of students not encountering any technical problems nearly equalized, with 51.55% of home and 52.50% of international students reporting no issues.

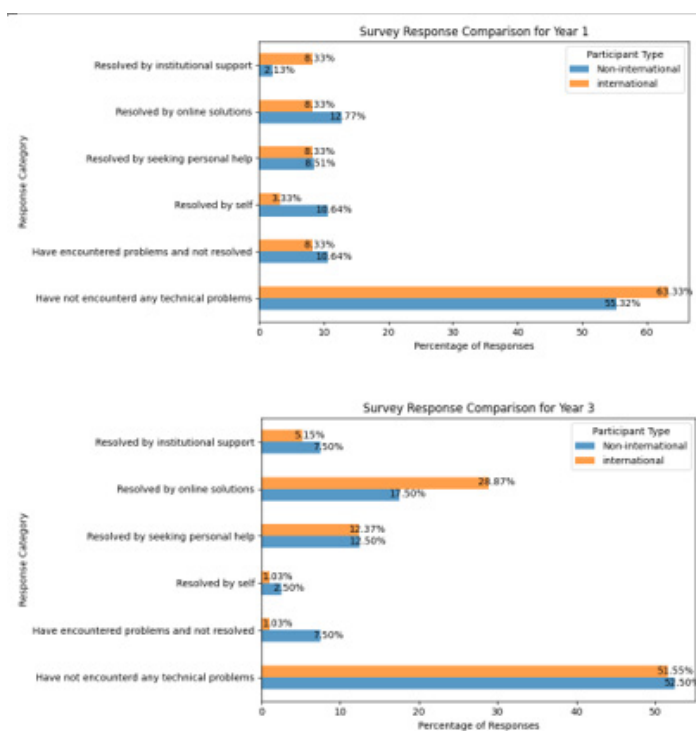


Figure 7. Comparison of technical problem resolution between home and international students for Year 1 and Year 3.

### Acquiring digital skills

The survey responses to Q8\_2 “How do you gain your digital skills?” reveal notable differences in the methods used by widening and non-widening participants across different academic years. The seven themes identified from the thematic analysis and the comparison between the two groups are reported in Figure 8. The Year 1 data show non-widening participants more frequently embracing self-learning (52.38%) compared to widening participants (38.46%). Online resources are also widely utilized by both groups, though slightly more by widening participants (26.92% vs. 23.81%). There is a stark contrast in reliance on formal education, with 19.23% of widening participants using it, far more than non-widening participants at 4.76%. Notably, a higher proportion of widening participants (9.52%) adopt mixed learning methods than non-widening participants (1.28%), with some reporting no access to digital learning opportunities (7.69% widening vs. 9.52% non-widening).

For Year 3 students, preferences shift notably; 50% of non-widening participants depend heavily on formal education, a significant rise from Year 1. Conversely, widening participants’ use of online resources increases to 34.75%. In contrast, only 4.17% of non-widening participants engage with online resources, indicating a decline. Self-learning rates decrease among non-widening participants to 25%, while 23.73% of widening participants persist with this method. Moreover, non-widening participants more commonly use mixed methods (16.67%) compared to widening participants (8.47%). Interestingly, by the third year, all non-widening participants report some access to digital skills development, unlike a small percentage of widening participants (3.39%) who still find themselves

without opportunities. This evolution underscores a growing divergence in learning strategies between the two groups over their academic journey.

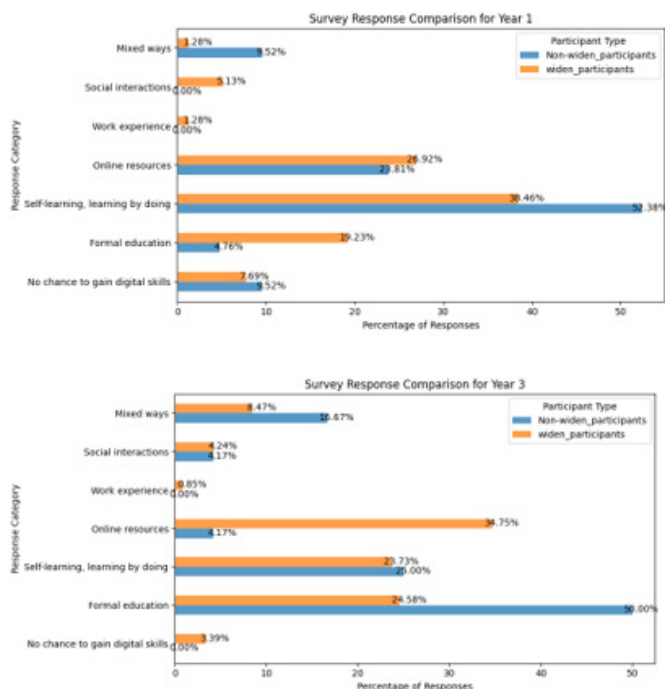


Figure 8. Comparison of resources on gaining digital skills between widening and non-widening participants for Year 1 and Year 3.

After three years of undergraduate education, non-widening participants heavily relied on formal education to develop their digital skills, while widening participants depended more on online resources. This observation is consistent with the results of Q8\_1, where non-widening participants showed a higher percentage of encountering and resolving technical problems using institutional support. The contradiction noted earlier, where non-widening participants were found to be in a better situation regarding overall digital literacy, can be explained by this reliance on formal education. While formal higher education appears to favour non-widening participants, thereby enlarging the digital divide, widening participants have been compensating by turning to online resources to bridge this gap. This will be discussed further in Section 5.2.

Figure 9 illustrates these differences between home and international students over the years. For Year 1 students, a significant percentage of international students (29.82%) reported using online resources to gain digital skills, compared to 19.51% of home students. International students also showed a higher reliance on formal education (21.05%) compared to home students (9.76%) in Year 1. Conversely, a higher percentage of home students (51.22%) engaged in self-learning and learning by doing compared to home students (35.09%).

In Year 3, the patterns evolved. The reliance on online resources remained high for international students (36.27%) and decreased for home students (12.50%). Meanwhile, the percentage of students relying on formal education grew

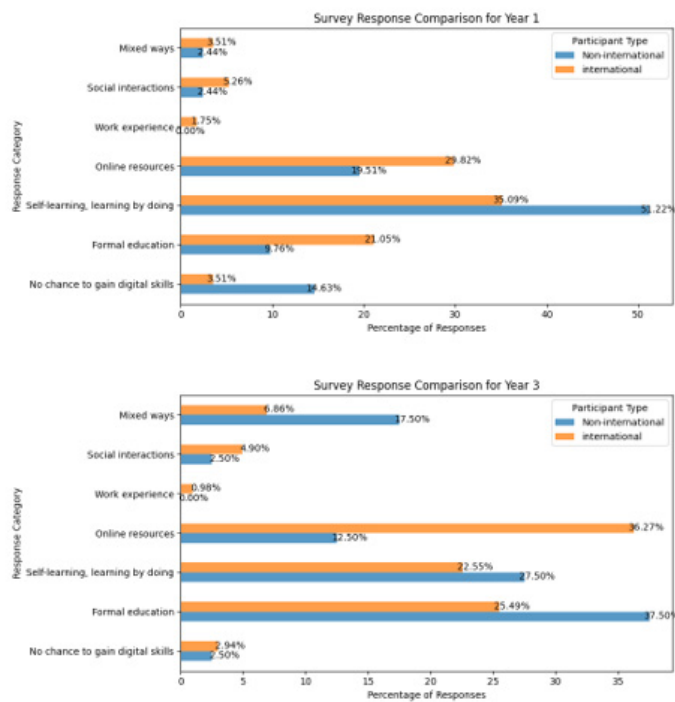


Figure 9. Comparison of resources on gaining digital skills between home and international students for Year 1 and Year 3.

for both groups but remained higher for home students (37.50%) compared to international students (25.49%). The engagement in self-learning and learning by doing showed a notable decrease, with 27.50% of home students and 22.55% of international students adopting this method.

International students consistently relied more on online resources throughout their academic journey, likely due to their need for flexible and accessible learning options. Home students, on the other hand, increasingly benefited from formal education, reflecting possibly better integration into structured educational support systems. These findings highlight the need for tailored support strategies that address the distinct preferences and needs of international and home students in acquiring digital literacy.

## Discussion

Our study aims to examine the digital divide across various demographic backgrounds and evaluate the effectiveness of the existing digital support and resources available to students. The findings reveal an expanding digital divide, aligning well with the existing research on the prevalence of digital inequalities (e.g., Jamil & Muschert, 2024; Van de Werfhorst et al., 2022). These disparities often result in discriminatory outcomes, as the digital divide may inadvertently perpetuate existing biases (Chinta et al., 2024; Scatiggio, 2020; Van de Werfhorst et al., 2022) and can significantly affect educational outcomes (Jaggars et al., 2021; Morgan et al., 2022; Youssef et al., 2022). Our study specifically focuses on the progression of this gap over a three-year academic journey, which has rarely been explored in previous research. Additionally, extending existing studies on strategies to narrow the Digital divide

(e.g., Afzal et al., 2023; Khan et al., 2023), we assess existing support mechanisms and their efficacy in addressing these disparities and propose strategic measures to mitigate them effectively.

### **The Digital divide through the theoretical lens of Connectivism**

Through the lens of Connectivism, our research contributes to the ongoing debate regarding the impact of digital transformation on educational disparities (Clarke, 2012; Habashi et al., 2023; Karakose, 2021; Tartaglia, 2020; Yelland & Neal, 2013). In the context of undergraduate students in the UK, we show that digital transformation exacerbates the digital divide over three academic years and between widening and non-widening students. Additionally, our findings provide a granular perspective, revealing distinct areas of strength between home and international students. Echoing studies on Connectivism (e.g., Downes, 2022; Siemens et al., 2020), this widening divide reflects unequal access to the digital networks and resources essential for knowledge acquisition and skill development. Widening participation students, often from disadvantaged backgrounds, and international students face specific barriers in effectively integrating into the digital learning environment due to limited familiarity with or access to institutional digital support (Chinta et al., 2024). This hinders their capacity to form and sustain the connections needed for continual learning, as Connectivism emphasizes (Siemens, 2004, 2005; Goldie, 2016). The distinct digital skills gap, where home students excel in areas such as collaborative digital tools while international students perform better in creative digital skills, suggests that students' digital literacy development is unevenly supported by the current educational infrastructure.

The following discussion will offer targeted solutions and recommendations based on our empirical findings, aimed at enhancing students' capacity to establish and sustain connections within digital knowledge networks, as highlighted by Connectivism principles.

#### ***The enlarging digital divide over the three years — continuous self-assessment***

Our findings reveal that Year 2 students exhibited the highest confidence in their digital skills, a proficiency that unexpectedly declined by Year 3. This decline could be attributed to a range of factors, including the increased academic and practical demands encountered in the final year, which may challenge students' existing competencies. One possible explanation is that while Year 2 students may feel confident with their foundational digital skills, they may experience a sudden realization of unmet advanced skill requirements as they approach real-world applications and career-related tasks. This pattern suggests a potential gap in ongoing digital skill development and support tailored to evolving academic and professional expectations. An alternative explanation might be the pressure of increased academic workload and preparation for post-graduate opportunities, which could shift focus away from digital skill development. Potential confounding factors may

include variations in support provided across academic years, differences in exposure to internships or practical work experiences, or individual differences in adaptability to digital demands.

Inspired by the research of self-assessments and tracking students' learning analytics (Ifenthaler et al., 2023), this observation underscores the urgent need for continuous self-assessment to prevent last-minute surprises in the final year, which often proves too late for effective intervention. Implementing regular feedback mechanisms and adaptive learning modules could help students identify and address their skill gaps in real time, ensuring they are better equipped for both academic and professional challenges. Such strategies would also contribute to a more resilient and capable graduate cohort.

#### ***The enlarging digital divide between widening and non-widening participants — effective support mechanisms for evolving needs***

Our study illuminates a concerning trend where the digital divide between widening and non-widening participants expands throughout undergraduate education, aligning well with existing research (e.g., Judijanto et al., 2022; Lee, 2024; Salas-Pilco et al., 2022). Initially, students enter their academic journey on generally equal footing regarding digital literacy. However, a significant divergence emerges as they progress, heavily favouring non-widening participants. This growing disparity points to potential flaws within the educational system, particularly in how it supports students who meet widening participation criteria. Such students often come from backgrounds that might already pose barriers to academic and technological access, and the failure to address these barriers adequately throughout their university tenure contributes to their lagging behind their peers.

The increasing gap underscores the necessity for educational strategies that align and adapt to meet their evolving needs through targeted interventions. Schools may implement more effective support mechanisms, such as personalized learning plans (Shemshack et al., 2020; Pratama et al., 2023) and enhanced access to digital resources, which cater specifically to the needs of widening participants. Additionally, continuous monitoring and adjustment of educational strategies will be crucial to ensure that all students can thrive in an increasingly digital learning environment as suggested by Connectivism, fostering a more inclusive digital learning community.

#### ***The digital divide between home and international students across different types of digital skills — tailored support***

We find that home students excel in utilizing ICT for cooperation and advocating for increased ICT integration in education, benefiting from the alignment between their national education systems and university resources. In contrast, international students demonstrate superior skills in creative tools, reflecting their diverse educational backgrounds, but they face challenges in self-directed

learning and ICT integration. Our findings complement research on the challenges faced by international students in the post-pandemic era (Steyn & Gunter, 2023; Zhao & Xue, 2023), highlighting the distinct strengths and challenges encountered by home and international students in digital literacy.

The finding underscores the necessity for tailored support strategies to ensure all students can fully benefit from digital resources, e.g., enhancing support for home students in creative digital skills such as photo editing and content marketing. For international students, greater access to and integration with the institution's broader ICT resources would help improve their digital competencies. This approach resonates with the findings of Rodríguez-Abitia et al. (2020), who highlight that contextual factors are crucial in determining how effectively an institution can leverage technology to enhance its education quality.

### ***Digital support and resources — developing adaptive skills, integrating online resources into curriculum, and preventing technological stagnation***

The previous discussions underscored the significant digital divide among different student demographics. This emphasizes the necessity for customized support and resources to bridge these divides.

For widening participants and international students, there is a clear benefit in enhancing access to robust online learning platforms and resources, coupled with support systems that encourage self-directed learning and problem-solving. This finding aligns with Tartaglia (2020) and Clarke (2012), who observed that disadvantaged students increasingly turn to online and digital resources as a means to bridge the digital divide.

This apparent contradiction to the broader digital divide observed in earlier sections, where widening participants were generally at a disadvantage, highlights a critical aspect of digital literacy: the capacity to adapt and utilize available resources to solve problems (Green et al., 2020; Sato et al., 2023). It indicates that widening participants and international students, perhaps out of necessity or facilitated by targeted interventions, become adept at navigating online platforms and tools, which may not be captured fully by traditional measures of digital literacy. This adaptation may serve as a compensatory mechanism, allowing these students to bridge gaps in their digital skills independently. Given these observations, educational strategies should focus on the development of such adaptive skills early in the educational journey. Providing robust online resources, coupled with training on how to effectively use these tools, could significantly benefit widening participants. For international students, the sustained use of online resources suggests that institutions integrate these online resources more deeply into the curriculum to support them better. This strategy echoes existing literature recommending the integration of technology into teaching (Ashour, 2020; Rajaram, 2021, Rajaram, 2023). Furthermore, fostering an educational environment that encourages experimentation and self-directed learning with digital tools might help

reduce the initial disparities observed and prepare all students more equally for the technological demands of the modern workplace.

It is notable that formal educational resources, such as institutional support and formal education, tend to favour non-widening and home students, possibly due to these groups having better access to or familiarity with the educational system's infrastructure. The finding extends Hoare and Johnston (2011) and O'Toole et al. (2024) on how students get formal education resources and gain a sense of fit with institutional systems. This discrepancy further calls for a reassessment of how support services are distributed and tailored, ensuring that interventions effectively address students' unique needs to bridge the digital divide truly.

For home and non-widening students, efforts might focus more on challenging the existing competencies and pushing the envelope on incorporating advanced digital tools and collaborative platforms into the learning experience to prevent technological stagnation (Zhao, 2009; Cucinelli & Farhan, 2024).

### **Conclusion**

Our study offers insights into the digital divide among undergraduate students from various demographic backgrounds across UK universities, particularly within business schools. The analysis illuminates that the digital divide evolves throughout students' academic journeys, with students facing a stark realization of their insufficient digital competencies when transitioning into job markets. This realization underscores a critical need for enhanced practical digital skills to meet real-world demands and continuous self-assessment. Furthermore, the disparities between the widening participants and their peers not only endure but broaden. The distinction between home and international students is particularly nuanced, with each cohort excelling in specific digital competencies, which suggests differentiated educational needs and supports. Overall, our study findings suggest that addressing the digital divide requires proactive, tailored interventions that evolve with students' academic progress, particularly for widening participants, while also recognizing and leveraging the distinct digital strengths of home and international students to foster a more inclusive educational environment.

### **Theoretical implications**

Through the theoretical lens of connectivism, our findings enrich the ongoing discussion on the role of digital educational resources in either mitigating or exacerbating the digital divide (Clarke, 2012; Habashi et al., 2023; Karakose, 2021; Tartaglia, 2020; Yelland & Neal, 2013). By conceptualizing digital competency as more than mere access to technology—encompassing the skills required to engage and navigate digital networks effectively—our findings challenge the common assumption in the existing literature that access to digital resources alone can bridge educational gaps. This perspective underscores the importance of providing resources and cultivating the skills

necessary for students to fully integrate into digital learning environments. We found that formal educational resources often do not equally meet the needs of all student groups, with widening participation and international students tending to rely more on online resources than on institutional support. This insight underscores the need for educational institutions to reassess their support structures to ensure they are inclusive and accessible to all students (QAA, 2023), so as to enhance students' capacity to establish and sustain connections within the digital learning communities (Siemens, 2005; Siemens et al., 2020).

### Broader practical implications beyond UK universities

Our research contributes to the existing body of literature by investigating how the digital divide evolves across different academic years. While prior studies have predominantly addressed global disparities in digital access and equipment usage (Hartnett, 2017; Jamil & Muschert, 2024; Van de Werfhorst et al., 2022), our study offers a more nuanced exploration of the evolution of digital skills across the three academic years, within the context of UK higher education.

The digital divide faced by widening participation and international students is not unique to the UK; similar challenges have been documented in other countries experiencing rapid digital transformations in their education systems (e.g., Jamil & Muschert, 2024), especially when students have diverse learning requirements (Tomlinson, 2014). For instance, students in countries with less developed digital infrastructure often struggle with equitable access to learning technologies, which reinforces socio-economic inequalities (Akinlar et al., 2023; AISadrani et al., 2020; Cheshmehzangi et al., 2023; Tewathia et al., 2020; Ucar et al., 2021).

Our findings and proposed solutions can be applied internationally, considering contextual differences across regions. First, continuous self-assessment is crucial globally for identifying and addressing issues early, allowing institutions to implement targeted interventions that more effectively bridge the digital divide (Chang et al., 2004). Providing tailored support for different demographic groups is another key area for global application. Additionally, fostering adaptability in students serves as a vital compensatory mechanism for those who are disadvantaged in their digital skills (Kholiavko et al., 2021). Integrating adaptive digital skills and online resources into curricula is vital to prevent technological stagnation, particularly in developed countries, where ensuring that educational practices keep pace with technological advancement is crucial for inclusive educational progress.

### Limitations and future research

While our study offers valuable insights, it is not without limitations. The scope of our research was confined to a specific group of students within UK business schools. The study primarily reflects the experiences of students in specific institutional settings, which may not fully represent the diverse experiences of students across different regions

and academic areas. Additionally, the use of self-reported data introduces potential bias, as participants' responses may be influenced by personal perceptions, which could impact the objectivity of the results. Future research could expand on this by including a broader range of students from different disciplines and conducting longitudinal studies to assess the long-term impact of digital literacy on academic performance.

Moreover, our study primarily focused on the quantitative analysis of digital literacy. Future studies could benefit from incorporating qualitative methods to gain a deeper understanding of students' personal experiences and challenges in developing digital skills.

Furthermore, this study did not incorporate questions or discussions on Generative AI (GenAI) since the survey questionnaire was designed before its widespread use. As AI technologies—particularly GenAI—are becoming more prevalent, it would be beneficial to explore their impact on higher education (e.g., Chaka, 2024; Mills et al., 2023; Rudolph et al., 2023; Sevnarayan & Potter, 2024). Future studies should investigate how GenAI tools like ChatGPT influence students' learning processes, potentially reshaping fair and inclusive education (Rudolph, 2023, p. 424).

Finally, the exploration of the ethical and social dimensions of digital literacy, specifically in the digital divide and "digital poverty" aspects (Manduna, 2016; Setthasuravich & Kato, 2020), could add value as an essential layer to this important ongoing conversation. Addressing these issues from a more inclusive and accessible standpoint would provide a more comprehensive view of the digital landscape in higher education. Overall, these areas represent promising avenues for further exploration to build on our findings.

## Appendix

Table A1. Questions from the survey on students' digital literacy, ICT attitudes towards digital learning experiences, and digital resources and support.

Overall digital literacy	
Q1	How would you rate your digital literacy on a scale of 0-5? 0 is very poor and 5 is that you are an expert
Students' attitudes to digital learning	
Q2_1	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I like using ICT for learning
Q2_2	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I learn better with ICT
Q2_3	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - ICT makes learning more interesting
Q2_4	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I am more motivated to learn with ICT
Q2_5	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - ICT enables me to be a self-directed and independent learner
Q2_6	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - There is a lot of potential in the use of mobile technologies (e.g. mobile phones, PDAs, iPods, tablets etc.) for learning
Q2_7	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - Teachers/lecturers should use more ICT in their teaching of my classes
Learning dimensions of digital literacy	
Q3_1	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I know how to solve my own technical ICT problems.
Q3_2	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I can learn new technologies easily.
Q3_3	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I keep up with important new technologies.
Q3_4	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I know about a lot of different technologies.
Q3_5	Please indicate how agreeable you are with the following by circling the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I have the technical skills I need to use ICT for learning and to create artefacts (e.g. presentations, digital stories, wikis, blogs) that demonstrate my understanding of what I have learnt
Q4_1	Please indicate how agreeable you are with the following by dragging the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I have good ICT skills

Q4_2	Please indicate how agreeable you are with the following by dragging the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I am confident with my search and evaluate skills in regards to obtaining information from the Web
Q4_3	Please indicate how agreeable you are with the following by dragging the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I am familiar with issues related to web-based activities e.g. cyber safety, search issues, plagiarism
Q4_4	Please indicate how agreeable you are with the following by dragging the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - ICT enables me to collaborate better with my peers on project work and other learning activities
Q4_5	Please indicate how agreeable you are with the following by dragging the appropriate number at right. 0 is strongly disagree and 5 is strongly agree. - I frequently obtain help with my university work from my friends over the Internet e.g. through Skype, Facebook, Blogs
<b>Proficiencies of ICT-based technologies</b>	
<b>Productivity tools</b>	
Q5_1	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Word processor: Word or Pages
Q5_2	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Spreadsheet: Excel, Numbers
Q5_3	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Presentation: PowerPoint, Keynote, Prezi
Q5_4	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Mobile devices organiser: address book, appointments
Q5_5	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Online documents organiser: Google Docs, Onedrive, Dropbox
Q5_6	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Reference information for study purpose: Online Dictionaries, Content specific websites
Q5_7	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Information Search: news, holidaying, even timetables
Q5_8	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Learning management system in the university: Moodle, Locate, University student Portal
<b>Creative tools</b>	
Q6_1	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Video editing: iMovie, MovieMaker, Screencast-O-Matic
Q6_2	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Photo/image editing: Photoshop, Photoscape
Q6_3	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Web design software: Dreamweaver, Frontpage, Wikispace
Q6_4	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Content Marketing: Blog posts, Youtube, Podcasts, Infographics
<b>Communication and collaboration tools</b>	
Q7_1	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Social Media: Facebook, Twitter, LinkedIn, Myspace
Q7_2	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Instant Message: What's up, Skype, Wechat, MSN, ICQ
Q7_3	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - Email: Yahoo, Gmail, Outlook, Hotmail
Q7_4	Please indicate your proficiency of using different ICT-based technologies. 0 is very poor and 5 is that you are an expert. - In-class discussion apps: Padlet, Kahoot, Socrative
<b>Problems, support, and resources</b>	
Q8_1	Have you encountered technical problems using the technologies? If yes, how did you resolve the problem?
Q8_2	How do you gain your digital skills?

## References

Afzal, A., Khan, S., Daud, S., Ahmad, Z., & Butt, A. (2023). Addressing the digital divide: Access and use of technology in education. *Journal of Social Sciences Review*, 3(2), 883-895. <http://dx.doi.org/10.54183/jssr.v3i2.326>

Alam, M. A. (2023). Connectivism learning theory and connectivist approach in teaching and learning: A review of literature. *Bhartiyam International Journal of Education & Research*, 12(2). [https://www.researchgate.net/publication/369734538\\_Connectivism\\_Learning\\_Theory\\_and\\_Connectivist\\_Approach\\_in\\_Teaching\\_and\\_Learning\\_A\\_Review\\_of\\_Literature](https://www.researchgate.net/publication/369734538_Connectivism_Learning_Theory_and_Connectivist_Approach_in_Teaching_and_Learning_A_Review_of_Literature)

Albert Gómez, M. J., Pérez Molina, C., García Pérez, M., Ortega Sánchez, I., & Castro, M. (2018). Influence of the mobile digital resources (mdr) conceptual model in motivation of disadvantaged students. In *Teaching and learning in a digital world: Proceedings of the 20th International conference on interactive collaborative learning—Volume 1* (pp. 317-322). Springer International Publishing. [https://doi.org/10.1007/978-3-319-73210-7\\_38](https://doi.org/10.1007/978-3-319-73210-7_38)

Akinlar, A., KAMIŞLI, M. U., Yildiz, H. S., & Bozkurt, A. (2023). Bridging the digital divide in migrant education: Critical pedagogy and inclusive education approach. *Journal of Qualitative Research in Education*, (36), 30-53. <http://dx.doi.org/10.14689/enad.36.1646>

Alenezi, M. (2023). Digital learning and digital institution in

higher education. *Education Sciences*, 13(1), 88. <https://doi.org/10.3390/educsci13010088>

AlSadrani, B., Alzyoudi, M., Alsheikh, N., & Elshazly, E. E. (2020). The digital divide in inclusive classrooms. *International Journal of Learning, Teaching and Educational Research*, 19(3), 69-85. <https://doi.org/10.26803/ijlter.19.3.5>

Ashour, S. (2020). How technology has shaped university students' perceptions and expectations around higher education: An exploratory study of the United Arab Emirates. *Studies in Higher Education*, 45(12), 2513-2525. <https://doi.org/10.1080/03075079.2019.1617683>

Attewell, P. (2001). Comment: The first and second digital divide. *Sociology of Education*, 74(3), 252-259. <https://doi.org/10.2307/2673277>

Boyras, S., & Ocak, G. (2021). Connectivism: A literature review for the new pathway of pandemic driven education. *International Journal of Innovative Science and Research Technology*, 6(3), 1122-1129. [https://www.researchgate.net/publication/350966425\\_Connectivism\\_A\\_Literature\\_Review\\_for\\_the\\_New\\_Pathway\\_of\\_Pandemic\\_Driven\\_Education](https://www.researchgate.net/publication/350966425_Connectivism_A_Literature_Review_for_the_New_Pathway_of_Pandemic_Driven_Education)

Chaka, C. (2024). Reviewing the performance of AI detection tools in differentiating between AI-generated and human-written texts: A literature and integrative hybrid review. *Journal of Applied Learning and Teaching*, 7(1). <http://dx.doi.org/10.1007/s40979-023-00140-5>

Chang, B. L., Bakken, S., Brown, S. S., Houston, T. K., Kreps, G. L., Kukafka, R., ... & Stavri, P. Z. (2004). Bridging the digital divide: Reaching vulnerable populations. *Journal of the American Medical Informatics Association*, 11(6), 448-457. <https://doi.org/10.1197/jamia.M1535>

Chang, L., Schulmann, P., & Lu, Z. (2014). Bridging the digital divide: Segmenting and recruiting international millennial students. *World Education News & Reviews*, 27(8). <https://dx.doi.org/10.2139/ssrn.2530547>

Chatterjee, R., & Correia, A. P. (2020). Online students' attitudes toward collaborative learning and sense of community. *American Journal of Distance Education*, 34(1), 53-68. <http://dx.doi.org/10.1080/08923647.2020.1703479>

Cheshmehzangi, A., Zou, T., Su, Z., & Tang, T. (2023). The growing digital divide in education among primary and secondary children during the COVID-19 pandemic: An overview of social exclusion and education equality issues. *Journal of Human Behavior in the Social Environment*, 33(3), 434-449. <https://doi.org/10.1080/10911359.2022.2062515>

Chinta, S. V., Wang, Z., Yin, Z., Hoang, N., Gonzalez, M., Quy, T. L., & Zhang, W. (2024). *FairAIED: Navigating fairness, bias, and ethics in educational AI applications*. arXiv preprint arXiv:2407.18745. <https://doi.org/10.48550/arXiv.2407.18745>

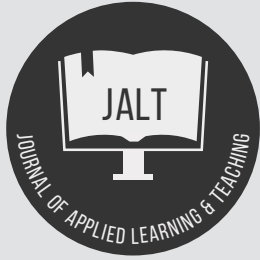
Clarke, J. H. (2012). Partnering with IT to help disadvantaged students achieve academic success. *Public Services Quarterly*, 8(3), 208-226. <https://commons.library>



- stonybrook.edu/library\_articles/23?utm\_source=commons.library.stonybrook.edu%2Flibrary\_articles%2F23&utm\_medium=PDF&utm\_campaign=PDFCoverPages
- Cruz-Jesus, F., Vicente, M. R., Bacao, F., & Oliveira, T. (2016). The education-related digital divide: An analysis for the EU-28. *Computers in Human Behavior*, 56, 72-82. <https://doi.org/10.1016/j.chb.2015.11.027>
- Cucinelli, G., & Farhan, L. (2024). Insights From educators: Navigating the technology landscape in K-12 schools. *Taboo: The Journal of Culture & Education*, 22(2).
- De Nito, E., Rita Gentile, T. A., Köhler, T., Misuraca, M., & Reina, R. (2023). E-learning experiences in tertiary education: Patterns and trends in research over the last 20 years. *Studies in Higher Education*, 48(4), 595-615. <http://dx.doi.org/10.1080/03075079.2022.2153246>
- Di Pietro, G. (2021). Changes in Italy's education-related digital divide. *Economic Affairs*, 41(2), 252-270. <https://doi.org/10.1111/ecaf.12471>
- Downes, S. (2022). Connectivism. *Asian Journal of Distance Education*, 17(1). <https://asianjde.com/ojs/index.php/AsianJDE/article/view/623>
- Ervianti, E., Sampelolo, R., & Pratama, M. P. (2023). The influence of digital literacy on student learning. *Klasikal: Journal of Education, Language Teaching and Science*, 5(2), 358-365. <https://doi.org/10.52208/klasikal.v5i2.878>
- Goldie, J. G. S. (2016). Connectivism: A knowledge learning theory for the digital age? *Medical Teacher*, 38(10), 1064-1069. <https://doi.org/10.3109/0142159x.2016.1173661>
- Gorski, P. (2005). Education equity and the digital divide. *AACE Review (Formerly AACE Journal)*, 13(1), 3-45. [https://www.researchgate.net/publication/228616386\\_Education\\_equity\\_and\\_the\\_digital\\_divide](https://www.researchgate.net/publication/228616386_Education_equity_and_the_digital_divide)
- Green, C., Mynhier, L., Banfill, J., Edwards, P., Kim, J., & Desjardins, R. (2020). Preparing education for the crises of tomorrow: A framework for adaptability. *International Review of Education*, 66, 857-879. <https://doi.org/10.1007/s11159-020-09878-3>
- Habashi, K., Andersen, S., Patel, D., Leon, G. K., Lee, C., & Simanton, E. (2023). Disadvantaged students utilize school campus and its resources more than non-disadvantaged students. *Cureus*, 15(9). <https://doi.org/10.7759/cureus.46128>
- Hartnett, M. (2017). Differences in the digital home lives of young people in New Zealand. *British Journal of Educational Technology*, 48(2), 642-652. <https://doi.org/10.1111/bjet.12430>
- Hoare, A., & Johnston, R. (2011). Widening participation through admissions policy—a British case study of school and university performance. *Studies in Higher Education*, 36(1), 21-41. <https://doi.org/10.1080/03075070903414297>
- Ifenthaler, D., Schumacher, C., & Kuzilek, J. (2023). Investigating students' use of self-assessments in higher education using learning analytics. *Journal of Computer Assisted Learning*, 39(1), 255-268. <https://doi.org/10.1111/jcal.12744>
- Jaggars, S. S., Motz, B. A., Rivera, M. D., Heckler, A., Quick, J. D., Hance, E. A., & Karwisch, C. (2021). *The digital divide among college students: Lessons learned from the COVID-19 emergency transition. Policy Report. Midwestern Higher Education Compact.* [https://www.researchgate.net/publication/349701773\\_The\\_Digital\\_Divide\\_Among\\_College\\_Students\\_Lessons\\_Learned\\_From\\_the\\_COVID-19\\_Emergency\\_Transition](https://www.researchgate.net/publication/349701773_The_Digital_Divide_Among_College_Students_Lessons_Learned_From_the_COVID-19_Emergency_Transition)
- James, P., Lal, J., Liao, A., Magee, L., & Soldatic, K. (2023). Algorithmic decision-making in social work practice and pedagogy: Confronting the competency/critique dilemma. *Social Work Education*, 1-18. <https://doi.org/10.1080/02615479.2023.2195425>
- Jamil, S., & Muschert, G. (2024). The COVID-19 pandemic and E-learning: The digital divide and educational crises in Pakistan's universities. *American Behavioral Scientist*, 68(9), 1161-1179. <https://doi.org/10.1177/00027642231156779>
- JISC. (2019) *Digital experience insights survey 2019: Findings from students in UK further and higher education.* <https://www.jisc.ac.uk/reports/digital-experience-insights-survey-2019-findings-from-students-in-uk-further-and-higher-education>
- Judijanto, L., Aini, M. A., Asfahani, A., Sain, Z. H., & Vandika, A. Y. (2022). Utilization AI for socially responsive education as a path to inclusive development. *Journal of Artificial Intelligence and Development*, 1(2), 69-78. [EJ1434316.pdf](https://doi.org/10.1177/00027642231156779)
- Karakose, T. (2021). Emergency remote teaching due to COVID-19 pandemic and potential risks for socioeconomically disadvantaged students in higher education. *Educational Process: International Journal (EDUPIJ)*, 10(3), 53-61. <http://dx.doi.org/10.22521/edupij.2021.103.4>
- Khan, N. F., Ikram, N., & Saleem, S. (2023). Digital divide and socio-economic differences in smartphone information security behaviour among university students: Empirical evidence from Pakistan. *International Journal of Mobile Communications*, 22(1), 1-24. <https://doi.org/10.1504/IJMC.2023.131802>
- Kholiavko, N., Popelo, O., Bazhenkov, I., Shaposhnykova, I., & Sheremet, O. (2021). Information and communication technologies as a tool of strategy for ensuring the higher education adaptability to the digital economy challenges. *International Journal of Computer Science & Network Security*, 21(8), 187-195. <https://doi.org/10.22937/IJCSNS.2021.21.8.25>
- Lee, B. (2024). *Bridging the divide: Addressing the resistance to ai adoption among the underrepresented.* [https://digitalcommons.georgiasouthern.edu/gaintlit/2024/2024/12/.](https://digitalcommons.georgiasouthern.edu/gaintlit/2024/2024/12/)

- Manduna, W. (2016). *Empirical study of digital poverty: A case study of a University of Technology in South Africa*. <http://hdl.handle.net/11462/1826>.
- McAleavy, T., Joynes, C., Gibbs, E., & Sims, K. (2020). *What steps are being taken to reach the most disadvantaged students during the period of COVID-19 school closure*. Education Development Trust. <https://edtechhub.org/wp-content/uploads/2020/05/disadvantaged-students.pdf> (details).
- Mills, A., Bali, M., & Eaton, L. (2023). How do we respond to generative AI in education? Open educational practices give us a framework for an ongoing process. *Journal of Applied Learning and Teaching*, 6(1), 16-30. <https://doi.org/10.37074/jalt.2023.6.1.34>
- Morgan, A., Sibson, R., & Jackson, D. (2022). Digital demand and digital deficit: Conceptualising digital literacy and gauging proficiency among higher education students. *Journal of Higher Education Policy and Management*, 44(3), 258-275. <http://dx.doi.org/10.1080/1360080X.2022.2030275>
- O'Toole, M., Dunnett, S., Brennan, M., Calvard, T., & Fakeyeva, L. (2024). Widening Participation in Scotland 1997–2021: A semi-systematic literature review and avenues for further research. *British Educational Research Journal*. <https://doi.org/10.1002/berj.3991>.
- Pala, Ş. M., & Başbüyük, A. (2023). The predictive effect of digital literacy, self-control and motivation on the academic achievement in the science, technology and society learning area. *Technology, Knowledge and Learning*, 28(1), 369-385. <https://doi.org/10.1007/s10758-021-09538-x>
- Peres, R., Schreier, M., Schweidel, D., & Sorescu, A. (2023). On ChatGPT and beyond: How generative artificial intelligence may affect research, teaching, and practice. *International Journal of Research in Marketing*, 40(2), 269-275. <http://dx.doi.org/10.1016/j.ijresmar.2023.03.001>
- Pratama, M. P., Sampelolo, R., & Lura, H. (2023). Revolutionizing education: Harnessing the power of artificial intelligence for personalized learning. *Klasikal: Journal of Education, Language Teaching and Science*, 5(2), 350-357. <https://doi.org/10.52208/klasikal.v5i2.877>
- QAA. (2023). *The inclusive education framework*. <https://www.qaa.ac.uk/membership/collaborative-enhancement-projects/equality-diversity-and-inclusion/the-inclusive-education-framework>.
- Rajaram, K. (2021). *Evidence-based teaching for 21st century classroom and beyond – innovative-driven learning strategies*. Springer.
- Rajaram, K. (2023). *Learning intelligence: Innovative and transformative learning strategies – cultural and social engineering perspectives*. Springer.
- Reddick, C. G., Enriquez, R., Harris, R. J., & Sharma, B. (2020). Determinants of broadband access and affordability: An analysis of a community survey on the digital divide. *Cities*, 106, 102904. <https://doi.org/10.1016/j.cities.2020.102904>
- Rodríguez-Abitia, G., Martínez-Pérez, S., Ramirez-Montoya, M. S., & Lopez-Caudana, E. (2020). Digital divide in universities and challenges for quality education: A diagnostic study in Mexico and Spain. *Sustainability*, 12(21), 9069. <https://hdl.handle.net/11441/146144>
- Rudolph, J. (2023). Book review. Popenici, Stefan (2023). Artificial intelligence and learning futures. Critical narratives of technology and imagination in higher education. Routledge. *Journal of Applied Learning and Teaching*, 6(2), 420-425. <http://dx.doi.org/10.4324/9781003266563>
- Rudolph, J., Tan, S., & Aspland, T. (2023). Editorial 6 (2): Personal digital assistant or job killer? Generative AI and the teaching profession in higher education. *Journal of Applied Learning and Teaching*, 6(2), 7-16. <https://doi.org/10.37074/jalt.2023.6.2.1>
- Salas-Pilco, S. Z., Xiao, K., & Oshima, J. (2022). Artificial intelligence and new technologies in inclusive education for minority students: A systematic review. *Sustainability*, 14(20), 13572. <http://dx.doi.org/10.4018/979-8-3693-3707-3.ch018>
- Sanni, O. F., Abiodun, O. P., Onoja, A. J., Kaniki, F. R., & Sanni, A. E. (2022). Knowledge and uptake of e-learning among African students during the COVID-19 lockdown: Online education, impacts of COVID-19. *Journal of Applied Learning and Teaching*, 5(Sp. Iss. 1), 43-51. <https://doi.org/10.37074/jalt.2022.5.s1.6>
- Sato, S. N., Condes Moreno, E., Rubio-Zarapuz, A., Dalamitros, A. A., Yañez-Sepulveda, R., Tornero-Aguilera, J. F., & Clemente-Suárez, V. J. (2023). Navigating the new normal: Adapting online and distance learning in the post-pandemic era. *Education Sciences*, 14(1), 19. <https://doi.org/10.3390/educsci14010019>
- Scatiggio, V. (2020). *Tackling the issue of bias in artificial intelligence to design ai-driven fair and inclusive services systems*. <https://www.politesi.polimi.it/handle/10589/186118>.
- Selwyn, N. (2024). Digital degrowth: Toward radically sustainable education technology. *Learning, Media and Technology*, 49(2), 186-199. <https://doi.org/10.1080/17439884.2022.2159978>
- Setthasuravich, P., & Kato, H. (2020). The mediating role of the digital divide in outcomes of short-term transportation policy in Thailand. *Transport Policy*, 97, 161-171. <https://doi.org/10.1016/j.tranpol.2020.07.008>
- Sevnarayan, K., & Potter, M. A. (2024). Generative artificial intelligence in distance education: Transformations, challenges, and impact on academic integrity and student voice. *Journal of Applied Learning and Teaching*, 7(1). <https://doi.org/10.37074/jalt.2024.7.1.41>
- Shemshack, A., & Spector, J. M. (2020). A systematic literature review of personalized learning terms. *Smart Learning Environments*, 7(1), 33. <https://doi.org/10.1186/s40561-020-00140-9>

- Siemens, G. (2004). *Connectivism: A learning theory for the digital age*. <http://www.elearnspace.org/Articles/connectivism.htm>
- Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1). <http://www.itdl.org/>
- Siemens, G., Rudolph, J., & Tan, S. (2020). "As human beings, we cannot not learn". An interview with Professor George Siemens on connectivism, MOOCs and learning analytics. *Journal of Applied Learning and Teaching*, 3(1), 108-119. <https://doi.org/10.37074/jalt.2020.3.1.15>
- Steyn, C., & Gunter, A. (2023). When an international student stays at home: Defining an international student in distance education. *Journal of Geography in Higher Education*, 47(1), 56-70. <https://doi.org/10.1080/03098265.2021.1991289>
- Tartaglia, A. M. (2020). *The potential impact of online learning on economically disadvantaged students*. <https://research.library.kutztown.edu/edddissertations/9/>.
- Teo, T. C., & Divakar, A. (2021). Understanding the concepts of digital learning approaches: An empirical analysis of schools in developing countries. *Journal of Applied Learning and Teaching*, 4(1), 120-128. <https://doi.org/10.37074/jalt.2021.4.1.18>
- Tewathia, N., Kamath, A., & Ilavarasan, P. V. (2020). Social inequalities, fundamental inequities, and recurring of the digital divide: Insights from India. *Technology in Society*, 61, 101251. <https://doi.org/10.1016/j.techsoc.2020.101251>
- Tomlinson, C. A. (2014). *The differentiated classroom: Responding to the needs of all learners*. ASCD.
- Ucar, I., Gramaglia, M., Fiore, M., Smoreda, Z., & Moro, E. (2021). News or social media? Socio-economic divide of mobile service consumption. *Journal of The Royal Society Interface*, 18(185), 20210350. <https://doi.org/10.1098/rsif.2021.0350>
- Van de Werfhorst, H. G., Kessenich, E., & Geven, S. (2022). The digital divide in online education: Inequality in digital readiness of students and schools. *Computers and Education Open*, 3, 100100. <https://doi.org/10.1016/j.caeo.2022.100100>
- Vasilescu, M. D., Serban, A. C., Dimian, G. C., Aceleanu, M. I., & Picatoste, X. (2020). Digital divide, skills and perceptions on digitalisation in the European Union—Towards a smart labour market. *PLoS One*, 15(4), e0232032. <https://doi.org/10.1371/journal.pone.0232032>
- Yelland, N., & Neal, G. (2013). Aligning digital and social inclusion: A study of disadvantaged students and computer access. *Education and Information Technologies*, 18, 133–149. <http://dx.doi.org/10.1007/s10639-012-9223-y>
- Youssef, A. B., Dahmani, M., & Ragni, L. (2022). ICT use, digital skills, and students' academic performance: Exploring the digital divide. *Information*, 13(3), 129. <https://doi.org/10.3390/info13030129>
- Zhao, X., & Xue, W. (2023). From online to offline education in the post-pandemic era: Challenges encountered by international students at British universities. *Frontiers in Psychology*, 13, 1093475. <https://doi.org/10.3389/fpsyg.2022.1093475>
- Zhao, Y. (2009). *Catching up or leading the way: American education in the age of globalization*. ASCD.
- Zhou, X., Smith, C., and Al-Samarraie, H. (2023). Systematic literature review of digital technology adaptation and experiences during Covid-19: What should we keep? *Journal of Computing in Higher Education*. <https://doi.org/10.1007/s12528-023-09376-z>.
- Zhou, X., & Wolstencroft, P. (2020). Digital masters? *Reflecting on the readiness of students and staff for digital learning*. BERA Blog. <https://www.bera.ac.uk/blog/digital-masters-reflecting-on-the-readiness-of-students-and-staff-for-digital-learning>.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Perception of future teachers on the influence of poverty

---

Daniel Rodríguez

A

*Faculty of Social Sciences, European University of Canary Islands*

Rodríguez<sup>A</sup>

Héctor Pérez Montesdeoca<sup>B</sup>

B

*Faculty of Social Sciences, European University of Canary Islands*

---

### Keywords

---

Academic performance;  
attitude;  
equity;  
social justice;  
training.

### Abstract

---

Education has been considered an elevator that allows people to progress socially. Unfortunately, this is not always the case, so it is essential that teachers understand the influence that poverty has on the development of students who live in this condition. This is why the aim of this study is to analyse future teachers' perceptions of the relationship between poverty and education. To this end, qualitative phenomenological research was conducted using the collective case study method. A sample of 127 students from the Master in Teacher Training at Spanish universities was exposed to life experiences and readings from the Report of the Special Rapporteur on extreme poverty and human rights, which was presented at the United Nations Human Rights Council for Spain in 2020. Individual written reflections and group discussions were conducted. The results showed that this type of experience helps to eliminate teachers' prejudices and stereotypes about students and their families who unfortunately live in socioeconomically disadvantaged conditions, as well as promoting a consciousness of equity and educational social justice.

---

### Correspondence

[daniel.rodriguez@universidadeuropea.es](mailto:daniel.rodriguez@universidadeuropea.es) <sup>A</sup>

---

### Article Info

Received 23 August 2024

Received in revised form 25 October 2024

Accepted 20 December 2024

Available online 16 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.8>

## Introduction

In Spain, the group most likely to experience poverty consists of minors, with an estimated child poverty rate of 28.9%. This percentage has been on the rise since 2018. Among these, 8.9% live in situations of severe material deprivation, according to the AROPE (At Risk of Poverty and/or Exclusion) rate (National Statistics Institute, 2021).

Poverty should be regarded as a structural phenomenon that constitutes a violation of human rights (Human Rights Commission, 1948). Consequently, education professionals must do everything within their power to ensure that their students who are in such circumstances can overcome them in the future, partly due to the formative role that teachers play. Educators should put their professional knowledge at the service of society and contribute to creating a better reality for their students (Jensen, 2013).

Traditionally, educational development has been considered one of the most important pathways through which individuals can escape poverty and achieve social mobility (Huang et al., 2009). Schools have served as the primary setting where children and adolescents acquire knowledge, skills, and values essential for ethical and effective participation in society and the future labour market (Bol et al., 2019; Schrag, 2016). For this reason, a substantial body of research has demonstrated that education is directly related to employment, professional development, and quality of life (Barlas et al., 2024; Jury et al., 2017). As students progress and attain higher educational levels, they are more likely to secure better jobs and earn higher salaries (Reichenberg, 2019). At the same time, they are less likely to become involved in criminal activities or drug use (Robison et al., 2017), or to rely on social services or state aid to lead a dignified life (Parr & Bonitz, 2015). Furthermore, the educational development of minors from low socioeconomic backgrounds has significant implications beyond the individual student, as it considerably reduces the societal costs associated with poverty (Hannum et al., 2017).

While academic progress is a means of escaping poverty, there is a strong relationship between poverty and academic performance. Studies consistently show a gap in educational outcomes between students from disadvantaged socioeconomic backgrounds and those who do not live in such conditions (Browman et al., 2017). These disparities have been observed from early childhood education (Thomas et al., 2020), through primary (Alves et al., 2017) and secondary education (Liu et al., 2022), to tertiary education (Sadowski et al., 2018).

There are three theoretical perspectives that explain teachers' attitudes towards students living in poverty: deficit, determination, and structural ideologies (Gorski, 2016). The deficit theory (Lewis, 1966) attributes educational inequalities to the deficiencies, of any kind, of students and their parents. For instance, from this perspective, teachers might blame students' families for their low level of engagement with the school, the little importance they attach to their children's education, students' absenteeism, or the lack of appropriate skills among minors to succeed in school. Teachers who operate under the deficit theory

may believe that their educational role is to ensure that their students succeed by leaving behind their neighbourhoods, families, and poverty-stricken contexts, which can create significant tensions in their relationships with the students' parents (Linberg et al., 2019).

Another approach, the determination theory (Duckworth et al., 2007), suggests that certain personality traits enable some individuals to overcome social and economic difficulties through effort and hard work (Daher et al., 2023). Teachers who align with this theoretical model tend to focus more on developing, promoting, and enhancing students' personal traits, without taking into account the influence that their socioeconomic contexts may have on them (Walker et al., 2019).

On the other hand, the structural theory views the influence of socioeconomic status on academic achievement as a result of inequity and the social and economic inequalities produced by structural poverty (Rank et al., 2003). This model emphasises that schools located in impoverished neighbourhoods often have lower budgets, less experienced and less pedagogically trained teachers, fewer technological resources, a lack of books, and other educational resources (Reddick et al., 2011). Teachers who adhere to this theoretical model recognise the importance of working with students' families but may feel frustrated or give up when they perceive that parental involvement is limited by personal circumstances or socioeconomic difficulties (Gordon & Cui, 2014).

In the educational field, there is a growing awareness of the importance of improving the training of teachers working with disadvantaged groups, whether due to socioeconomic factors or other reasons (Keeney et al., 2019). Unfortunately, these aspects are still far from being considered a significant part of teacher training programmes, whether in undergraduate and postgraduate degrees or in the professional development plans offered by public administrations or other governmental institutions (Steinberg & Krumer-Nevo, 2020).

One of the main objectives that teacher training should address is the development of equity awareness (Gorski, 2017). This involves understanding poverty, recognizing people living in poverty as experts in their own experiences, and the willingness of teachers to use their knowledge and skills to promote equity and social justice in educational settings (Kretchmar & Zeichner, 2016). From this perspective of equity awareness, teachers should first analyse whether the school policies and practices in their schools are unjust towards students from low-income families (Cochran-Smith et al., 2016). Secondly, they should question whether they, as teachers, hold prejudices and erroneous stereotypes about people living in poverty that might bias their educational work (Martínez et al., 2017). Finally, they should promote teaching strategies that prevent the devaluation of these students' learning, encouraging, wherever possible, the participation of their families (Benner et al., 2016). This entire process requires knowledge and understanding of the life experiences of low-income families, as well as their personal and social circumstances, which influence their children's education. A lack of such knowledge will make

it very difficult for teachers to develop the emotional and cognitive processes necessary to foster equity awareness (Gorski, 2017).

In addition to its theoretical conception, equity awareness includes a detailed pedagogical framework that has been implemented in various teacher education courses around the world (Cleovoulou et al., 2022; Dyches & Boyd, 2017). The uniqueness of this pedagogical framework lies in its emphasis on a combination of cognitive, emotional, and ethical aspects; that is, in the integration of theoretical and empirical knowledge about poverty and its implications, along with the refinement of reflective knowledge, incorporating a shift in personal attitudes and values towards the consequences of academic development in poverty-stricken contexts (Haberman, 2010). Furthermore, this pedagogical approach aligns with studies that emphasise the importance of humanizing education, where the well-being of students must be considered if they are to optimise their learning processes and achieve strong academic outcomes (Tong & Ismail, 2024).

The aim of the study was to examine the emotional and cognitive responses of future secondary school teachers to the influence of poverty on the personal, social, and educational development of individuals.

## Method

This study employed a qualitative methodology from a phenomenological perspective, using the collective case study method and the focus group technique (Stake, 1998).

### Participants

The sample consisted of 127 students (54 women) enrolled in the Master's Programme for Teacher Training in Secondary Education, Baccalaureate, Vocational Training, and Language Teaching at three different Spanish universities during the 2022/2023 academic year. The age range was 23 to 54 years ( $M = 35.43$ ;  $SD = 8.11$ ). The sampling method used was non-probabilistic convenience sampling with voluntary inclusion (Cohen et al., 2011).

### Procedure

Following approval from the academic coordinators of the Master's Programme at the three participating universities, the main research objective was presented to the students, informing them that their participation was voluntary and would take place outside of regular class hours. Six focus groups were formed from the students who volunteered, each consisting of between 15 and 23 participants.

Each group participated in a total of six two-hour sessions, held weekly. The sessions took place in the afternoon, in a classroom at each of the universities. All six focus groups began and ended their activities simultaneously, with each session facilitated by a person with a degree in psychology. The first five sessions followed the same structure. In the first

part, participants were asked to read selected passages from the Report of the Special Rapporteur on Extreme Poverty and Human Rights, which was presented to the United Nations Human Rights Council for Spain in 2020. After this, they engaged in individual reflection, followed by a group discussion and debate.

During the second hour, persons living in poverty, without formal education, were invited to attend the session. These individuals were part of projects against poverty and social exclusion run by local associations in the municipalities where the universities were located. No personal data that could identify these individuals was collected; the management of this procedure was handled by the associations, which proposed participants from among their beneficiaries based on the research team's request for voluntary participation in this study. These individuals shared their life experiences for ten minutes and then answered questions from the research group participants for twenty minutes.

Finally, during the last thirty minutes, participants were invited to write personal reflections in a notebook, describing their thoughts and feelings experienced during the session, what was new to them, and how the knowledge gained could contribute to their future work as teachers. These reflections which formed the basis for group discussions, were documented, and analysed using content analysis to uncover assumptions, meanings, and patterns, and to identify the main themes related to participants' emotional and cognitive responses. In the sixth and final session, participants shared their experiences and engaged in a debate based on everything they had written in the previous five sessions, discussing their views on the influence of poverty on individuals' educational development.

The study was approved by the University's Research Ethics Committee (CIPI/22.244).

### Data analysis

The reflections recorded by the students in their workbooks were analysed using content analysis (Strauss, 1987). The first part of the analysis involved distinguishing between emotional and cognitive responses. For example, sadness and anger were categorised as emotional responses, while the desire for knowledge and the awareness of a lack of understanding were analysed as cognitive responses. The second part of the analysis focused on identifying specific themes within each category. Four themes were identified within the emotional response category, and three within the cognitive response category. The third stage involved refining the themes. The categories and themes were further refined through discussions among the team of psychologists who facilitated the focus groups.

## Results

The following section presents the results, categorised into emotional and cognitive responses.

## Emotional responses

The most frequent emotional responses were rejection, compassion, sadness, and anger.

### Rejection

A significant group of participants expressed rejection towards people living in poverty or towards their life stories. Their judgment was based on the belief that these individuals' poverty and lack of education were due to personal decisions and chosen behaviours, characterising them as passive and apathetic. Additionally, participants mentioned that they believed these individuals did not make enough effort to study and therefore were getting what they deserved. They also associated these individuals with the idea that if they were currently living in poverty, it was partly because they had not done what was necessary to overcome difficulties and escape poverty. This rejection stemmed from the participants' difficulties in understanding the complexity of living in poverty, the obstacles it creates, and the barriers it perpetuates, as well as the actions people living in poverty might take to combat it.

Discussing this feeling of rejection in class was important, as it highlighted the lack of understanding among future teachers about how poverty contexts influence students. For example, the majority reacted with astonishment when a participant in one of the groups mentioned that nearly half of students from poor families repeat a grade at some point during their schooling, compared to 9% of students from wealthy families (Save the Children, 2019). The thematic analysis identified many emotional expressions of rejection towards uneducated poor people, blaming them for not trying hard enough to escape poverty. Classroom discussions also addressed how such rejection by teachers could negatively impact students' academic development or the relationship with their families.

Among the more critical participants, their comments about the social progress they had made in their lives were attributed to personal characteristics like responsibility, effort, and commitment, arguing that in our societies, anyone could escape poverty if they worked hard enough during their academic years.

I recognise that life is very complex, and if one is born into a poor family, they may face barriers and obstacles that others may not have. But anyone who tries hard enough can overcome them. Students don't study or don't try to do things right because of their personal choices. These students tend to be more laid-back, more interested in having fun than doing what they should, so they simply prioritised what they preferred at the time, and now they have to face the consequences of those decisions. In life, if you want something, you must fight for it and not resign yourself, as some of these people do. (Participant 46)

## Compassion

Other participants, after reading the report and hearing the life experiences of the guests, expressed feelings of compassion, showing an interest in learning more about these individuals' suffering. They understood the vulnerability that students growing up in poverty might experience, and how it could particularly affect girls compared to boys, given that their families might ask them to help with household chores. Some participants also showed compassion and empathy towards particularly vulnerable families, such as single-parent families or those caring for elderly or dependent relatives, which exacerbated the difficulty of escaping poverty. These aspects were highlighted in the discussion groups, and participants suggested that as future teachers, they should pay special attention to the personal and educational care of these students and their families, striving to maintain a close relationship with them.

What's most important for me has been understanding how difficult it can be to study or make academic progress in a family that may not have the basic means for it, in marginalised environments, with parents who, despite wanting the best for their children, are excluded or marginalised by society, not provided with decent jobs that would allow them to offer their children a good education. I remember in my youth, a classmate had a tough time when her father died, and her mother, who didn't work, had to try to support the family. My classmate had to leave school as soon as she could to start working and contribute money at home, even though I remember she wasn't a bad student. These things shouldn't happen in our country. I imagine myself in the situation this woman told us about today, and I wouldn't know what to do—I'd be as bad off, or worse, than she was. (Participant 15)

### Sadness

Participants' notes revealed emotional expressions of sadness about how poverty hinders personal development, a sentiment that was even more evident in the discussions, where some participants cried after hearing the life stories of the guests. These intense emotional reactions led to proposals on how to help students face the reality of poverty. There were also written reflections on how to emotionally distance oneself from such situations to avoid continuously feeling sorrow for the personal circumstances of their students. In a way, though the future teachers are aware of the sadness and emotional pain caused by thinking about their future students possibly suffering such situations, they sought ways to distance themselves from this suffering to feel better.

Hearing the guests' stories makes me feel very sad about the damage poverty causes in many lives. I feel overwhelmed by emotions, and I see that some of my classmates have even cried in class. In some way, we must emotionally detach from these situations to be able to face them more effectively. However, it's hard not to feel pain thinking about the future students who might go through similar situations.

This experience is emotionally intense, but it's also a valuable opportunity to learn and grow as future professionals. (Participant 54)

Discussing the sadness arising from these experiences allowed participants to reflect on how society denies the educational difficulties faced by students living in poverty. Dealing with emotional pain enabled them to examine common perceptions of people living in poverty.

### **Anger**

Other emotional responses reflected an awareness of the social injustice experienced by students raised in poverty. The future teachers' notes included expressions of anger towards the social system, the state, and the social structures that perpetuate inequality.

I'm very angry, and I think it's a terrible injustice that someone, just because they're born into a low social class family, has so many factors against them to escape this cycle of poverty. That shouldn't be the case, and we need to do something to improve the education of our students. (Participant 8)

Some participants also expressed anger at themselves, as after reading passages from the report, they felt they had been unaware of a reality that educational research has highlighted for decades. Group discussions reflected on whether this anger could be channelled into an active movement for social justice, with proposals for strategies or initiatives they could develop as teachers.

As a future teacher, I've realised the social inequality that students raised in poverty experience. I think this situation is very unjust. It shouldn't be that someone has so much against them just because of where they were born. Also, after reading the report, I feel angry at myself for not being aware of this reality, which has been right in front of me for so long, and I've never done anything to help. There must be something, even if it's just a little, that I can do to help these students. (Participant 23)

### **Cognitive responses**

Participants' cognitive responses were categorised into false proximity, awareness, and changes in practice.

#### **False proximity**

Most participants believed they were familiar with poverty, thinking they knew everyday examples of poverty or often saw people living in this situation on the streets. However, reading passages from the report helped them understand how people actually experience poverty, especially the efforts they make to escape it and provide their children with a decent education. Along with the life experiences, many participants noted in their journals that although poverty is an apparently familiar phenomenon, knowledge often comes from a biased and superficial understanding provided

by the media and popular culture. This realisation led them to admit that they knew less than they had thought before participating in the project and there is a need to critically reflect on the socially transmitted notions of poverty and its influence on educational development.

I thought I knew what poverty was, why it occurred, and its consequences for those who live in it. If we think about it, it's rare that we don't see a beggar on the street or hear some news related to poverty. But in reality, this experience is making me realise that we think we know, but we barely understand anything. Everything we're doing here is making me reflect on the misconceptions we have, preconceived ideas that, if we don't become aware of them, could lead us to prejudge the families of our students. Now that I know I understand much less about this topic than I thought, I want to keep learning and cross-checking information so I can be a competent teacher in the future. (Participant 60)

### **Awareness**

Some participants indicated that they were acquiring new knowledge about a reality they had previously been unaware of. They reflected on the importance of poverty and how it could affect their future students. The awareness they were developing made them express the significance of considering families from impoverished environments and trying, as much as possible, to compensate for the educational deficits their students might face. For example, one participant narrated the following:

I had no idea that poverty so heavily determined students' academic performance. I always thought this had been eradicated in our society, but nothing could be further from the truth. These families and their children need all the support they can get, not just from the educational sphere but from all areas of society. It's unacceptable that because of their parents' unfortunate circumstances, their children might experience the same. All students deserve equal opportunities. (Participant 84)

In the discussions within several focus groups, some master's students emphasised the injustice of the situation they were becoming aware of, highlighting that education does not socially equalise people and that, to some extent, it contributes to the perpetuation of intergenerational cycles of poverty. Other participants, who did not identify with this cognitive response, argued that as future teachers, they should not feel responsible for the poor decisions that these individuals had made in their lives. They believed that it was the parents who should take action to reverse these situations, as future educators could do little to change them. These opposing views led to heated debates in some groups, as the positions were fundamentally antagonistic. However, it is worth noting that for most participants who had not initially expressed this cognitive response in their reflective journals, engaging in discussions and listening to their peers eventually offered them a new perspective on the realities faced by families living in poverty and their children's education. They began to shed the belief that



these parents were negligent or lacked care for their families' development. After these debates, they acknowledged having developed the ability to recognise the complexities of life in poverty.

The awareness of the importance of obtaining accurate information about the circumstances of those living in poverty and how these might affect students led participants to adopt new interpretations of the behaviours of people living in poverty, becoming more flexible in understanding their decisions and actions rather than judging them as some had done previously.

### *Changes in practice*

Some participants reported in their testimonies that the new knowledge and perceptions regarding the influence of poverty on educational development were changing the way they approached their placements in schools. They felt that understanding the realities of families living in poverty had contributed to their treating students identified as living in such circumstances with greater sensitivity and empathy. They also sought to coordinate more closely with their academic tutors on how to provide specific support to these students.

According to the participants' testimonies, they believed they had made better use of the mentoring sessions they held with these students and their families. They communicated more effectively, striving to listen to the parents and involving them in greater cooperation with the school, so that they could work together towards achieving the best academic outcomes for the children. Some participants also noted that involving families seemed to result in changes in students' behaviour at school, leading to increased motivation or better conduct, which in turn improved their academic performance.

At first, hearing these stories felt distant and impersonal to me, but when I started my placements and met the students, reality hit me hard. I began to understand the difficult circumstances many of these families lived in and how this impacted the children in their daily lives in the classroom. I started to act differently, trying to be more approachable. What surprised me most was how the relationship I established with the families completely changed the way I interacted with the students. I was struck by how the cooperation between the family and the school translated into better academic outcomes for the students. I clearly remember a meeting with the mother of one of my students. I had invited her for a talk, and at the end of the meeting, she hugged me. I felt deeply connected with her and realised how important it is to involve these families, especially in the educational process of their children. (Participant 77)

When asked in the discussion groups to explain these testimonies, the participants agreed that they had observed, together with their tutors, that some students had academic problems and their families were involved. Instead of

adopting a more punitive or restrictive approach towards them, adopting a more cooperative approach and inviting them to share their personal situations often revealed that it was difficult for their children to maintain a good study routine at home. This led them to jointly seek strategies for the students to access other study environments within the school or at municipal libraries—resources that the family had not considered previously.

### **Discussion**

One of the greatest challenges in teacher training is to prepare educators with the appropriate awareness of equity so that they can effectively support students from impoverished backgrounds in educational settings, developing the necessary strategies to address issues of social justice and improve these students' education (Keeney et al., 2019). Therefore, the primary aim of this research project was to examine the emotional and cognitive responses of future secondary school teachers to the influence of poverty on personal, social, and educational development.

Previous research has shown that, in general, teacher education programmes do not sufficiently develop an understanding of the effects of poverty on education (Steinberg & Krumer-Nevo, 2020). Experts in equity awareness and social justice in education have highlighted the potential of training processes such as the one proposed in this research to change teachers' attitudes and behaviours towards poverty and contribute to the educational development of all students (Cleovoulou et al., 2022; Cochran-Smith et al., 2016).

Particularly important components of teacher education that have been highlighted in this study are emotional responses to poverty, value-based attitudes, and the acquisition of critical capacity (Dyches & Boyd, 2017), which are necessary for future teachers to challenge conventional cultural perceptions of poverty. It was found that most participants initially struggled to understand the multiple ways in which poverty creates barriers to students' educational development. Therefore, it is especially important to identify those teachers who exhibit cognitive rejection towards people living in poverty, so they can shift towards supportive thoughts and behaviours (Gorski, 2016).

Providing teachers with knowledge about social justice is a way to improve their attitudes and skills when working with students from socioeconomically disadvantaged families (Schrag, 2016; Walker et al., 2019).

The process of acquiring such knowledge can be facilitated by studying life experiences and objective reports on the subject, as this involves participants examining their own experiences and personal attitudes, as well as their cognitive and emotional responses. In contemporary societies, if this is not specifically addressed with teachers, it is difficult to achieve, as the prevailing ideology and discourse regarding poverty often glorifies personal responsibility and free choice, while denying the multiple ways in which poverty contexts create situations that profoundly influence the educational development of children and adolescents, as

well as the life decisions they can make (Daher et al., 2023; Gorski, 2016).

It was found that many participants identified with or expressed views aligned with deficit theory (Lewis, 1966), holding deeply ingrained stereotypes about people living in poverty. This aligns with other studies conducted with future teachers in the United Kingdom (White & Murray, 2016) and the United States (Gorski, 2012). This ideology leads to ineffective pedagogical practices and school-family relationships (Linberg et al., 2019). As the group sessions progressed, some participants even attempted to distance themselves from the topic of poverty, claiming that they knew everything about it. These individuals rarely participated in discussions about how poverty could negatively affect their future students, remaining on the sidelines and silent. A small number of them, towards the end of the project, particularly after hearing different life experiences, changed their perspectives and began to exhibit responses of empathy, compassion, and a sense of social responsibility.

During the focus groups, intense debates occasionally arose about how school practices should be implemented with students living in poverty, as well as related topics such as the lack of family involvement in school activities, teachers' expectations of academic performance, and students' own perceptions of their academic abilities. The exchange of diverse viewpoints on social class and unequal access to resources and educational experiences outside of school engaged participants in critical reflections on their own positions within the social system, their ideologies about poverty, and how these ideologies shaped their understanding. These debates and exchanges of opinions about educational strategies that promote social justice for students should play a fundamental role in all teacher training programmes (Kretchmar & Zeichner, 2016).

This experience shows that reflective reading of well-selected, objective information can change teachers' erroneous stereotypes about people living in poverty. Stories that present facts and situations, when narrated effectively, allow readers to shift their value judgments and begin to develop cognitive and emotional responses that first foster an awareness of equity and, second, prepare them to actively contribute to the educational development of these students in collaboration with their families. Reversing deeply ingrained social attitudes requires changes in how teachers perceive and interact with their students, parents, and the communities associated with the schools where they work. Valuing everyone and striving to build positive relationships with them, while leveraging knowledge of the realities from which they come, are fundamental principles for developing initiatives that can promote students' success in school (Hannum et al., 2017; Sadowski et al., 2018).

A turning point in this study was the exposure of future teachers to the life stories of people living in poverty, which led to positive changes in their awareness, understanding, and practice regarding the phenomenon of poverty and its influence on students' education. Through an effective pedagogical approach involving reading, listening to life experiences, writing personal reflections, and participating in group discussions, teacher education can be enhanced

to better understand socioeconomic disadvantages and promote pedagogical strategies that benefit students.

Listening to life stories was a key component of the training. It allowed participants to confront their own attitudes and perceptions about poverty, and to become aware of their own deficit ideologies and how they had misinterpreted the attitudes of parents and students—something which they recognised would have hindered their future professional careers as teachers. Teachers' expectations are considered a very important factor for the proper functioning of a school and the educational success of the students within it (MacPhail et al., 2019). Teacher education that is conscious of poverty has the potential to develop teachers' skills and willingness to act with equity awareness and to promote social justice both within and beyond educational institutions.

## Conclusion

The findings of this study offer valuable insights into the perceptions of future teachers regarding the impact of poverty on students' academic, social, and personal development. One of the key implications of this research is the confirmation of the need for teacher training programmes to incorporate a deeper focus on equity awareness, particularly when it comes to understanding and addressing the challenges faced by students from low socioeconomic backgrounds. The pedagogical approach applied in this study, combining theoretical knowledge with real-life experiences, demonstrated its potential to dismantle existing stereotypes and foster empathy among future educators.

Moreover, this research underscores the importance of developing emotional and cognitive skills in teachers to improve their effectiveness in working with socioeconomically disadvantaged students. The inclusion of reflective practices, such as the ones employed in this study, can lead to significant changes in teachers' attitudes and approaches to social justice in education, ultimately contributing to more inclusive and supportive classroom environments.

From a practical perspective, the educational institutions should reconsider the role of experiential learning in teacher training curricula, as it can better prepare educators to manage the complexities of teaching in socioeconomically diverse classrooms. Additionally, these findings highlight the importance of engaging with communities and families living in poverty to create more collaborative and informed educational interventions.

Future research should explore the long-term impact of similar pedagogical interventions on the professional practices of teachers once they enter the workforce. It would also be beneficial to examine how these approaches can be integrated into different cultural and educational contexts to assess their wider applicability. In this regard, further studies could delve into how systemic changes in teacher training can contribute to closing the achievement gap between students from diverse socioeconomic backgrounds.

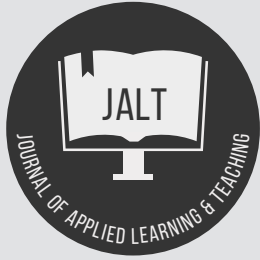
## Endnote

In this article, the term “poverty” is primarily understood in economic terms, based on the criteria established by the AROPE (At Risk of Poverty and/or Exclusion) rate used by the European Union. This measure includes individuals who live with income below the poverty threshold, those in severe material deprivation, or those living in households with very low work intensity. While poverty can be understood in various ways, this study focuses on the socioeconomic conditions of students whose families fall within these AROPE-defined parameters, acknowledging the broader social, cultural, and geographical factors that may also shape their experiences.

## References

- Alves, A. F., Gomes, C. M., Martins, A., & da Silva, L. (2017). Cognitive performance and academic achievement: How do family and school converge? *European Journal of Education and Psychology, 10*(2), 49-56. <https://doi.org/10.1016/j.ejeps.2017.07.001>
- Barlas, A. W., Ansari, S. M. M., & Mohammadi, M. A. (2024). A study of Afghan university graduates' perspectives on the relevance of higher education. *Journal of Applied Learning and Teaching, 7*(2), 1-18. <https://doi.org/10.37074/jalt.2024.7.2.14>
- Benner, A. D., Boyle, A. E., & Sadler, S. (2016). Parental involvement and adolescents' educational success: The roles of prior achievement and socioeconomic status. *Journal of Youth and Adolescence, 45*(6), 1053-1064. <https://doi.org/10.1007/s10964-016-0431-4>
- Bol, T., Ciocca Eller, C., Van De Werfhorst, H. G., & DiPrete, T. A. (2019). School-to-work linkages, educational mismatches, and labor market outcomes. *American Sociological Review, 84*(2), 275-307. <https://doi.org/10.1177/0003122419836081>
- Browman, A. S., Destin, M., Carswell, K. L., & Svoboda, R. C. (2017). Perceptions of socioeconomic mobility influence academic persistence among low socioeconomic status students. *Journal of Experimental Social Psychology, 72*, 45-52. <https://doi.org/10.1016/j.jesp.2017.03.006>
- Cleovoulou, Y., Iznardo, M., & Kamani, F. (2022). An examination of equity pedagogy during program coherence building in teacher education. *Teaching and Teacher Education, 120*, article 103866. <https://doi.org/10.1016/j.tate.2022.103866>
- Cochran-Smith, M., Ell, F., Grudnoff, L., Haigh, M., Hill, M., & Ludlow, L. (2016). Initial teacher education: What does it take to put equity at the center? *Teaching and Teacher Education, 57*, 67-78. <http://dx.doi.org/10.1016/j.tate.2016.03.006>
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). Routledge.
- Daher, M., Tomicic, A., Rosati, A., & Campero, M. J. (2023). The right to dream: A cross-sectional look at poverty alleviation programs. *Journal of Community Psychology, 51*(4), 1518-1539. <https://doi.org/10.1002/jcop.22930>
- Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology, 92*(6), 1087-1101. <https://doi.org/10.1037/0022-3514.92.6.1087>
- Dyches, J., & Boyd, A. (2017). Foregrounding equity in teacher education: Toward a model of social justice pedagogical and content knowledge. *Journal of Teacher Education, 68*(5), 476-490. <https://doi.org/10.1177/0022487117705>
- Gordon, M., & Cui, M. (2014). School-related parental involvement and adolescent academic achievement: The role of community poverty. *Family Relations, 63*(5), 616-626. <https://doi.org/10.1111/fare.12090>
- Gorski, P. C. (2012). Perceiving the problem of poverty and schooling: Deconstructing the class stereotypes that misshape education practice and policy. *Equity & Excellence in Education, 45*(2), 302-319. <https://doi.org/10.1080/10665684.2012.666934>
- Gorski, P. C. (2016). Poverty and the ideological imperative: A call to unhook from deficit and grit ideology and to strive for structural ideology in teacher education. *Journal of Education for Teaching, 42*(4), 378-386. <https://doi.org/10.1080/02607476.2016.1215546>
- Gorski, P. C. (2017). *Reaching and teaching students in poverty: Strategies for erasing the opportunity gap*. Teachers College Press.
- Haberman, M. (2010). The pedagogy of poverty versus good teaching. *Phi Delta Kappan, 92*(2), 81-87. <https://doi.org/10.1177/003172171009200223>
- Hannum, E., Liu, R., & Alvarado-Urbina, A. (2017). Evolving approaches to the study of childhood poverty and education. *Comparative Education, 53*(1), 81-114. <https://doi.org/10.1080/03050068.2017.1254955>
- Huang, J., Van den Brink, H. M., & Groot, W. (2009). A meta-analysis of the effect of education on social capital. *Economics of Education Review, 28*(4), 454-464. <https://doi.org/10.1016/j.econedurev.2008.03.004>
- Human Rights Commission (1948). *Universal declaration of human rights*. United Nations.
- Jensen, E. (2013). *Engaging students with poverty in mind: Practical strategies for raising achievement*. ASCD.
- Jury, M., Smeding, A., Stephens, N., Nelson, J., Aeelenei, C., & Darnon, C. (2017). The experience of low-SES students in higher education: Psychological barriers to success and interventions to reduce social-class inequality. *Journal of Social Issues, 73*(1), 23-41. <https://doi.org/10.1111/josi.12202>
- Keeney, A. J., Hohman, M., & Bergman, E. (2019). Interprofessional education: A poverty simulation with elementary teachers and social work students. *Journal of*

- Teaching in Social Work, 39(2), 148-162. <https://doi.org/10.1080/08841233.2019.1586808>
- Kretchmar, K., & Zeichner, K. (2016). Teacher prep 3.0: A vision for teacher education to impact social transformation. *Journal of Education for Teaching, 42*(4), 417-433. <https://doi.org/10.1080/02607476.2016.1215550>
- Lewis, O. (1966). *La vida: A Puerto Rican family in the culture of poverty - San Juan and New York*. Random House.
- Linberg, T., Schneider, T., Waldfogel, J., & Wang, Y. (2019). Socioeconomic status gaps in child cognitive development in Germany and the United States. *Social Science Research, 79*, 1-31. <https://doi.org/10.1016/j.ssresearch.2018.11.002>
- Liu, J., Peng, P., Zhao, B., & Luo, L. (2022). Socioeconomic status and academic achievement in primary and secondary education: A meta-analytic review. *Educational Psychology Review, 1*-30. <https://doi.org/10.1007/s10648-022-09689-y>
- MacPhail, A., Ulvik, M., Guberman, A., Czerniawski, G., Oolbekkink-Marchand, H., & Bain, Y. (2019). The professional development of higher education-based teacher educators: Needs and realities. *Professional Development in Education, 45*(5), 848-861. <https://doi.org/10.1080/19415257.2018.1529610>
- Martínez, S., Monjas, R., & Torrego, L. M. (2017). Hunger and prejudice. A study of development education in teachers training. *Procedia-Social and Behavioral Sciences, 237*, 950-955. <https://doi.org/10.1016/j.sbspro.2017.02.134>
- National Statistics Institute. (2021). *Living conditions survey. Year 2021*. [https://www.ine.es/prensa/ecv\\_2021.pdf](https://www.ine.es/prensa/ecv_2021.pdf)
- Parr, A. K., & Bonitz, V. S. (2015). Role of family background, student behaviors, and school-related beliefs in predicting high school dropout. *The Journal of Educational Research, 108*(6), 504-514. <https://doi.org/10.1080/00220671.2014.917256>
- Rank, M. R., Yoon, H. S., & Hirschl, T. A. (2003). American poverty as a structural failing: Evidence and arguments. *Journal of Sociology and Social Welfare, 30*(4), 3-29.
- Reddick, R. J., Welton, A. D., Alsandor, D. J., Denyszyn, J. L., & Platt, C. S. (2011). Stories of success: High minority, high poverty public school graduate narratives on accessing higher education. *Journal of Advanced Academics, 22*(4), 594-618. <https://doi.org/10.1177/1932202X11414133>
- Reichenberg, O. (2019). Cohort and education as predictors of temporary employment, and their relation to low wages and socioeconomic classification for young people in Sweden. *Journal of Education and Work, 32*(1), 1-20. <https://doi.org/10.1080/13639080.2019.1601690>
- Robison, S., Jagers, J., Rhodes, J., Blackmon, B., & Church, W. (2017). Correlates of educational success: Predictors of school dropout and graduation for urban students in the Deep South. *Children & Youth Services Review, 73*, 37-46. <https://doi.org/10.1016/j.childyouth.2016.11.031>
- Sadowski, C., Stewart, M., & Padiaditis, M. (2018). Pathway to success: Using students' insights and perspectives to improve retention and success for university students from low socioeconomic (LSE) backgrounds. *International Journal of Inclusive Education, 22*(2), 158-175. <https://doi.org/10.1080/013603116.2017.1362048>
- Save the Children. (2019). *Everything you need to know about PISA 2018 on equity*. [https://www.savethechildren.es/sites/default/files/imce/dossier\\_pisa2018\\_espanadatos.pdf](https://www.savethechildren.es/sites/default/files/imce/dossier_pisa2018_espanadatos.pdf)
- Schrag, F. (2016). *Thinking in school and society*. Routledge.
- Stake, R. E. (1998). *Case study research*. Ediciones Morata.
- Steinberg, S., & Krumer-Nevo, M. (2020). Poverty-aware teacher education. *European Journal of Teacher Education, 45*(2), 1-16. <https://doi.org/10.1080/02619768.2020.1827390>
- Strauss, A. L. (1987). *Qualitative analysis for social scientists*. Cambridge University Press.
- Thomas, N., Colin, C., & Leybaert, J. (2020). Interactive reading to improve language and emergent literacy skills of preschool children from low socioeconomic and language-minority backgrounds. *Early Childhood Education Journal, 48*(5), 549-560. <https://doi.org/10.1007/s10643-020-01022-y>
- Tong, C. X., & Ismail, F. (2024). Gratitude: Humanising pedagogy in higher education. *Journal of Applied Learning and Teaching, 7*(2), 1-14. <https://doi.org/10.37074/jalt.2024.7.2.3>
- United Nations. (2020). *Report of the special rapporteur on extreme poverty and human rights*. <https://documents-dds-ny.un.org/doc/UNDOC/GEN/G20/097/31/PDF/G2009731.pdf?OpenElement>
- Walker, J., Pearce, C., Boe, K., & Lawson, M. (2019). *The power of education to fight inequality: How increasing educational equality and quality is crucial to fighting economic and gender inequality*. Oxfam.
- White, M. L., & Murray, J. (2016). Seeing disadvantage in schools: Exploring student teachers' perceptions of poverty and disadvantage using visual pedagogy. *Journal of Education for Teaching, 42*(4), 500-515. <https://doi.org/10.1080/02607476.2016.1215543>



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Utilizing creative drama practices for enhancing communication skills of medical students: An applied theatre intervention

---

Pimrapat Prueksapitak <sup>A</sup>	A	<i>Faculty of Fine Arts, Srinakharinwirot University, Thailand</i>
Noppadol Inchan <sup>B</sup>	B	<i>Faculty of Fine Arts, Srinakharinwirot University, Thailand</i>
Srirath Pakdeeronachit <sup>C</sup>	C	<i>Faculty of Fine Arts, Srinakharinwirot University, Thailand</i>

---

### Keywords

---

Communication skills,  
creative drama,  
empathy,  
medical education;  
Thailand.

### Abstract

---

This research explores the transformative potential of drama pedagogies in medical education by developing and implementing a creative drama-based curriculum aimed at enriching medical students' patient communication skills. The study integrates the Source-Message-Channel-Receiver Model of Communication and Cognitive Learning Theory within a framework of applied theatre practices to address this often-overlooked aspect of medical training in Thailand. Field research was conducted with a purposively selected group of twenty-two first-year medical students at a Thai university in two stages: 1) the creation of a drama-based educational intervention and 2) its subsequent evaluation using an observational assessment method. The researchers designed a series of drama activities, which were taught over six sessions, each lasting two hours. The first half of the programme introduced fundamental principles of the dramatic process, while the second half applied these processes directly to medical contexts. This structure aimed to develop two primary communication abilities: empathy and public speaking. Post-intervention evaluation revealed a substantial improvement in the participants' communication skills. This enhancement was evident across all evaluated areas and bore statistical significance at the 0.01 level. This study demonstrates the efficacy of applied theatre practices in fostering essential communication skills within medical education, an approach relatively rare in the didactic environment of Thai universities. It emphasizes the potential for theatre-based pedagogical interventions to facilitate cultural engagement, education, and social change, thereby promoting the development of innovative teaching methods for medical students.

---

### Correspondence

[pprueksapitak419@gmail.com](mailto:pprueksapitak419@gmail.com)<sup>A</sup>

---

### Article Info

Received 20 July 2024  
Received in revised form 16 October 2024  
Accepted 3 December 2024  
Available online 6 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.4>

## Introduction

Interpersonal communication skills are increasingly valued as indispensable for professional success (Majid et al., 2019; Meeks, 2017). These skills facilitate social interaction and holistic human development. In the Thai healthcare system, the paramount importance of effective communication is starkly evident (Sathaporn & Pitanupong, 2022). High-profile incidents have recently illustrated a concerning lack of empathy among some medical professionals. These range from inappropriate comments to elderly patients (Amarin TV, 2018a), rude discharge of patients (Amarin TV, 2018b; Thairath Online, 2018), and late-night disputes between physicians and relatives (Amarin TV, 2022). These troubling episodes have led to tangible consequences, including legal action against medical practitioners. Issues ranging from misdiagnosis to hospital violence have also been attributed to communication gaps (Sithirangsan, 2020). In fact, in a case study of 381 complaints filed at Songklanagarind Hospital in Southern Thailand, the three most common issues were communication, service behavior, and service access (Sornlertlumvanich & Pinjareon, 2012). Data compiled by the Thai Medical Council illustrates the continued scale of this problem, with hundreds of complaints filed each year (Thrakul et al., 2023). Yet, official records represent only a fraction of actual infringements, with less than 200 annual complaints per 300 million treatments (Sithirangsan, 2020). This observation raises concerns about unreported incidents and victims seeking redress through other legal channels.

Empathetic communication is integral to the cultivation of trust in healthcare (Haribhai-Thompson et al., 2022; Steinmair et al., 2022). Poor communication can inadvertently distort intentions, resulting in misunderstandings, conflicts, and failures. In his book *Performance, Medicine and the Human*, Alex Mermikides (2020) argues that there has been a particular convergence of theatre and medicine in Western healthcare services in the twenty-first century – a phenomenon he terms medical performance and which the book credits for the increasing prevalence of drama techniques used in Western medical education. There have been similar moves to improve the level of interpersonal communication skills training in Asian medical education, which has traditionally overlooked the importance of humanist values in medical school (Zhu et al., 2022). Yet, there remains an urgent need for enhanced communication skills among medical students in Thailand, a gap that this research aims to address through the application of theatre for development. There are significant disparities between the few progressive medical schools in the country and the majority of education providers, which continue to teach primarily through didactic lectures and multiple-choice assessments (Aung et al., 2022). The present study explores creative methods to enhance communication skills through applied theatre (for the purposes of consistency in this investigation, interchangeable with drama), which incorporates performance arts and organizational development. Building upon the innovative theories of Leslie Stager Jacques (2013), these researchers believe that drama can cultivate essential communication skills in medical professionals, such as listening, observing, and self-awareness. By harnessing the use of words and bodily expressions to convey thoughts and emotions, applied theatre encourages participants

to develop personal resources, placing emphasis on the learning process towards change (Gao et al., 2019; Jennings et al., 2020). By fostering better self-understanding, effective communication, and empathy, the study aims to address the significant need for improved patient interaction in Thailand's healthcare system.

## Literature review

### Communication theory and medical education

David Berlo's (1977) communication theory, the SMCR Model (Source-Message-Channel-Receiver), has been a seminal work in communication studies since its initial publication. Berlo (1960) introduced six components within the communication process: the communication source, encoder, message content, channel, decoder, and receiver. In instances of direct, one-to-one communication, the sender and encoder, as well as the decoder and receiver, are often the same individual. Therefore, Berlo consolidated these six components into four: the sender (*source*), the content of communication (*message*), the method of conveyance (*channel*), and the recipient of the message (*receiver*). This proved to be a more efficient framework for understanding communication and has been the most influential theory for communications development in Thailand over the past half a century (Ka-Kan-Dee & Nonthapot, 2020; Thongsrikum et al., 2020).

The SMCR model has implications for health communication and its impact has been widely explored in international literature. The importance of the *sender* was the focus of a quasi-experimental study by Rijitha and Gouda (2022) that showed how attitude, communication skills, and values significantly influence the perception of the message. In a real-world example, key *senders* during the COVID-19 pandemic clearly influenced the direction of healthcare experiences (The Lancet, 2020). The *message* also has a direct impact on promoting health communication behavior (Kachentawa & Cheyjunya, 2017). Information *messages* can vary from factual health information to guidelines for prevention and treatment, and their content must be adapted to overcome communication challenges (Brodsky et al., 2021). The choice of *channel* through which these *messages* are delivered then influences their impact and reach. Multiple *channels* are used for disseminating information in the context of healthcare and have varying impacts depending on the demographic using them (Noar & Austin, 2020; Olaimat et al., 2020). To effectively adapt *messages* to the specific contexts of different *receivers*, *senders* must understand the receiver's personal, cultural, and environmental background, emphasizing the need for a dynamic adaptation strategy in communication practices (Kurtz et al., 2005). Finally, the *receiver's* characteristics and personal attitudes have a significant influence on how *messages* are interpreted and consequently their effectiveness (Dadaczynski et al., 2021). This is the dynamic that has driven communication strategies in Thai healthcare for decades.

For Berlo, this communication framework equates to the learning process. The *message* serves as a stimulus, and the response it elicits can be equated to learning. Sensory

mechanisms - seeing, hearing, touching, smelling, and tasting - act as *channels*, decoding the received stimulus (Boonlue, 2014). This decoding process is akin to perception, leading to the interpretation and encoding of response, which is a reflexive reaction to the stimulus (Khananurak, 2004). The model thus emphasizes the necessity of the cognitive process and language use for achieving mutual understanding in communication, whose success is contingent upon various factors, particularly the *sender's* capability to transmit the message. This underlines the importance of training for *senders* (in our study, the medical students) to effectively communicate messages.

The versatility of Berlo's model is demonstrated by its ability to accommodate various media, such as person-to-person interaction and email or telephone conversations. It also enables overlap with Mehrabian's (1971) 7%-38%-55% rule of words-tone-body language. Mehrabian's theory indicates that the receiver will most likely trust tone and body language, which are irrefutably the predominant forms of communication despite criticisms of the misleading percentages (Lapakko, 2007). By integrating these insights into the educational process, educators can develop curricula that emphasize the importance of contextualizing communication to suit various patient backgrounds, enhancing both the technical and affective domains of communication. The dynamism of SMCR reflects the complexity and multifaceted nature of communication, however, there have been criticisms of the model's seeming oversimplification of the process, particularly in complex settings such as medical education (Eva & Regehr, 2005; Getchell et al., 2023). Critics argue that Berlo's model, in its linear format, might not fully encapsulate the intricacies of the feedback process in educational settings where feedback is often multidirectional and contingent on numerous factors (Parker & Coiera, 2000). Furthermore, the model insufficiently accounts for external factors that can influence communication within healthcare settings (Henry, 2019). By disregarding critical competencies such as empathy, rapport-building, and shared decision-making, the model overlooks key facets of healthcare communication, which is problematic given their significance in medical students' professional development (Kurtz et al., 2005; Veenker & Paans, 2016). As a result, additional paradigms are necessary to fully comprehend and instruct the breadth of skills requisite for effective healthcare communication.

### **Communication theory applied to cognitive learning theory**

Bloom's (1956) Taxonomy is the go-to theory of learning effectiveness, covering each of the cognitive, affective, and psychomotor domains. As a summary, this model is a hierarchical progression, starting from basic knowledge and gradually moving towards comprehension, application, analysis, synthesis, and evaluation. For Bloom, the affective domain encapsulates psychological responses and implies the gradual development of attitudes, beliefs, interests, and virtues. Simultaneously, the psychomotor domain pertains to neuromuscular behaviors, emphasizing the acquisition and proficient use of physically demonstrable and evaluable skills. Bloom's taxonomy therefore emphasizes the

necessity of a foundational understanding for learners while appreciating the differences in learning abilities. The original concept was revised by Anderson and Krathwohl (2001), who refined the dimensions and added knowledge characteristics to the taxonomy, including factual, conceptual, procedural, and metacognitive knowledge. This innovation shifted the taxonomy's focus from nouns to action-oriented verbs, such as remember, evaluate, and construct. Consequently, educators could define learning objectives more precisely while retaining Bloom's hierarchical structure. The revised taxonomy provided a framework for the authors in setting learning objectives, assessing student progress, curriculum development, and instructional methods in this study.

Within the context of healthcare, communication theorists have determined effective communication as a conduit to advise on holistic needs, provide comfort and consistency, educate care providers, improve relationships, and ensure a smooth flow of information (Henry, 2019). Medical educators have consequently developed assessment instruments to evaluate communication efficacy in medical training (Matusitz & Spear, 2014). In a critical analysis of fifteen such instruments, Schirmer et al. (2005) identified the seven-point Kalamazoo Consensus Statement as an effective measure of successful communication. Nevertheless, the study noted significant omissions, including non-verbal communication and cultural competency. Based on their review and the aforementioned criteria, the present researchers have derived eight key assessment areas crucial for effective communication training for medical practitioners:

1. Establishing a starting point – Setting a clear agenda at the beginning of the interaction to guide the patient and clinician through a structured conversation (Gobat et al., 2015).
2. Utilizing effective facial expressions – Recognizing the impact of non-verbal cues in enhancing expressiveness and empathy in communication (Oe & Murata, 2019).
3. Using appropriate tones – Modulating vocal pitch and tone to suit the emotional and informational needs of the communication (Ambady et al., 2002).
4. Demonstrating active listening and adapting communication – Showing attentiveness and adjusting communication strategies based on patient feedback and cues (Fassaert et al., 2007).
5. Presenting information clearly – Conveying medical and procedural information in a manner that is understandable and unambiguous (Chandra et al., 2018).
6. Crafting concise conclusions – Summarizing the conversation effectively to ensure clarity and retention of critical information (Song et al., 2020).

7. Projecting a professional demeanor – Maintaining conduct that fosters trust and confidence (Mikesell, 2013).
8. Employing effective gestures – Integrating gestures to complement verbal communication, enhance understanding, and demonstrate empathy (Tarigan & Stevani, 2021).

Each category was constructed to measure the explicit content of communication and capture implicit competencies (e.g. empathy, rapport-building, and sensitivity), thereby providing a holistic, multidimensional assessment of communication skills.

### **The role of applied theatre in medical education**

Theatre is a multifaceted discipline that transcends mere acting to embody latent ideas, reflections, and emotions intended to evoke certain feelings or awareness in humans (Hamilton, 2013). Roland Barthes famously described theatre as a communication machine that simultaneously delivers various messages through different semiotic elements such as set, clothing, lighting, actor's position, gestures, sign language, and speech (Lombardinio, 2024). This coordination of messages, he argued, is the essence of theatre (Barthes, 1972; Barthes & Duisit, 1975). Whilst theatre is a means to create excitement and entertainment, it is also a method of exchanging ideas and a form of communication that has evolved over time from simple human gestures to more complex forms such as singing and dancing (Combs & Mansfield, 1976). Given this relationship between dramatic technique and communication, it comes as no surprise that theatrical performance has been identified in a vast array of human interactions, not least in medicine (Lewandowska & Węziak-Białowolska, 2023; Weitkamp & Almeida, 2022). Theatre in its various guises has consequently become a tool for fostering learning and development through experiential activities such as performance, observation, and critical thinking (Sextou et al., 2020; Sinha & D'Souza, 2022). With this function, where drama and theatrical processes are used in non-traditional settings to engage with participants and address social issues, facilitate personal development, or achieve educational goals, theatre becomes applied theatre (Prendergast et al., 2024).

The theoretical frameworks proposed by George H. Mead and Erving Goffman provide a robust basis for understanding the dynamics of role-playing and the dramaturgical approach within applied theatre. Mead's (1967) role theory and Goffman's (1959) analysis of everyday life as a series of dramatic performances suggest that theatre can be an effective medium for training medical professionals in empathetic communication. Building on the foundational aspects of applied theatre as a platform for experiential learning and social engagement, it is clear that the principles underpinning effective interpersonal communication in therapeutic settings can be greatly enhanced through dramaturgical techniques. In medical training, for example, employing actors to simulate patient experiences can be a practical application of these theories, allowing medical

professionals to practice and hone essential skills (Eisenberg et al., 2015). Most patients are not forthright in verbalizing their emotional state, often leaving clues instead. Suchman et al. (1997) clarify that empathic communication entails recognizing the potential presence of unexpressed emotions and effectively acknowledging these feelings for the patient to feel understood. This suggests that key skills such as active listening, perceptive reading, and responsive engagement to a patient's verbal and non-verbal cues, and improvisation in unforeseen circumstances should be developed, practiced, and assessed. Numerous case studies have advocated the use of applied theatre in teaching these interpersonal communication skills to medical practitioners (de Carvalho et al., 2020; Hobson et al., 2019). Theatre can enhance case presentation skills, facilitate empathy, and help practitioners grapple with ethical dilemmas, but there must be the development of a curricular rationale for these techniques to ensure their value is recognized, and not just seen as a passing trend (Kohn, 2011; Shapiro & Hunt, 2003).

Recent scholarship highlights the limitations of training that focuses solely on concrete communication skills in a checklist manner, suggesting it can restrict physicians' ability to adapt their communication to different audiences and situations (Eisenberg et al., 2015; Hoffmann-Longtin et al., 2021; Kaplan-Liss et al., 2018). Instead, Levinson et al. (2010) argue that effective relationships in healthcare require genuine personal engagement, beyond mechanical skill application. To address these needs, some medical education programs have incorporated applied improvisational theatre techniques, aiming to enhance physicians' spontaneity, flexibility, and responsiveness in communication (Hoffmann-Longtin et al., 2018; Sawyer et al., 2017). This is a direct contrast to Barthes' approach, whose sentiments have been critiqued for their reductionism and neglect of the audience's active role in creating theatrical meaning, potentially oversimplifying the dynamic and experiential nature of performance (Daddario & Wilson, 2023; Pavis, 2003). Reinforcing this critique, medical education programs increasingly view communication as a dynamic interaction, encouraging a deep understanding of the audience to tailor culturally competent messages. The effectiveness of such programs is supported by evidence suggesting that experiential learning through improvisation promotes deeper understanding and adaptability (Hoffmann-Longtin et al., 2021; Rossing & Hoffmann-Longtin, 2016). Given the dynamic and interactive nature of communication emphasized in applied improvisational theatre, the use of a rubric and observational assessment form in this study is justified as it provides a structured method to evaluate and reflect on the practical application of these skills in real-time interactions.

Acknowledging the increasingly complex social, economic, and emotional climates in which medical professionals operate, the fostering of empathy, improvisation, active listening, and responsive engagement are gaining more and more importance (Bouchard & Mermikides, 2016; Stager Jacques, 2013). The application of advanced theatre-based learning methods, such as improvisation and interactive drama, can be useful not only for medical practitioners but also for organization development practitioners in navigating complex interpersonal and organizational issues



(Macneill et al., 2016). Therefore, theatre's incorporation into professional education and training should be seen as a necessity for the development of effective, empathetic, and future-responsive professionals. The following study attempts to examine these ideas more closely in the context of a Thai medical school and answer the question: how effective are applied theatre activities in improving the communication skills of medical students?

## Research methodology

The objectives of this quasi-experimental, mixed methods research are two-fold: 1) to develop a series of applied theatre activities aimed at improving the communication skills of medical students; 2) to study the impact of these applied theatre activities on the communication skills of medical students, by comparing their skills before and after the activities. This study adopts an interdisciplinary approach that is increasingly recognized as vital in exploring the complexities of medical training, including social science research paradigms that are particularly suited to the investigative aims of this study (Berger-Estilita et al., 2020). The authors chose qualitative methods of observation and structured interviews for their strength in capturing interpersonal dynamics and the depth of individual learning experiences. The authors considered these methods to align with established research in educational settings, where understanding the impact of innovative teaching methods on student outcomes is key. The choice to add quantitative analysis further supported the evaluation by enabling examination of the study's effects on the acquisition and application of communication skills. This framework was supported by literature emphasizing the effectiveness of mixed methods in educational research (Creswell & Plano Clark, 2017; Johnson & Onwuegbuzie, 2004). The investigation was conducted at Srinakharinwirot University with first-year medical students from the academic year 2022. The study population comprised 167 students, from which 22 volunteers were purposively selected. The inclusion criteria for respondents in this investigation were that students were first-year medical students at Srinakharinwirot University, their instructors consented to allow the activities to run during scheduled lesson times, and the respondents provided their consent to be included in the research and their data to be used in related reports and publications. All participants were fully informed about the purpose, methods, and potential impacts of the research prior to selection and provided their informed consent. The study was approved by the Ethics Commission of Srinakharinwirot University, ensuring that all ethical guidelines, including respect for participant autonomy and confidentiality, were strictly followed. The ethical approval number for this study was SWUEC-G355/2564E.

The researchers used two primary instruments: an observational rubric and a drama activity package. The rubric was designed to score the students' communication skills before and after the drama activity. It focused on empathy, communication, and public speaking abilities. The inclusion of public speaking in the rubric acknowledges the essential role of articulate expression in patient interactions, which Nie et al. (2020) found to be crucial to information

delivery. Moreover, empathy and effective communication are considered pivotal in numerous evidence-based studies, as they directly influence patient outcomes and are central to relational practices that emphasize noticing and responding to patient emotions and cues within clinical settings (Bachmann et al., 2022; Smith et al., 2017). The observational rubric was created following a literature review and consultation with experts in drama and medical communication. The rubric was divided into eight sections, each graded on a scale from 1 to 5. To ensure the validity of the rubric, it was examined by three independent experts using the Index of Item Objective Congruence (IOC). Furthermore, its reliability was validated by employing the Intra-Class Correlation (ICC) statistic of the SPSS program using Cronbach's alpha coefficient formula.

The drama activity scheme of work was created following a review of drama- and education-related literature, document analysis, and expert interviews. The scheme was designed to be suitable for the students' learning requirements and time constraints and consisted of six sessions, each lasting two hours. The first three sessions addressed basic communication skills through drama, and the remaining three sessions applied these skills in a medical context. Details of the specific activities are available as supplements to this manuscript. The activity set was presented to three experts to evaluate its alignment with the research objectives, using the IOC. After calculating the IOC values and refining the activities based on expert feedback, the researchers taught the scheme of work to the volunteer medical students. An observation model was designed to capture data during the lessons based on insights from interviews with experts and the literature review. The observation form and the scheme of work were then reviewed by three experts to validate the tools.

The applied theatre activities were carried out with guidance from specialists in drama. All activities were conducted in Thai, and all materials were printed in Thai. Before and after the activity, the communication skills of the students were assessed using the observational rubric and assessment form by three experts (Appendix I). The researchers acknowledge that concepts like the effectiveness of tone, gestures, and vocabulary are contentious topics, which are inherently subjective. For this reason, experts in medicine, drama, and communication were all asked to judge volunteer performance, with an average taken from the three scores. The Scoring Rubric was employed to check the reliability of the observation form by examining the Interrater Reliability (IRR) from the pre- and post-activity communication skills grading. The study adopted a pre-experimental research design, conducting pre-test and post-test evaluations for data analysis. The ICC statistics were used to assess the reliability of the communication skills observations by examining the IRR. The Paired Samples T Test was applied to compare the pre-test and post-test scores of medical students' communication skills. The researchers finally analyzed all collected data using a statistical analysis package.

## Results

### Development of applied theatre activities for enhancing medical students' communication skills

The researchers undertook a thorough review of relevant literature and conducted field interviews to construct a model for observing communication skills, centered on appropriate criteria within the medical field. The constructed scoring rubric comprised eight skill assessment categories and five levels of communication skill observation criteria.

Table 1. The scoring rubric for evaluating medical student communication skills.

Evaluation Criteria	Ineffective (1)	Below Average (2)	Acceptable (3)	Good (4)	Excellent (5)
Establishing a starting point	Lack of introduction	Greeting and introducing the message incomplete	Greeting and introducing the message and/or purpose	Effective language use in introduction, greeting, and introducing message and/or purpose	Excellent language use in introduction, naturally connects with content, greeting, and introducing message and/or purpose
Utilizing effective facial expressions	Lack of control over facial expressions	No negative expression, but overall lack of natural facial expressions	No negative expression and some changes according to the message	Appropriate facial expressions corresponding to the message, adequate eye contact	Clear control over facial expressions to match the content, steady eye contact
Using appropriate tone	Lack of control over voice tone/volume, consistently unpleasant or inappropriate	Sometimes lacks control over voice tone/volume, sometimes unpleasant, or inappropriate	Mostly controls voice tone/volume, generally pleasant and relatively suitable	Controls voice tone/volume well, corresponds with the message, pleasant and suitable	Excellent control over voice tone/volume, adjusts to content and rhythm of communication, pleasing and appropriate
Demonstrating active listening and adapting communication	Shows no empathy or awareness of the listener's context	Shows lack of empathy or awareness of the listener's context	Shows empathy or awareness of the listener's context, but does not adjust the content to the listener	Shows empathy or awareness of the listener's context, adjusts the content to the listener to some extent	Clearly empathetic and/or aware of the listener's context, adjusts the content excellently, making it easy to understand
Presentation of information	As though reading from a script, but the vital information is incomplete	As though reading from a script, but the vital information is complete	Communicates so that the listener understands, with all essential content	Communicates so that the listener understands and shows systematic planning in the presentation	Excellent ability to communicate, organized clearly, and uses easy-to-understand methods of communication
Crafting concise conclusions	Concludes the conversation stubbornly, without summarizing content	Tries to summarize, but doesn't do it well	Summarizes, but has some defects	Concludes with an appropriate length, with all essential content	Shows excellent summarizing skills, with appropriate length, easy to understand and remember
Projecting a professional demeanor	Stooping or sitting with a stiff body. Unable to organize the body systematically. Unconfident posture. Speaker not visible	Standing or sitting with a hunched shoulder, body is stiff. Unable to organize the body systematically. Sideways stance. Speaker not visible	Standing or sitting straight with a relaxed body. Speaker partially visible	Standing or sitting upright, chest out, body relaxed. Arranges arms and legs in suitable positions. Speaker clearly visible	Standing or sitting straight, naturally confident. Arranges arms and legs excellently. Speaker clearly visible
Utilizing effective gestures	Doesn't use gestures, or, unable to control gestures	Uses gestures a little, uses too many gestures, or, is unable to organize own actions well	Uses gestures at some points and is able to organize body actions	Uses gestures appropriately, in a rhythm suitable for the message, in an appropriate quantity	Uses gestures excellently, in a rhythm suitable for the message, in an appropriate quantity, appears natural

Three experts, including an acting coach, a film and digital media lecturer, and a child and adolescent psychiatry professor, validated the rubric using the Index of Item Objective Congruence (IOC). Each criterion in the rubric was confirmed to be in line with the objectives of the assessment. The reliability of the rubric was evaluated using Interrater Reliability (IRR) and Intra-Class Correlation (ICC). Cronbach's Alpha Coefficient, a measure of internal consistency, was also calculated. The pre-activity and post-activity alpha values were .918 and .820, respectively, demonstrating very good and good levels of confidence. These results show a statistically significant correlation in the reliability of the evaluations conducted by the experts, with the recorded level of significance at  $p = 0.01$ . The rubric was therefore suitable for assessing the communication skills of medical students and is valid and reliable according to expert opinion and statistical evaluation.

The researchers subsequently developed a series of applied theatre activities to enhance medical students' communication skills. The structure of these activities was informed by David Berlo's communication theory and Bloom's learning theory. The program consisted of six sessions, each lasting two hours (Table 2).

Table 2. A summary of the six applied theatre activities.

Activity	Objective	Key Activities	Theoretical Concept	Benefits
Hello I Am	1. Relax students 2. Practice using imagination 3. Express thoughts freely 4. Pre-Test communication skills	Introduce themselves, practice activities, Pre-Test	Cognitive Domain Learning Theory: Interpret facts and draw conclusions	Familiarize, reduce tension, understand practices throughout the project phase together, pre-test communication
My Body	1. Prepare the body 2. Use the tone of voice 3. Use words appropriately 4. Use rhythm in communication	Practice activities, joint conclusion of learning	Communication Theory: Preparation of communication	Learn to use body, sounds, words, and rhythm of speech by adapting physical training of drama process
My Position	1. Practice meditation 2. Practice breathing rhythms 3. Learn to express feelings appropriately 4. Learn gestures 5. Learn the rhythm of movements	Practice activities, joint conclusion of learning	Communication Theory: Preparation of communication	Learn to relieve anxiety, concentrate, understand principles of communication, use faces, eyes, facial expressions, gestures, and rhythm of movements
Motivation and Action	1. Learn the impulse of action naturally 2. Learn to tell stories 3. Learn necessary communication skills in the medical field	Practice activities, joint conclusion of learning	Cognitive Domain Learning Theory: Interpret facts, draw conclusions, adapt and apply knowledge, embed values to control behavior	Analyze character's motivation, empathize with others, tell the story clearly; knowledge, combine applied theatre activities with medical communication skills
In My Mind	1. Review the body of knowledge 2. Prepare before the practice test	Practice activities, joint conclusion of learning	Cognitive Domain Learning Theory: Interpret facts, draw conclusions, adapt and apply knowledge; Communication Theory: Communication Practice	Review knowledge of all 4 activities
Own Ways	1. Use communication more empathetically, communicate naturally 2. Understand the knowledge of drama, apply it to work effectively	Practice activities, joint conclusion of learning	Cognitive Domain Learning Theory: Interpret facts, draw conclusions, adapt and apply knowledge; Communication Theory: Communication Practice	Practice drama process in 5 steps until understanding and being able to apply knowledge in profession

Following the development of the applied theatre activities and communication skills observation form, the Index of Congruence (IOC) method was used to ascertain the consistency between the activity set, observation form, and objectives. The three experts found the consistency index to be 1.00.

### Comparison of students' communication skills before and after the applied theatre activities

The impact of the applied theatre activities on the students' communication skills was assessed over six sessions, with evaluations conducted before and after each session by all three experts. The results showed a statistically significant improvement in communication skills following the activity, with a  $p$ -value of 0.01. The experts' use of the scoring rubric before and after the activities was tested for inter-rater reliability using Intra-Class Correlation (ICC) statistics. The analysis revealed a statistically significant agreement among the three experts' scores, with a  $p$ -value of 0.01. The final results of pre- and post-intervention assessments are recorded below in Table 3.

## Conclusions

Emerging concerns within the medical field in Thailand underline the necessity of effective communication, and the results of this study align with the vision of promoting interpersonal communication skills within medical education. The creation of a series of applied

Table 3. Overall pre- and post-intervention scores for the test group.

Volunteer No.	Pre-intervention Score (x̄)	Post-intervention Score (x̄)	Notable Improvements	Suggestions
1	18.33	29.33	Improved word choice, volume, and eye contact	More practice with tone variation
2	12	26	Improved speech rhythm and facial expressions	Maintain consistent eye contact
3	15.33	30.33	Improved posture and voice volume	Use more appropriate gestures
4	27.67	37	Improved word choice, tone, and gestures	Practice more eye contact
5	24	37.33	Improved pronunciation, volume, and eye contact	Speak louder to boost confidence
6	20.33	35.33	Improved facial expressions, pronunciation, and gestures	Be more approachable
7	22.67	30.33	Adjusted speech, improved posture	Avoid excessive smiling
8	30.33	37.33	Improved speech speed, tone, and gestures	Control excitement for natural demeanor
9	17.67	30.67	Improved posture, more eye contact	Manage excitement in front of large audiences
10	25.67	33.67	Improved expressions and use of examples	Increase knowledge proficiency
11	23.33	32.33	Improved speech rhythm and appearance	Improve information proficiency
12	33.33	39.57	More relaxed demeanor, use of gestures	Practice speaking in front of large audiences
13	23	34.33	Improved tonal selection and gestures	Practice more eye contact and maintain a louder tone
14	21.67	33	Better word choice and tonal selection	Increase self-confidence
15	19	29.33	Increased facial expressions, improved tone	Improve voice projection
16	31	36.33	Improved eye contact, gesture use, and tone selection	More fluency and spontaneity in speech
17	22.67	36.33	Decreased anxiety, better word choice, and effective use of gestures	Continue to build confidence and maintain natural demeanor
18	27	33.67	Improved eye contact, speech pace, and gestures	Continue to work on word choice suitable for the audience
19	32.67	38.33	Improved calmness, content emphasis, and concise speech	Keep engagement with the listeners
20	26.67	32.67	Improved speech rhythm, effective use of gestures, and reliable posture	Maintain eye contact and speak more slowly
21	28.67	34.33	Improved empathy, use of examples, and voice selection	Continue practicing speaking to increase confidence
22	19.33	26	Improved eye contact, word choice, and tone selection	Continue to work on confidence, maintain eye contact, and smile more

theatre activities tailored for first-year medical students at Srinakharinwirot University. A thorough examination and interview process led to the identification of two key areas of development: empathy and public communication. These facets concern appropriate word choice, tone, eye contact, listener consideration, appropriate demeanor, and postural awareness. These areas served as the foundation for constructing a medical communication observation model and the development of drama activity sets. Using the observation, the researchers assessed skills such as initiating conversation, facial expressions, tone of voice, listening awareness, and communication adjustment. It was ensured that the activities catered to the needs of the students. This approach aligns with the role of creative drama in developing assertive behavior, self-expression, and free thinking. Post-intervention evaluation revealed a substantial improvement in the participants' communication skills. This enhancement was evident across all evaluated areas and bore statistical significance at the 0.01 level. The study demonstrates the efficacy of applied theatre practices in fostering essential communication skills within medical education and therefore advocates theatre-based pedagogical interventions for medical students.

## Discussion

This study makes a significant contribution to the discourse on the role of creative drama in fostering critical skills in medical education by expanding the research field to

Thailand (de Carvalho et al., 2020; Hobson et al., 2019). By aligning with cognitive and psychomotor domain learning theories, this investigation sets a precedent for Thai universities to enhance the overall effectiveness of medical communication through applied theatre. The research promotes the construction of personal style, communication expertise, and control to convey messages within the SMCR paradigm. This practical example of applied theatre for medical communication training builds on the theoretical work of Thanasin Chutintharanon (2017), which suggested that applied theatre at the heart of education can develop learning, covering interpersonal communication skills and psychological educational goals. He found that learners' exposure to activities or theatrical processes creates direct experiences, forming long-lasting memories.

Our study empirically validated Berlo's (1960) SMCR Model within the context of medical education, with notable insights regarding each of the model's core components. Specifically, our findings reinforce the work of Rijitha and Gouda (2022) by substantiating the vital role of the sender's attributes, such as their attitude and communication skills, in shaping the perception of the message. We also found that the content of the message, aligned with Kachentawa and Cheyjunya's (2017) observations, significantly influenced health communication behavior. Our empirical evidence demonstrated that messages need to be specifically tailored and adapted to overcome various communication challenges, affirming the findings of Brodsky et al. (2021). The post-class survey revealed that learners perceived word choice as the most critical skill (72%). This is despite academic research advocating the contrary (Mehrabian, 1971). Regardless, the learners' insights underscore the importance of concentration and mindfulness in communication, particularly in adverse situations where inappropriate language can exacerbate the circumstances. Subsequent skills in importance were conclusion clarity (18%), a reflection of mutual understanding, and voice tonality (9%), an aspect deemed integral to effective word choice. The learners' feedback on their preferred activities indicated a strong affinity for role-playing scenarios, which provided opportunities to address problems and discover solutions using gestures. This finding is corroborated by the high assessment scores on gesture communication in role-play scenarios where learners portrayed doctors interacting with a patient with limited Thai language proficiency.

Notwithstanding the positive outcomes of using applied theatre activities in this context, our study also underlined the limitations of Berlo's model when applied to the complexities of medical education, thus mirroring the critiques of Eva and Regehr (2005) and Getchell et al. (2023). To address these limitations, particularly Berlo's insufficient consideration of the receiver's context in communication, our integration of Bloom's taxonomy aimed to expand on the emotional and cultural dimensions of communication. This approach helped in tailoring messages more effectively to diverse audiences. Our empirical evidence suggested that the model might overlook certain critical competencies such as empathy and rapport-building, important for effective healthcare communication. On this account, we turned to the use of applied theatre as an auxiliary educational tool. By employing drama techniques that emphasize role-

playing and scenario-based learning, we facilitated a deeper understanding and practice of adaptive communication strategies. This method enriched students' abilities to modify their communicative approaches depending on the unique cultural and emotional contexts of their patients. Mirroring Eisenberg et al.'s (2015) observations, our findings demonstrated that theatre-based pedagogy significantly improved non-verbal communication and cultural competency among the participants, elements that Schirmer et al. (2005) found to be often overlooked in traditional medical communication models.

The students' average communication scores improved from good to very good after the experiment, showing that the applied theatre activities enhanced their communication skills in this limited trial. The applied theatre activities were found to be suitable for medical students as they helped develop ideas, attitudes, and understanding of people. The activities increased physical actions, making the learners' communication more natural, and emphasized the importance of word choice. This was evident when the medical students, acting as doctors, had to explain medical information to patients in everyday language. The importance of tone was also stressed in the activities and the students learnt to adjust their tone according to their audience. Furthermore, the use of facial expressions that matched the tone of voice and context improved the efficiency of communication.

Facial expressions serve as unconscious reflections of a person's thoughts and can significantly impact others. Therefore, being aware of and controlling facial expressions can help mitigate the potential negative effects on others, especially in sensitive medical settings (Versluijs et al., 2021). Introducing information such as knowledge about precautions, factors that can cause diseases, or healthcare guidelines, requires expertise on the part of the speaker. Additional introductions during such activities can enhance the listener's attentiveness to the speaker. In the medical field, the introduction stage plays a vital role in establishing rapport with patients. By starting with a greeting and self-introduction, doctors can help alleviate patients' anxiety and create an initial sense of relaxation, building a connection with patients and their families. Volunteers expressed that having a starting point is not merely an introduction but also an opportunity to foster closeness and break the ice in conversations. By introducing themselves effectively, doctors can help patients feel at ease. They should strive to establish good relationships with their listeners through self-introduction, general greetings, and explanations of objectives, steps, and timelines (Morgan, 2018).

In medicine, the end of a conversation or activity serves as a review of the conveyed information and allows the speaker to gauge the listener's understanding. Volunteers highlighted the significance of having a conclusion or summary. An ending provides an opportunity to recap the information, and check the listener's comprehension, and can be accompanied by questioning to reinforce key points. Concluding a conversation is still regarded as an essential component. Endpoint-related activities primarily focus on ensuring the listener's understanding aligns with the information communicated by the doctor. This may involve

repeating or summarizing important points for clarity and to prevent message distortion. However, it is crucial to consider other factors, such as the patient's level of maturity and understanding. Kurtz (2002) also emphasizes the importance of repeating or summarizing key points from the patient's story, as it builds trust by conveying genuine interest and understanding.

The premise of communication skills training through applied theatre activities stems from the observation that knowledge acquisition through practice transcends mere information presentation (Ekebergh et al., 2004). The experiential nature of learning inherently necessitates direct learner involvement, consequently fostering comprehension and problem-solving capabilities naturally. This shows that applied theatre activities can cultivate communication skills and advocate an inside-out approach to knowledge and understanding. This method encourages learners to actively engage in knowledge creation, sequentially developing understanding through participation. The effectiveness of this approach was particularly evident in the observed transformation of the shier and more reserved volunteers during this study. The clear articulation of imagination fostered a safe space, enabling the volunteers to express themselves comfortably. These findings resonate with Willson's (2006) assertion that drama's educational application allows learners to build knowledge through classroom experiences; it facilitates cognitive re-engagement with life, community, and societal aspects. In essence, this process fosters learner understanding, inspires participation, and enhances essential actor skills such as communication, storytelling, and creativity.

### **Limitations and recommendations**

It is acknowledged that the small sample size of 22 volunteers in this investigation could have an impact on the generalizability of the findings. Secondly, the study is based on a pre-test and post-test evaluation design without a control group, which could limit its ability to fully account for external variables. Future studies could employ a control group to respond to Anderson and Krathwohl's (2001) call for structured experimental designs to better assess educational outcomes. The observational nature of this research might also be subject to observer bias, despite the use of the observational rubric and the employment of the Interrater Reliability check. This is particularly true given the subjective nature of judgments and echoes concerns highlighted by Eva and Regehr (2005) regarding the reliability of self-assessment methods in educational settings. The researchers recommend further research into the accuracy and judgment of what makes effective communication skills. The deeper context of communication, including the subtext and nuances that determine whether communication is beneficial for the patient or the doctor, remains unexplored within the scope of this foundational study. Further research is encouraged to explore these complex dimensions, especially how applied theatre can aid in understanding and enacting good communication across different contexts and for varying purposes, especially in Southeast Asia where studies of this kind are rare.

Since the study was conducted, an interdisciplinary research group has published a new framework for effective communication in medical settings. The Glasgow Consensus Statement is “intended to function as a useful international touchstone for the training and practice of health professionals” (Makoul et al., 2024). The researchers of the present investigation recommend further analysis of the new Glasgow Consensus Statement to see how it can be applied as an alternative or complementary rubric to the one used here. This could help to refine the measures of communication effectiveness in line with international standards, which is critical in meaningful educational assessment (Stager Jacques, 2013).

Despite its limitations, this study represents a pioneering effort to explore the potential of drama-based interventions in enhancing communication skills among medical students in Thailand, not traditionally known for its innovative pedagogies in higher education. The unique observational rubric and a drama activity package demonstrate that both have the potential to be useful resources for further studies. The insights gleaned from this investigation could guide the development of more comprehensive, robust, and nuanced strategies for teaching and evaluating communication skills in Thai medical education. Future research should include larger and more representative samples, and dissecting the criteria upon which interpersonal communication skills are valued by Thai medics and patients.

## References

Amarin TV. (2018a). *Thup to-kha khao: Mo num sa-eun khor thot khon kai, kor wirakam da yab-paai jai ngam aphai, khor ya tham ik* [Table news: Young doctor apologizes to patient, commits audacity to scold-pardon, beautiful-hearted aunt forgives, don't do it again]. <https://youtu.be/ESTeotxtW8w>.

Amarin TV. (2018b). *Thup to-kha khao: Khon kai peud jai patru duead mo chun thuuk lai raksa thi euun seum koi don priaep pen tua ngern tua thong* [Table news: Patient speaks out against doctor irate at being repeatedly sent to get treatment elsewhere, always getting treated unfairly]. <https://youtu.be/gPSkjH8-5HQ>.

Amarin TV. (2022). *Thup to-kha khao: Mo sao at klip woi mo ta-phoet mae puay mai raksa, het yang mai klai taai, por khor thot khat mo kriat* [Table news: Female doctor records clip accusing doctor of neglecting sick mother, not close to dying yet, head apologizes expecting doctor to be stressed]. <https://www.youtube.com/watch?v=fjEMU06xc7M>.

Ambady, N., LaPlante, D., Nguyen, T., Rosenthal, R., Chaumeton, N., & Levinson, W. (2002). Surgeons' tone of voice: A clue to malpractice history. *Surgery, 132*(1), 5-9. <https://doi.org/10.1067/msy.2002.124733>

Anderson, L. W., & Krathwohl, D. R. (Eds.). (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. New York, NY: Longman.

Aung, M. N., Vanapruks, V., Sithisarankul, P., Yenbutra, P., Rattanamongkolgul, S., Suvarnabhumi, K., & Wannakrairot,

P. (2022). *A mixed-method national study of public health core competencies in undergraduate medical schools in Thailand to find out the need for transformative changes*. Unpublished article. <https://doi.org/10.20944/preprints202205.0341.v1>

Bachmann, C., Pettit, J., & Rosenbaum, M. (2022). Developing communication curricula in healthcare education: An evidence-based guide. *Patient Education and Counseling, 105*(7), 2320-2327. <https://doi.org/10.1016/j.pec.2021.11.016>.

Barthes, R. (1972). *Critical essays*. Evanston, IL: Northwestern University Press.

Barthes, R., & Duisit, L. (1975). An introduction to the structural analysis of narrative. *New Literary History, 6*(2), 237-272. <https://doi.org/10.2307/468419>

Berger-Estilita, J., Fuchs, A., Hahn, M., Chiang, H., & Greif, R. (2020). Attitudes towards interprofessional education in the medical curriculum: A systematic review of the literature. *BMC Medical Education, 20*, 1-17. <https://doi.org/10.1186/s12909-020-02176-4>

Berlo, D. K. (1960). *The process of communication: An introduction to theory and practice* (Vol. 10). New York, NY: Holt, Rinehart and Winston.

Berlo, D. K. (1977). Communication as process: Review and commentary. *Annals of the International Communication Association, 1*(1), 11-27. <https://doi.org/10.1080/23808985.1977.11923667>

Bloom, B. S. (1956). *Taxonomy of educational objectives: The classification of educational goals - handbook 1, cognitive domain*. New York, NY: David McKay.

Boonlue, T. (2014). Theories and models of basic communication. In T. Boonlue (Ed.), *Main subject teaching documents and communication theories* (p. 51). Nonthaburi: Sukhothai Thammathirat Open University Press.

Bouchard, G., & Mermikides, A. (Eds.). (2016). *Performance and the medical body*. London & NY: Methuen Bloomsbury.

Brodsky, J. E., Brooks, P. J., Scimeca, D., Galati, P., Todorova, R., & Caulfield, M. (2021). Associations between online instruction in lateral reading strategies and fact-checking COVID-19 news among college students. *AERA Open, 7*. <https://doi.org/10.1177/23328584211038937>

Chandra, S., Mohammadnezhad, M., & Ward, P. (2018). Trust and communication in a doctor-patient relationship: A literature review. *Journal of Healthcare Communications, 3*(3), 36. <https://doi.org/10.4172/2472-1654.100146>

Chutintaranond, T. (2017). Educational theatre in Western and Thai societies. *University of the Thai Chamber of Commerce Journal Humanities and Social Sciences, 37*(4), 195-207. <https://so06.tci-thaijo.org/index.php/utccjournalhs/article/view/178807>

Combs, J. E., & Mansfield, M. W. (1976). *Drama in life: The*

- uses of communication in society. New York, NY: Hastings House.
- Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research*. New York, NY: Sage.
- Dadaczynski, K., Okan, O., Messer, M., Leung, A. Y. M., Rosário, R., Darlington, E., & Rathmann, K. (2021). Digital health literacy and web-based information-seeking behaviors of university students in Germany during the COVID-19 pandemic: Cross-sectional survey study. *Journal of Medical Internet Research*, 23(1), e24097. <https://doi.org/10.2196/24097>
- Daddario, W., & Wilson, H. R. (2023). *Rethinking Roland Barthes through performance*. London, UK: Bloomsbury.
- de Carvalho Filho, M. A., Ledubino, A., Frutuoso, L., da Silva Wanderlei, J., Jaarsma, D., Helmich, E., & Strazzacappa, M. (2020). Medical education empowered by theatre (MEET). *Academic Medicine*, 95(8), 1191-1200. <https://doi.org/10.1097/ACM.0000000000003271>
- Eisenberg, A., Rosenthal, S., & Schlusell, Y. R. (2015). Medicine as a performing art: What we can learn about empathic communication from theatre arts. *Academic Medicine*, 90(3), 272-276. <https://doi.org/10.1097/ACM.0000000000000626>
- Ekebergh, M., Lepp, M., & Dahlberg, K. (2004). Reflective learning with drama in nursing education - a Swedish attempt to overcome the theory praxis gap. *Nurse Education Today*, 24(8), 622-628. <https://doi.org/10.1016/j.nedt.2004.07.011>
- Eva, K. W., & Regehr, G. (2005). Self-assessment in the health professions: A reformulation and research agenda. *Academic Medicine*, 80(10), S46-S54. <https://journals.lww.com/academicmedicine/toc/2005/10001>
- Fassaert, T., van Dulmen, S., Schellevis, F., & Bensing, J. (2007). Active listening in medical consultations: Development of the active listening observation scale (ALOS-Global). *Patient Education and Counseling*, 68(3), 258-264. <https://doi.org/10.1016/j.pec.2007.06.011>
- Gao, L., Peranson, J., Nyhof-Young, J., Kapoor, E., & Rezmovitz, J. (2019). The role of 'improv' in health professional learning: A scoping review. *Medical Teacher*, 41(5), 561-568. <https://doi.org/10.1080/0142159X.2018.1505033>
- Getchell, K., Dubinsky, J., & Lentz, P. (2023). A critique of transmission communication models in introductory management and organizational behavior textbooks. *Journal of Management Education*. <https://doi.org/10.1177/10525629231182156>
- Gobat, N., Kinnersley, P., Gregory, J. W., & Robling, M. (2015). What is agenda setting in the clinical encounter? Consensus from literature review and expert consultation. *Patient Education and Counseling*, 98(7), 822-829. <http://dx.doi.org/10.1016/j.pec.2015.03.024>
- Goffman, E. (1959). *The presentation of self in everyday life*. New York, NY: Anchor Books.
- Hamilton, J. R. (2013). Theatre. In B. Gaut & D. Lopes (Eds.), *The Routledge companion to aesthetics* (pp. 543-553). London, UK: Routledge.
- Haribhai-Thompson, J., McBride-Henry, K., Hales, C., & Rook, H. (2022). Understanding of empathetic communication in acute hospital settings: A scoping review. *BMJ Open*, 12(9), e063375. <https://doi.org/10.1136/bmjopen-2022-063375>
- Henry, B. (2019). Communication in palliative and end-of-life care. In V. R. Preedy (Ed.), *Handbook of nutrition and diet in palliative care, second edition* (pp. 101-111). London: CRC Press.
- Hobson, W. L., Hoffmann-Longtin, K., Loue, S., Love, L. M., Liu, H. Y., Power, C. M., & Pollart, S. M. (2019). Active learning on center stage: Theatre as a tool for medical education. *MedEdPortal*, 15, 10801. [https://doi.org/10.15766/mep\\_2374-8265.10801](https://doi.org/10.15766/mep_2374-8265.10801)
- Hoffmann-Longtin, K., Organ, J. M., Helphinstine, J. V., Reinoso, D. R., Morgan, Z. S., & Weinstein, E. (2021). Teaching advocacy communication to pediatric residents: The efficacy of applied improvisational theatre (AIT) as an instructional tool. In *Communication in instruction* (pp. 30-51). London, UK: Routledge.
- Hoffmann-Longtin, K., Rossing, J. P., & Weinstein, E. (2018). Twelve tips for using applied improvisation in medical education. *Medical Teacher*, 40(4), 351-356. <https://doi.org/10.1080/0142159X.2017.1387239>
- Jennings, M., Deeny, P., & Tizzard-Kleister, K. (2020). Acts of care: Applied drama, 'sympathetic presence' and person-centred nursing. In A. S. Fish & J. Thompson (Eds.), *Performing care: New perspectives on socially engaged performance* (pp. 187-203). Manchester, UK: Manchester University Press.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26. <https://doi.org/10.3102/0013189X033007014>
- Ka-Kan-Dee, M., & Nonthapot, S. (2020). Communication factors affecting the tourism services in the upper northeast of Thailand. *Management Science Letters*, 10(7), 1437-1444. <http://growing-science.com/beta/msl/3610-communication-factors-affecting-the-tourism-services-in-the-upper-northeast-of-thailand.html>
- Kachentawa, K., & Cheyjunya, P. (2017). Factors promoting participatory communication to create health communication behavior in the community. *The Journal of Behavioral Science*, 12(1), 13-28. <https://so06.tci-thaijo.org/index.php/IJBS/article/view/52987>
- Kaplan-Liss, E., Lantz-Gefroh, V., Bass, E., Killebrew, D., Ponzio, N. M., Savi, C., & O'Connell, C. (2018). Teaching medical students to communicate with empathy and clarity using improvisation. *Academic Medicine*, 93(3), 440-443. <https://doi.org/10.1097/ACM.0000000000002031>
- Khananurak, M. (2004). *Jitwitthayakan sue saran khong*

- manut [Psychology of human communication]. Bangkok: Odeon Store Press.
- Kohn, M. (2011). Performing medicine: The role of theatre in medical education. *Medical Humanities*, 37(1), 3-4. <https://doi.org/10.1136/jmh.2011.007690>
- Kurtz, S. M. (2002). Doctor-patient communication: Principles and practices. *Canadian Journal of Neurological Sciences*, 29(S2), S23-S29. <https://doi.org/10.1017/S0317167100001906>
- Kurtz, S. M., Silverman, D. J., Draper, J., van Dalen, J., & Platt, F. W. (2005). *Teaching and learning communication skills in medicine*. Oxford: Radcliffe Pub.
- The Lancet. (2020). COVID-19: Fighting panic with information. *The Lancet*, 395(10224), 537. [https://doi.org/10.1016%2FS0140-6736\(20\)30379-2](https://doi.org/10.1016%2FS0140-6736(20)30379-2)
- Lapakko, D. (2007). Communication is 93% nonverbal: An urban legend proliferates. *Communication and Theatre Association of Minnesota Journal*, 34(1), 2. <https://cornerstone.lib.mnsu.edu/ctamj/vol34/iss1/2/>
- Levinson, W., Lesser, C. S., & Epstein, R. M. (2010). Developing physician communication skills for patient-centered care. *Health Affairs*, 29(7), 1310-1318. <https://doi.org/10.1377/hlthaff.2009.0450>
- Lewandowska, K., & Węziak-Białowolska, D. (2023). The impact of theatre on social competencies: A meta-analytic evaluation. *Arts & Health*, 15(3), 306-337. <https://doi.org/10.1080/17533015.2022.2130947>.
- Lombardinilo, A. (2024). Imaginary myths: Roland Barthes and the rhetorical induction. In A. Lombardinilo (Ed.), *The lure of communication: Sociology through rhetoric* (pp. 139-168). London, UK: Palgrave Macmillan.
- Macneill, P., Gilmer, J., Tan, C. H., & Samarasekera, D. D. (2016). Enhancing doctors' and healthcare professionals' patient-care role through actor-training: Workshop participants' responses. *Annals of the Academy of Medicine*, 45(5), 205-211. <https://hdl.handle.net/2123/25572>
- Majid, S., Eapen, C. M., Aung, E. M., & Oo, K. T. (2019). The importance of soft skills for employability and career development: Students and employers' perspectives. *IUP Journal of Soft Skills*, 13(4), 7-39. <https://ssrn.com/abstract=3796720>
- Makoul, G., Noble, L., Gulbrandsen, P., van Dulmen, S., & Consensus Working Group. (2024). Reinforcing the humanity in healthcare: The Glasgow consensus statement on effective communication in clinical encounters. *Patient Education and Counseling*, 122(2024), 108158. <https://doi.org/10.1016/j.pec.2024.108158>
- Matusitz, J., & Spear, J. (2014). Effective doctor-patient communication: An updated examination. *Social Work in Public Health*, 29(3), 252-266. <https://doi.org/10.1080/19371918.2013.776416>
- Mead, G. H. (1967). *Mind, self and society: From the standpoint of a social behaviorist*. Chicago, IL: University of Chicago Press.
- Meeks, G. A. (2017). *Critical soft skills to achieve success in the workplace* (Doctoral dissertation). Walden University, Minneapolis, Minnesota.
- Mehrabian, A. (1971). *Silent messages*. Belmont, CA: Wadsworth.
- Mermikides, A. (2020). *Performance, medicine and the human*. London, UK: Bloomsbury Publishing.
- Mikesell, L. (2013). Medicinal relationships: Caring conversation. *Medical Education*, 47(5), 443-452. <https://doi.org/10.1111/medu.12104>
- Morgan, M. (2018). *The doctor-patient relationship: Sociology as applied to medicine* (7th ed.). London: Palgrave.
- Nie, J., Torabi, S., Peck, C., Niles, H., & Encandela, J. (2020). Teaching public speaking to medical students. *The Clinical Teacher*, 17(6), 606-611. <https://doi.org/10.1111/tct.13153>.
- Noar, S. M., & Austin, L. (2020). (Mis)communicating about COVID-19: Insights from health and crisis communication. *Health Communication*, 35(14), 1735-1739. <https://doi.org/10.1080/10410236.2020.1838093>
- Oe, A., & Murata, Y. (2019). Identification of appropriate facial expressions for medical doctors. *IARIA, International Journal on Advances in Life Sciences*, 11(1), 44-55.
- Olaimat, A. N., Aolymat, I., Shahbaz, H. M., & Holley, R. A. (2020). Knowledge and information sources about COVID-19 among university students in Jordan: A cross-sectional study. *Frontiers in Public Health*, 8, 254. <https://doi.org/10.3389/fpubh.2020.00254>
- Parker, J., & Coiera, E. (2000). Improving clinical communication: A view from psychology. *Journal of the American Medical Informatics Association*, 7(5), 453-461. <https://doi.org/10.1136/jamia.2000.0070453>
- Pavis, P. (2003). *Analyzing performance: Theatre, dance, and film*. Ann Arbor, MI: University of Michigan Press.
- Prendergast, M., Saxton, J., & Kandil, Y. (Eds.). (2024). *Applied theatre: International case studies and challenges for practice*. Bristol, UK: Intellect Books.
- Rijitha, R., & Gouda, N. K. (2022). Mediating folk media message in social media: Challenges, adaptations, opportunities, and threats. *ShodhKosh Journal of Visual and Performing Arts*, 3(1), 426-436. <https://doi.org/10.29121/shodhkos.v3.i1.2022.128>
- Rossing, J. P., & Hoffmann-Longtin, K. (2016). Improv(ing) the academy: Applied improvisation as a strategy for educational development. *To Improve the Academy*, 35(2), 303-325. <https://doi.org/10.1002/tia.20044>

- Sathaporn, K., & Pitanupong, J. (2022). Factors associated with the improvement of the empathy levels among clinical-year medical students in Southern Thailand: A university-based cross-sectional study. *BMC Psychology*, 10(1), 1-10. <https://doi.org/10.1186/s40359-022-00842-4>
- Sawyer, T., Fu, B., Gray, M., & Umoren, R. (2017). Medical improvisation training to enhance the antenatal counseling skills of neonatologists and neonatal fellows: A pilot study. *The Journal of Maternal-Fetal & Neonatal Medicine*, 30(15), 1865-1869. <https://doi.org/10.1080/14767058.2016.1228059>
- Schirmer, J. M., Mauksch, L., Lang, F., Marvel, M. K., Zoppi, K., Epstein, R. M., Brock, D., & Pryzbylski, M. (2005). Assessing communication competence: A review of current tools. *Family Medicine*, 37(3), 184-192. [https://www.researchgate.net/publication/7995038\\_Assessing\\_communication\\_competence\\_A\\_review\\_of\\_current\\_tools](https://www.researchgate.net/publication/7995038_Assessing_communication_competence_A_review_of_current_tools)
- Sextou, P., Karypidou, A., & Kourtidou-Sextou, E. (2020). Applied theatre, puppetry and emotional skills in healthcare: A cross-disciplinary pedagogical framework. *Applied Theatre Research*, 8(1), 89-105. [https://doi.org/10.1386/atr\\_00028\\_1](https://doi.org/10.1386/atr_00028_1)
- Shapiro, J., & Hunt, L. (2003). All the world's a stage: The use of theatrical performance in medical education. *Medical Education*, 37(10), 922-927. <https://doi.org/10.1046/j.1365-2923.2003.01634.x>
- Sinha, E., & D'Souza, K. (2022). Experiential learning through applied theatre in corporate training: A qualitative approach. *Journal of Management Development*, 41(7/8), 431-449. <https://doi.org/10.1108/JMD-05-2022-0102>
- Sithirangsan, W. (2020). *Peud sathiti kadi thang kan paet 2561-2563 su naeokhit sang khreu khai chat rabop pong gan panyah prap ruam* [Revealing statistics medical cases 2018-2020: Towards the idea of creating a network system to prevent overall problems]. <https://www.hfocus.org/content/2020/11/20529>
- Smith, K. E., Norman, G. J., & Decety, J. (2017). The complexity of empathy during medical school training: Evidence for positive changes. *Medical Education*, 51(11), 1146-1159. <https://doi.org/10.1111/medu.13398>
- Song, Y., Tian, Y., Wang, N., & Xia, F. (2020). Summarizing medical conversations via identifying important utterances. In *Proceedings of the 28th international conference on computational linguistics* (pp. 717-729). Barcelona, Spain (Online): International Committee on Computational Linguistics. <https://doi.org/10.18653/v1/2020.coling-main.63>
- Sornlertlumvanich, P., & Pinjareon, S. (2012). Complaint management at Songklanagarind Hospital. *Songklanagarind Medical Journal*, 30(5), 277-285. <http://smj.medicine.psu.ac.th/index.php/smj/article/view/141>
- Stager Jacques, L. (2013). Borrowing from professional theatre training to build essential skills in organization development consultants. *The Journal of Applied Behavioral Science*, 49(2), 246-262. <https://doi.org/10.1177/0021886312460504>
- Steinmair, D., Zervos, K., Wong, G., & Löffler-Stastka, H. (2022). Importance of communication in medical practice and medical education: An emphasis on empathy and attitudes and their possible influences. *World Journal of Psychiatry*, 12(2), 323. <https://doi.org/10.5498%2Fwjpp.v12.i2.323>
- Suchman, A. L., Markakis, K., Beckman, H. B., & Frankel, R. (1997). A model of empathic communication in the medical interview. *JAMA*, 277(8), 678-682. <https://doi.org/10.1001/jama.1997.03540320082047>
- Tarigan, K. E., & Stevani, M. (2021). The interpersonal communication strategy between doctors and patients. *British Journal of Nursing Studies*, 1(1), 01-07. <https://doi.org/10.32996/bjns.2021.1.1.1>
- Thairath Online. (2018). *Rop. yom rap phit, mo lai khon kai klang duek* [Hospital admits fault, doctor dismisses patient in the middle of the night]. <https://youtu.be/05dK5hP8exc>
- Thongsrikum, S., Tungprasert, J., & Pingkhanont, P. (2020). Karn pattana seausarn kong nuay ngan pak rat puea pattana kunnapap chiwit hai kab klum bobang nai prathet Thai [Development of communication in government institutions in order to develop the quality of life of vulnerable groups in Thailand]. *Journal of Local Governance and Innovation*, 6(3), 155-172. <https://so03.tci-thaijo.org/index.php/JLGISRRU/article/view/264669>
- Thrakul, S., Insorn, T., Chokprajakchat, S., Arpanantikul, M., & Yotawut, M. (2023). Preventive measure of criminal prosecution for nursing and midwifery errors: Case studies of public hospitals. *International Journal of Criminal Justice Sciences*, 18(1), 208-231. <https://doi.org/10.5281/zenodo.4756211>
- Veenker, H., & Paans, W. (2016). A dynamic approach to communication in health literacy education. *BMC Medical Education*, 16(1), 1-12. <https://doi.org/10.1186/s12909-016-0785-z>
- Versluijs, Y., Moore, M. G., Ring, D., & Jayakumar, P. (2021). Clinician facial expression of emotion corresponds with patient mindset. *Clinical Orthopaedics and Related Research*, 479(9), 1914. <https://doi.org/10.1097%2FCORR.0000000000001727>
- Weitkamp, E., & Almeida, C. (2022). *Science & theatre: Communicating science and technology with performing arts*. Dubai, UAE: Emerald.
- Willson, S. (2006). Essay: What can the arts bring to medical training? *The Lancet*, 368, S15-S16. [https://doi.org/10.1016/S0140-6736\(06\)69909-1](https://doi.org/10.1016/S0140-6736(06)69909-1)
- Zhu, C. S., Yap, R. K. F., Lim, S. Y. S., Toh, Y. P., & Loh, V. W. K. (2022). Humanism in Asian medical education - A scoping review. *The Asia Pacific Scholar*, 7(1), 9-20. <https://doi.org/1satha0.29060/TAPS.2022-7-1/RA2460>



# Appendix

## Appendix A – Communications Skills Assessment Form

Student ID: .....

Evaluator: .....

Assessment Format:

- Before Activity
- After Activity

Overall Quality Level of Communication Skills Based on Total Score:

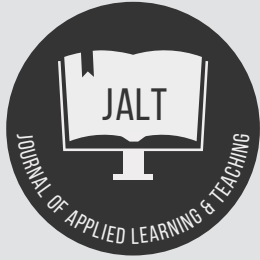
- Total Score 31 – 40: Excellent
- Total Score 21 – 30: Good
- Total Score 11 – 20: Satisfactory
- Total Score 1 – 10: Needs Improvement

No.	Behavior	Score	Comments
1	Establishing a starting point		
2	Utilizing effective facial expressions		
3	Using appropriate tone		
4	Demonstrating active listening and adapting communication		
5	Presentation of information		
6	Crafting concise conclusions		
7	Projecting a professional demeanor		
8	Utilizing effective gestures		
<b>Total</b>			

Additional Comments:

.....

Copyright: © 2025. Pimrapat Prueksapitak, Noppadol Inchan and Srirath Pakdeeronachit. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Game modding: A design cognitive perspective in entrepreneurship education

---

Wilian Gatti Junior<sup>A</sup>

A

*Ambrose School of Business, Ambrose University, Calgary, Canada*

Beaumie Kim<sup>B</sup>

B

*Werklund School of Education, University of Calgary, Calgary, Canada*

---

### Keywords

---

Constructionism;  
design cognition;  
design thinking;  
entrepreneurship education;  
game modding.

### Abstract

---

This design-based research investigates how game modding—intentional alterations to a game’s original content—can foster a cognitive approach to design thinking among business students, grounded in constructionist theory. A two-stage game-based activity was created and implemented in a Business Game class at a specialized entrepreneurship college in São Paulo, Brazil. Data collection included video recordings, interviews, and student reports. The analysis focused on a representative group of four students, examining the design cognitive processes employed during their redesign journey. Our analysis reveals that due to the absence of a repertoire of previous design solutions, the students grounded their analogies in their own sociocultural context, reflecting their social norms, and through interdisciplinary thought processes. To address the research question, ‘How can game modding support the development of business students’ cognitive perspective in design?’ we propose that game modding serves as a useful pedagogical tool to foster essential cognitive processes in design thinking, particularly within a business education context. Game modding helps develop business students’ cognitive perspective by creating an experiential learning environment emulating the entrepreneurial journey.

---

### Correspondence

wilian.gatti@ambrose.edu <sup>A</sup>

---

### Article Info

Received 7 September 2024

Received in revised form 3 December 2024

Accepted 26 December 2024

Available online 22 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.12>

## Introduction

In entrepreneurship education, more notably at the undergraduate level, design thinking pedagogy often relies on stepped or prescriptive methods embodied in templates and toolkits (e.g., Business Model Canvas) to support non-designer students in understanding design thinking (Wrigley & Mosely, 2023). Thus, design thinking instruction emphasizes the process over design cognition (Chan, 2015). However, understanding the cognitive elements of design can enhance students' comprehension of problem and solution spaces (Dorst & Cross, 2001). While business students are often trained to focus on solving predefined problems efficiently, designers are trained to first explore and define the true nature of the problem they are addressing (Norman, 2013). Thus, entrepreneurship education could benefit from incorporating a design cognition viewpoint into its pedagogical frameworks (Garbuio et al., 2018). This perspective would equip prospective entrepreneurs and managers with innovative strategies, providing them with the competitive edge to thrive in the complex and ever-evolving business world. Additionally, insights into the designers' thought processes can enrich students' design skills and utilization of prescriptive tools and improve their overall project outputs. Armed with this understanding, they would be adept at making informed decisions even in ambiguous and unstructured scenarios (Garbuio et al., 2018).

In order to cultivate design cognition within the framework of design thinking pedagogy, we have put forth a game-based intervention rooted in the principles of constructionism (Kafai, 2006a; Papert, 1980, 1991). Constructionism is a learning theory that emphasizes the profound learning potential that arises from students actively constructing artifacts, including games (Harel, 1991; Kafai, 2006a; Kafai & Burke, 2015a).

Our primary objective is to answer the following question: How can game modding support the development of business students' cognitive perspective in design? Game modding, short for game modification, involves altering the original content of a game to add new challenges, change mechanics and aesthetics, or create novel levels. By examining the design journey of a group of students with no prior design experience, this study delves into the cognitive design processes they employed to address a game design challenge, navigating the task without the aid of prescriptive tools.

We adopted games for our pedagogical approach because they are more than mere cognitive exercises; they tell stories and offer dynamic representations of the real world. For our examination, we used a board game designed to teach fundamental business concepts. Board games foster conceptual understanding by engaging students with complex systems while minimizing irrelevant variables (Castronova & Knowles, 2015; Squire, 2003). Additionally, this research utilized board games to decelerate the learning process and encourage student reflection. The urgency, immediacy, and instantaneousness fueled by technology, globalization, and real-time economic operations (Rosa, 2013) often suppress necessary reflection time. This prevailing sense of urgency contrasts with the time required

for deep learning. Our pedagogical intervention aims to counteract this immediacy, serving as a mediational artifact to support reflection and analysis. This approach anticipates positive outcomes for both deep learning and student engagement. As Kaufman and Flanagan (2016) noted, board games "slowed down play and allowed more turn taking in conversation, creating less rush and more room for each player to engage in thoughtful discourse." (p. 12)

This pedagogical approach signifies a departure from the conventional teacher-centric transmission of knowledge, emphasizing the understanding of knowledge as a dynamic construct shaped by the students themselves (Games & Squire, 2008). Consequently, the educator's focus extends beyond merely evaluating students' end products. Instead, it becomes crucial to recognize and appreciate the design journey in which students actively engage.

## Design thinking

After many years of research nested in traditional disciplines such as architecture and design, the concept of design thinking was embraced by the management literature in the 2000s. In business and management, design thinking is related to practice (Hassi & Laakso, 2011; Johansson-Skoldberg et al., 2013) as a process or even a mindset (Sarooghi et al., 2019) to solve problems. This new interpretation turned design thinking into a tool that defines a way of working with design and innovation grounded in the IDEO experience (Kelley, 2001).

The well-known American design company IDEO and the Stanford d.school popularized the concept of design thinking, codifying it in a stepped method to help managers innovate and solve problems. These phases are identified as (1) discover or empathize (to find a way to approach the problem), (2) interpretation or define (to interpret the problem), (3) ideation (the creative process to find a solution), (4) experimentation or prototype (to make tangible the possible solution), and (5) evolution or test (to assess the possible solution). From this perspective, design thinking can be understood as "a discipline that uses the designer's sensibility and methods to match people's needs with what is technologically feasible and what a viable business strategy can convert into customer value and market opportunity" (Brown, 2008, p. 86).

Quickly, the popular business press championed the five-step design thinking method, which boosted its dissemination over many segments, such as business consulting (Norman, 2010) and education (Riverdale Country School & IDEO, 2011). These phased models of design thinking, however, have been criticized, among other reasons, for portraying a naïve vision of design. Through these models, non-designers search for the correct answers by applying a straightforward process or an algorithm to solve problems (McCullagh, 2010; Sosa, 2015) rather than preserving ambiguity in the design process in an iterative idea exploration context (Meinel & Leifer, 2012).

Moreover, using design thinking as a phased tool for problem-solving can limit creativity in the design process (Mayer, 1989). Norman (2010) described how design thinking in business is just another name for creative thinking, highlighting the confusion about the role of design. Design thinking became a useful myth for designers and business consultants. Johansson-Skoldberg et al. (2013) observed that design thinking is very often interpreted as a ready-to-use toolbox. In their opinion, designer methods are taken out of context to be used by a person without any previous training, knowledge, or skill.

A possible approach to foster the design thinking creative process might be to complement the phased method with concepts neglected by the management literature and practice so far: understanding the cognitive processes involved in design thinking.

## Design cognition

When solving design challenges, human designers use cognitive processes and techniques known as “designer thinking” (Dinar et al., 2015). Attempting to urge the management community to adopt a cognitive perspective in entrepreneurship education, Garbuio et al. (2018) presented four different cognitive acts as the basis of design and entrepreneurial cognition: framing, abductive reasoning, analogical reasoning, and mental simulation. Similar design cognitive acts were identified by Micheli and colleagues (2019) as attributes of design thinking.

### Framing

Framing relates to the creative aspect of the design process and may be thought of as a designer’s attempt to portray the issue and find a solution (Stumpf & McDonnell, 2002). The framing process embraces the development of a viewpoint to address a problematic situation or as a schema to interpret a problem (Garbuio et al., 2015; Kim & Ryu, 2014). This schema comes from a process of association and dissociation between the situation, assumptions, and precedence (Garbuio et al., 2018).

In contrast to design research, framing in the behavioural decision literature has a distinct focus. Framing is generative in design. Since there are no known alternatives, the first set of options can be created with no restrictions. In decision research, however, framing is analytical since it is linked to analysis, assessment, and selection of an alternative from a specific set of options (Dong et al., 2016; Garbuio et al., 2015). Framing is examined in entrepreneurship research in a similar way to design research: for instance, through the lens of reframing as an enabler to find problems worth solving as a critical attribute of entrepreneurs in the modern business environment (Bianchi & Verganti, 2022) and to show how experienced entrepreneurs face decision-making problems in creating new ventures (Dew et al., 2009).

## Abductive reasoning

Abductive reasoning is a form of logical inference that leads us to the best explanation (not precisely the correct one) for a problem. It is a meaningful and reasonable theory to explain the circumstances at hand (Shank, 1998). Although this explanation may not be correct in terms of logic or science, it connects the worlds of “what is” and “what may be” (Guenther et al., 2021).

Different typologies have been proposed in the literature to classify abductive reasoning. Dorst (2011) presented the concepts of Abduction-1 and Abduction-2. To explain them, Dorst employed the equation “what + how = value.” In Abduction-1, both “how” (the working principle) and “value” (the final product) are known. In Abduction-2, neither the “what” (a thing) nor the “how” is known. As Garbuio (2015) highlighted, in Abduction-2, “designers must abductively propose both the design artifact and the means of achieving it” (p. 456).

In a different typology, Roozenburg (1993) also proposed two types, explanatory and innovative abductions. The explanatory abduction attempts to find a likely cause, forming a possible explanation of an effect, synthesizing complex, contradictory or incomplete information. The innovative abduction predefines unknown variables (e.g., value to be created, how to solve a problem) to explain how it will affect a given parameter (e.g., a new business model) (Garbuio & Lin, 2021; Guenther et al., 2021).

The literature on entrepreneurship explored explanatory and innovative abductions, outlining, for instance, that when an entrepreneur is trying to interpret the reaction of an incumbent in the industry, they are using explanatory abduction. Yet, when entrepreneurs invent a new product or business model, they employ innovative abduction (Garbuio et al., 2018).

## Analogical reasoning

Analogical reasoning is the cognitive act associated with the transfer process when a mental representation goes from a source domain to a target domain (Garbuio et al., 2018). Ball and Christensen (2009) said that analogical reasoning “involves accessing and transferring previously acquired knowledge of objects, attributes and relations to support current problem-solving and decision-making activities” (p. 169). Analogical reasoning is described as a fundamental cognitive process in areas such as cognitive problem-solving (Chan et al., 2012; Gick & Holyoak, 1980), creative design (Ball & Christensen, 2009), architecture (Ozkan & Dogan, 2013), scientific discovery (Gentner et al., 1997), learning (Gentner et al., 2003), and business innovations (Hargadon, 2002).

The design literature has described analogical reasoning as a way to overcome design fixation (Crilly, 2015; Moreno et al., 2014; Ozkan & Dogan, 2013; Smith et al., 1995), which is defined as “a blind adherence to a set of ideas or concepts limiting the output of conceptual design” (Jansson & Smith, 1991, p. 3). In innovation and entrepreneurship research,

analogical thinking is perceived as a source of inspiration for product breakthroughs (Herstatt & Kalogerakis, 2005) and support for discovering and developing new business opportunities (Dew et al., 2009; Van Burg & Romme, 2014).

### **Mental simulation**

Mental simulation represents the capacity to reassess past events and project future ones before any actions, or even decisions, are taken (Garbuio et al., 2018), aiming to predict cause-effect relations (Casakin et al., 2015). Ball and Christensen (2009) highlighted that mental simulations are not limited to technical design properties but are related to various circumstances, including the end-user impression based on interaction with the design artifact.

Gaglio (2004) presented two functions of mental simulation to emphasize its significance. The first function is affective. Through mental simulations, we may revisit and process feelings that help us learn how to deal with a situation, control our emotional reactions, or rebuild our self-esteem. The preparative function is the second function. Through mental simulations, we may picture various outcomes, prepare potential reactions, project events, foresee circumstances, and devise plans and tactics to accomplish our objectives. In the same vein, Casakin et al. (2015) pointed out that mental simulations are helpful for designers to imagine new design solutions, predict potential outputs, and assess their viability.

Referred to also as imaginativeness, mental simulation is examined in entrepreneurship research as a creative force to help entrepreneurs disrupt the status quo through a recombination of resources to envision and build what could be (Kier & McMullen, 2018). Mental simulation is also discussed as one of the mechanisms to identify and develop innovative opportunities (Gaglio, 2004; Haynie et al., 2010).

### **Design thinking pedagogy**

The design thinking education literature in business and entrepreneurship is quite broad, mainly grounded around the stepped IDEO method or with no or negligible emphasis on design cognition (Glen et al., 2015; Huq & Gilbert, 2017; Matthews & Wrigley, 2017; Nielsen & Stovang, 2015; Sarooghi et al., 2019; Von Kortzfleisch et al., 2013; Zupan & Nabergoj, 2016). Garbuio et al. (2018), most likely the earliest reference to cognitive design in entrepreneurship education, pointed out that a problem- and team-based pedagogy could stimulate the introduction of design cognition, mainly when lecturers act as coaches rather than just instructing their students. Yet, design thinking pedagogy's would focus on project-based learning with student teams (ideally interdisciplinary) rather than formal lectures or other didactic methods (Glen et al., 2014).

We support the idea that game design fits perfectly as one of the problem-based pedagogies to foment design thinking in entrepreneurship education (Neck & Greene, 2011). This view embraces games not only as artifacts to play and learn with but also as artifacts to make it, representing and embodying students' knowledge as promoted by the

constructionism perspective (Kafai, 2006b; Kafai & Burke, 2015b; Papert, 1991). Pedagogic activities around game design support students' capacity to think about any discipline and develop a range of technical and soft skills, connecting students (Kafai, 2006b; Kafai & Burke, 2015b; Kim & Bastani, 2017; Marasco et al., 2017). Game design is also an innovative instructional practice and an alternative to design thinking activities centered on the traditional five-step method. Grounded in these premises, we designed a board game activity to engage learners and mediate their design-thinking learning process.

### **Research design**

In this design-based research (DBR), we developed a two-stage game-based activity aimed at exploring the design process undertaken by undergraduate students lacking formal design training. In the initial stage, students participate in a customized board game designed to introduce key business concepts alongside foundational game mechanics. This stage encourages students to strategize, adapt to simulated economic fluctuations, and engage in competitive play. The second stage, which forms the core of this study, involves collaborative group work focused on modifying the existing game. This process culminates in the presentation of a functional prototype.

The study received ethical approval from the Research Ethics Board at the hosting Canadian university. In Brazil, where the college lacks a dedicated ethics board, the research was approved by the government-affiliated Comitê de Ética em Pesquisa (CEP) (Research Ethics Committee), complying with Brazilian ethical research regulations.

DBR was initially conceptualized in the 1990s (Brown, 1992; Collins, 1992) as a response to diverse challenges in educational research. DBR addresses theoretical questions concerning the nature of learning in authentic contexts, moves beyond narrow measures of learning, and emphasizes deriving findings through formative evaluation and interventions in real-world settings rather than controlled laboratory environments (Collins et al., 2004). Barab and Squire (2004) define DBR as "a series of approaches, with the intent of producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings" (p. 2). By engaging with real educational contexts, DBR enhances the ecological validity of the research, ensuring that its findings are meaningful and applicable to the specific intervention context, while also having the potential to inform broader settings (Anderson & Shattuck, 2012).

Unlike traditional experimental research, DBR does not seek generalizability in the statistical sense but instead focuses on developing a deep understanding of the learning processes in specific, complex educational environments. Generalization in DBR is often achieved through transferability, wherein the insights gained are contextually situated but can offer valuable implications for similar settings through thick descriptions and detailed contextual accounts. Similarly, rather than emphasizing reliability in terms of replicability under identical conditions, DBR prioritizes design reliability,

which entails consistent processes of iterative refinement (McKenney & Reeves, 2012). This iterative, cyclical approach helps ensure that the interventions are responsive to the learning environment, producing outcomes that are both credible and adaptable.

### The game

Our game-based activity revolves around a competitive board game called Entrepreneurial Thinking. Our game balances playability and education, integrating game structure, learning objectives, and enjoyable gameplay. Components, rules, and mechanics were designed for realism while reducing complexity. The omission of certain business notions (e.g., inventory costs, taxes) encourages student awareness and engagement in the (re)design phase.

In Entrepreneurial Thinking, up to four players compete as owners of industrial companies on a market board representing two Canadian provinces with eight interconnected cities. Each city has varying costs for establishing offices, factories, and warehouses and markers indicating customer expectations for product quality and price. The game concludes after 24 rounds, with the company earning the highest profit declared the winner.

More details about the game components and rules can be found in the Appendix.

### Data collection

The sample for this study consisted of 12 male Brazilian students, aged 20 to 24, enrolled in a Business Game class at a specialized entrepreneurship college in São Paulo, Brazil. All participants were Portuguese speakers from similar socio-economic backgrounds. The selection of this group was driven by the unique opportunity it provided to observe the use of cognitive design acts within a controlled and consistent educational environment. Our intent was to build a nuanced understanding of the cognitive processes at play during game modification.

The existing educational setting, where the instructor Marcos (pseudonym) had already collaborated with us to incorporate the board game into his curriculum, presented an ideal context for this exploration. The board game Entrepreneurial Thinking was selected to offer students a distinct experience that differed from typical digital simulations and to expose them to a diverse range of gaming approaches.

Data collection occurred during a game modification session (Figure 1) and included video and audio recordings, classroom photographs, in-depth interviews with each student (lasting approximately one hour), and the final written reports submitted as part of their end-of-term assignments. These reports provided comprehensive reflections on their experiences and contributions throughout the activity. Individual interviews further explored relevant themes, such as students' prior exposure to board games and video games, their professional backgrounds, and their motivations for studying entrepreneurship. This combination of data

sources allowed us to capture the complexity of students' design thinking processes in a holistic manner.



Figure 1. Game design session.

In our analysis, we focused on a specific group composed of Paulo, Lucas, Adriano, and Ricardo (pseudonyms), as illustrated in Figure 2. By conducting an in-depth investigation of this single group, we were able to closely examine the nuanced ways in which the students engaged with design challenges, navigated creative problem-solving, and employed cognitive strategies during the game modification process. The selection of this particular group was driven by the specific educational opportunity it presented, rather than by an effort to control for demographic variables. Their engagement, however, proved representative of broader trends, as supported by Sengupta et al. (2015) and Taber (2008).

Our decision to concentrate on this group aligns with a rich qualitative tradition that emphasizes the value of in-depth case studies in revealing the nuanced realities of complex phenomena (Yin, 2014). DBR provides an ideal framework for such an exploration, as it encourages an iterative, context-sensitive approach to understanding learning processes. Within DBR, the focus on a specific group serves not only to understand the intervention in its natural setting but also to iteratively refine both the intervention and our understanding of how participants interact with it in practice. The deep insights derived from the four students are significant, not because of the sample size but due to the depth and richness of their contributions—an approach well recognized for its methodological rigour (Flyvbjerg, 2006).

Comparative analysis and consistent observations from various game modding activities indicate that Paulo, Lucas, Adriano, and Ricardo's behavioural patterns and thematic parallels are representative rather than exceptional. This analysis's robustness is enhanced by methodological triangulation, aligning qualitative insights from individual cases with perspectives from interviews and written reports, thereby strengthening the credibility of our findings (Denzin, 2017).

The pedagogical implications of our findings are significant, offering a granular view of the design processes that often remain obscured in larger samples. The distinctive roles and diverse ideas discussed by these students have contributed to entrepreneurship education, especially in game-based learning. This focused analysis is consistent with educational

research precedents where small group analyses have provided significant insights, showing that even a small sample can reflect broader trends and behaviours (Creswell & Poth, 2017; Stake, 1995).

The case of these four students is not an isolated instance but a reflective microcosm of the entrepreneurial program at this institution. It exemplifies the typical undergraduate experience while providing unique insights that are pedagogically relevant and methodologically sound (Sengupta et al., 2015; Taber, 2008).



Figure 2. In the foreground, the four students during the activity (from left to right): Paulo, Ricardo, Adriano (pointing to the main board) and Lucas.

The class dedicated 15 hours to the game-based activities, spread across seven distinct sessions, as indicated in Table 1. In our analysis, we focused on Session 4, in which the students revamped the game they had played during Sessions 2 and 3.

Table 1. Activities in class.

Session	Duration	Activity
1	1h30m	Understanding the rules
2	1h30m	Gameplay – basics
3	3h	Full gameplay
4	1h30m	Game (re)design
5	1h30m	Crafting the new game
6	3h	Gameplay – playtesting
7	1h30m	Debriefing

## Data analysis

All video content and interviews were transcribed, and the entire dataset, including audio recordings, was translated from Portuguese to English by the first author, a native Portuguese speaker. The translation process required meticulous attention to ensure accurate interpretation of expressions within their cultural context.

Our first step in interpreting the data collected was the creation of open codes (Table 2) in line with the research goal. Furthermore, eight codes were created, reflecting themes described in the literature. Four codes were used to examine the design thinking process and derived from the

four cognitive acts (abductive reasoning, framing, analogical reasoning, and mental simulations) presented by Garbuio et al. (2018). The other four codes (objects, attributes, internal relationships, and environment) were adopted to reflect the elements of the game (Salen & Zimmerman, 2004).

Table 2. Examples of open codes.

Open Code	Dialogue example
Business understanding	“So, every three rounds everything changes, every quarter.”
Seasonality	Like... usually between quarters is the time when the economy changes, and companies bring in new products.”
Identity	“Map of several cities, city of Guarulhos, city of São Paulo, city of Jquitiba, because for example, we have already played three times.”
Logistics	“The warehouse gives me greater freedom than I can... I can be here [Referring to the factory] and the warehouse here.”
Business understanding	“Income tax, we can put it at the beginning as an example.”
Tax system	But... the government collects the tax from you monthly
Legal/Accounting	according to your accounting framework, which is ... teacher help me here...”
Mental simulation	“Relax man...listen to me. Then in the future, the guy starts to make more than one sale per round. If he has one of these cards each round and each sale, he must pay a percentage over the sale, and if the guy makes three sales, it will start getting expensive for him.”

The next step was clustering the codes according to themes (Table 3) that emerged from the analysis, such as sociocultural context, real life (business environment), and disciplines (program’s courses). Game and design thinking themes have already been clustered into the eight described codes. Finally, we confirmed the pieces of evidence verified in the video segments by analyzing the interviews and students’ reports, looking for inconsistencies in our first coding.

## Building conceptual representations and design reasoning

The students in this activity, Paulo, Lucas, Adriano, and Ricardo, along with the other groups, were free to navigate their own paths to complete the game design assignment rather than following a prescriptive approach to overcome the activity’s constraints and create conceptual business representations within a playable game prototype.

Unlike traditional design thinking methods that rely heavily on visual drawings and sketches for crafting conceptual representations (Visser, 2006), these students adopted a collaborative meeting dynamic. They centered their discussions on business concepts, utilizing argumentation to explore and evaluate design possibilities without relying extensively on visual representations. In the following sections, we describe how these four students engaged in cognitive design acts to modify the game, despite their limited experience and lack of design instruction. Their work is presented chronologically to illustrate the progression and use of cognitive design acts.

Table 3. Themes and correlated codes.

Themes	Codes created
Sociocultural context	Business understanding
	Identity
	Student role (within the group)
	Presentation (design idea)
	Critic (design idea)
Real life (business environment)	Defence (design idea)
	Tax system
	Seasonality
Disciplines	Special days (holidays)
	Sales & Marketing
	Human Resources
	Logistics
	Production
	Operation Management
	Purchase
	Legal/Accounting
	Economics
	Game
Attributes	
Internal relationships	
Environment	
Design Thinking	Framing
	Analogical reasoning
	Abductive reasoning
	Mental simulation

### Framing the design task

Discussions and reflections among the classmates that happened post-gameplay sessions made clear to the students the type of problem they have to address. A specific problem, the monopoly, a term the students coined to describe an instance where a player managed to gain control over a specific raw material, has emerged as the main problem. In many gameplays, house rules (player-created modifications to the official game rules) were tried by other students to overcome the problem.

In consequence of these observations, they framed their design task in response to the monopoly concern, hypothesizing that introducing greater randomness into the game and imposing elevated costs on the companies would enhance the overall gameplay experience by mitigating the occurrence of monopolistic situations.

### Applying abductive reasoning to imagine solutions

To address the monopoly problem, Paulo, Lucas, Adriano, and Ricardo proposed ideas to increase the game's randomness and impose additional costs on companies to deplete their cash reserves. A more randomized game would necessitate new strategies, rendering the monopoly approach less effective. Additionally, with fewer resources, players would be unable to purchase all available raw materials. These

solutions emerged through abductive reasoning, enabling the students to begin tackling the monopoly issue.

A conversation between Paulo and Lucas, who devised a new game mechanism to increase costs related to managers' salaries, started the quest for solutions. Adriano interjected and suggested a structured approach to the design process. He proposed discussing each idea separately, noting the decisions made before moving on to the next idea. The group readily embraced this approach.

Thus, they decided to discuss the idea of new maps for the mainboard, depicting the players' residing areas, which would introduce more unpredictability into the game by presenting a new market where the monopoly would not work. The players decided to start the discussion with the maps, considering them to be simpler compared to the other ideas.

Introducing new maps would encourage players to develop innovative strategies for business locations, marketing, and distribution. Multiple maps were viewed as a way to increase unpredictability and prevent monopolies. However, incorporating new cities raised the question of whether additional macroeconomic cards were needed for each new city. In the original deck, eight cards triggered changes in the demand for any of the eight original cities. Removing these cards would undermine the goal of increasing unpredictability. To address this challenge, Lucas proposed an alternative approach to enhance unpredictability.

Lucas: Instead of having macro cards that change the demand in specific cities, we can change all cities' expectations every X rounds. Let's say, we change the customer expectations every three rounds because the market is volatile. This way, players cannot create a monopoly.

While framing facilitated the identification of the design problem (the monopoly), the application of abductive reasoning allowed for the emergence of ideas to tackle the design challenge. In the following section, we will demonstrate how analogical reasoning helped the students incorporate their own experiences and perspectives, which in turn led to improving their design concepts.

### Grounded on analogical reasoning: Constructing actual representations

Analogical reasoning was also crucial to the (re)design process. Lacking an established repertoire of patterns from previous solutions (Chan, 2015), Paulo, Lucas, Adriano, and Ricardo relied on analogical reasoning to draw representations from their personal experiences and worldviews to the game elements and rules they proposed. For instance, Paulo, inspired by his experience working at his parents' convenience store, introduced the concept of seasonality in their design discussion to justify Lucas's idea of demand change every three rounds.



Thus, the randomness brought by the seasonality (changing the demand every three rounds) was established, and they realized they did not need new maps, and neither did the original eight macroeconomic cards that changed the demand of the original cities. As they knew that a new macroeconomic card marks the beginning of each round, a deck with 24 cards promotes a game with 24 rounds. Thus, at this point in their design, the number of rounds was in suspension.

Ricardo pointed out that they had to speed up the gameplay, which meant that the game must have 16 rounds (24 cards minus the eight cards); therefore, no extra cards were needed. However, the others argued that the gameplay with 16 rounds was too short. The gameplay length was highlighted by Lucas, who argued that the game must have 20 rounds. They just needed to create four extra cards. Lucas said they could copy some cards to make the process easy in the following craft session. They all agreed. However, Paulo came up with a different idea for the extra four cards.

Paulo: Hmm... We could include other cards.

All: Which ones?

Paulo: Obligation to pay a tax to the government.

Lucas: Man, I like it! I like it!

The students used analogies based on real-world phenomena like seasonality and annual income tax to promote their design concepts (e.g., shorter playtime, less predictability). Afterwards, they used mental simulations to assess the feasibility of their ideas, envisaging potential game scenarios to gauge their practicality and effectiveness.

### Evaluating design ideas with mental simulations

Mental simulation, as a cognitive process, entails the ability to mentally revisit past events and envision future scenarios to anticipate cause-effect relationships. Paulo, Lucas, Adriano, and Ricardo employed mental simulations as an integral part of their design process, serving two pivotal functions. Firstly, mental simulations played a crucial role in their ability to translate real-world information into concrete game design concepts. Through mental simulations, they envisioned various events and devised strategies based on analogical reasoning.

Secondly, mental simulations served as a valuable tool for evaluating their design ideas and exerted influence over peer opinions. For instance, Ricardo utilized mental simulations to visualize the end-users' interaction with the game, thereby dissuading Lucas from implementing the concept of representing seasonality through a Children's Day event card. Additionally, the group collectively rejected the idea of introducing new maps, taking into account considerations related to logistics and strategy.

By employing mental simulations in their design process, Paulo, Lucas, Adriano, and Ricardo could conceptualize game elements, assess their viability, and make informed

decisions based on the projected user experience and strategic considerations. For instance, the suggestion to introduce cards representing corporate income tax needed assessment via mental simulation. However, they admitted a lack of sufficient knowledge on the topic and sought Marcos (the instructor) for a brief explanation of Brazil's complex tax system.

Ricardo: To make it easier, we should set a value, a percentage.

Marcos: A percentage over the amount of money a player has.

Ricardo: Yeah, the total money the player has!

Marcos: 20% more or less?

Lucas: No, no. I think it's a lot. Shall we put 10%?

Ricardo: The game must teach something to the players. Let's assume 20%.

Lucas: I think 20% is too much!

Ricardo: Bro, you will lose 1/5 of your cash. It will be great!

Adriano: I suggest that the player must pay according to the product's level. For example, if you have access to Product 1, you pay 10%. If you have access to Product 2, you pay 15%. If you have access to Product 3, you pay 25%.

Lucas: Come on, 25?! No. Not 25, 20! 20, I agree.

The team decided to create new cards with the taxes reflecting the pre-agreed product level rates (10%, 15%, and 20%). Lucas proposed incorporating a specific Brazilian tax (related to the circulation of goods, interstate and intercity transportation, and communication services) to heighten the game's realism. After weighing the complexity this could introduce, Ricardo and Adriano convinced Lucas to abandon his idea. The focus then shifted to managers' roles. In sync with Paulo's previous conversation about cost increases through higher managerial salaries, the group agreed that respective manager salary boosts should compensate for advancements in marketing mix levels. While aiming to inhibit monopolies by imposing costs on companies, this decision simultaneously underlined the importance of human capital.

The discussion then turned to the production system. Paulo proposed allowing players to exceed the 10 units per turn production limit upon product level enhancement. Ricardo, as before, used mental simulation to envision how such a change could affect the overall game dynamics and worsen the issue (monopoly) they were trying to address.

Ricardo: What prevents a player from making many sales? The inventory. Players have to wait for several rounds to accumulate enough inventory for multiple sales. Changing this rule would allow players to easily

form a monopoly by passing all raw materials to the outbound area and then making several sales. It would harm everyone. I wouldn't make that change. It disrupts the entire game system.

In a final attempt to avoid monopolies, the team decided to incorporate a house rule observed in some gameplay sessions. After choosing to sell, players are limited to selling in their subsequent decisions. Such a restriction prevents successful players from using their sales proceeds to purchase a large number of raw materials pieces in the same turn, effectively preventing the formation of a monopoly.

## Discussion

Traditional design thinking pedagogy is often characterized by linear steps such as empathize, define, ideate, prototype, and test. While effective in conveying the basics, such methods have been criticized for oversimplifying the inherently complex design process (McCullagh, 2013; Sosa, 2015) and failing to fully embrace the ambiguity needed for creative exploration (Meinel & Leifer, 2012).

In contrast, our approach diverges from these prescriptive methodologies by incorporating the principles of constructionism through game modding. Game modding, as a teaching strategy, fosters an experiential learning environment that emphasizes cognitive acts such as framing, abductive reasoning, analogical reasoning, and mental simulations (Garbuio et al., 2018). This empowers students to construct their own understanding of design and entrepreneurship, deploying their sociocultural backgrounds and interdisciplinary knowledge to make learning both engaging and personally relevant.

By using game modding, we create a pedagogical environment that emulates the entrepreneurial journey. As we examine the design process, exemplified in Figure 3 by the initial stages, we noticed that students actively frame problems, explore ideas, construct meaning, and verify propositions, thereby navigating complex challenges in a non-linear manner—an essential skill for real-world business scenarios. Through framing, they learn to identify and define key challenges, cultivating the ability to distill complex scenarios into manageable strategies. Abductive reasoning encourages creative and plausible hypotheses, essential for navigating uncertainty in entrepreneurship. Analogical reasoning enables students to draw connections between personal experiences and business problems, fostering the development of novel, interdisciplinary solutions. Mental simulations further support iterative refinement, allowing students to visualize outcomes and enhance decision-making.

This approach has significant implications for entrepreneurship education. First, it emphasizes problem-identification skills, guiding students to understand core challenges before jumping to solutions (Norman, 2013). Second, it encourages creativity and innovation by challenging traditional perspectives and exploring novel possibilities. Third, the iterative refinement of ideas promotes reflective thinking, critical for adapting to the dynamic

nature of business. Finally, it emphasizes systems thinking, highlighting the interconnected nature of decisions and teaching students to approach entrepreneurial challenges holistically. Together, these elements prepare students to navigate the complexities and uncertainties inherent in entrepreneurship.

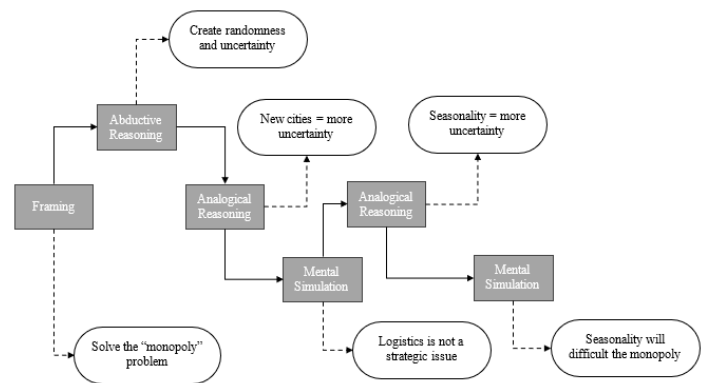


Figure 3. Initial stage of the design process.

Overall, game modding allows students to become more aware of the design process, helping them foster a mindset that values iterative exploration and adaptability—qualities that are indispensable for aspiring entrepreneurs.

Building on these cognitive design acts, constructionism, as a pedagogical foundation, further supports our approach by recognizing the significance of students' sociocultural context and interdisciplinary integration in shaping their learning experiences and outcomes. Interdisciplinarity is critical in constructionism, as it promotes the integration of multiple disciplines and perspectives into the learning process. This approach encourages learners to explore connections between various subjects, fostering a comprehensive understanding of complex issues (Kafai, 1995). Real-world problems often require an interdisciplinary perspective, and the game modding task allowed students to adopt a holistic view, drawing from multiple fields to enhance their sociocultural analogies. This perspective, integral to design thinking and entrepreneurship education, contrasts with traditional, compartmentalized educational approaches that are common in business schools (Welsh & Dehler, 2013).

By integrating multiple disciplines, learners develop the ability to analyze and address complex problems that transcend single disciplinary boundaries (Pfeffer & Fong, 2004). Interdisciplinary thinking fosters creativity and innovation in problem-solving by encouraging consideration of diverse perspectives and solutions. For instance, during discussions about seasonality, students combined insights from operations management, marketing, and economics, as well as their personal consumer experiences. This integrated approach provided them with a broader understanding of the impact of seasonality, making it more meaningful and effectively integrating it into the game design.

Our findings indicate that the sociocultural context was instrumental in generating analogies and design ideas (see Table 4). Personal elements, such as places of residence, market assumptions, and favourite holidays, prominently featured in students' discussions, underscoring the role of

sociocultural experiences in shaping the design process. By linking an artifact to the students' cultural context, their knowledge becomes more meaningful, relatable, and applicable. This approach enables students to integrate their prior knowledge and experiences with new concepts, leading to a more profound understanding of entrepreneurial activity (Kafai, 2006b).

Table 4. Discussed design ideas.

Idea	Author	Argument	Presented Criticism	Discipline	Result
New maps with new cities (new main board)	Paulo	Create randomness in demand and a new localization strategy	Require time to produce and new macroeconomic cards	Logistics	Discarded
			Do not represent a meaningful change to avoid the monopoly	Marketing	
			Localization is not an important asset in the strategy of the game	Strategy	
Change customer expectations every three rounds	Lucas	Create randomness in demand	Difficult to implement	Economics Marketing Operations Management	Implemented
Create four new macroeconomic cards	Lucas	Keep the game in 20 rounds	Gameplay takes time; 16 rounds could speed up gameplay	Economics	Implemented
New cards representing income tax	Paulo	Reduce companies' profitability	Companies can bankrupt with these cards in the game	Law	Implemented
New cards representing ICMS	Lucas	Reduce companies' profitability	Increase complexity	Law Accounting	Discarded
Seasonal card <i>Children's Day</i>	Lucas	Represent Seasonality	It is not an international holiday	Marketing	Discarded
Idea	Author	Argument	Presented Criticism	Discipline	Result
Seasonal card <i>Christmas</i>	Lucas	Represent Seasonality	It might not correspond to the time in the game	Marketing	Discarded
Play with more than one map (two countries with different economies)	Lucas	Create randomness in demand and a new localization strategy	Increase complexity	Economics Marketing	Discarded
New models to transport goods	Paulo	New localization strategy	Increase complexity	Logistics	Discarded
Increase managers' salaries according to market mix level	Paulo	Reduce companies' profitability	Difficult to implement	Human Resources	Implemented
Remove constraint in the production system	Paulo	Improve the production volume	It will change the system completely since the production constraint limited companies' revenue	Operations Management	Discarded
After deciding to sell, the player cannot do anything else (just sell)	House	Reduce companies' revenue	Constrain decision-making	None	Implemented

## Conclusion

To address the research question, 'How can game modding support the development of business students' cognitive perspective in design?' we propose that game modding serves as a useful pedagogical tool to foster essential cognitive processes in design thinking, particularly within a business education context. Game modding helps develop business students' cognitive perspective by creating an experiential learning environment emulating the entrepreneurial journey.

Our findings demonstrate that design thinking, mediated by cognitive acts such as framing, abductive reasoning, analogical reasoning, and mental simulations, enabled students to reproduce their conceptual representations within the game. These representations were deeply informed by students' sociocultural contexts and multidisciplinary reasoning, highlighting the value of incorporating diverse perspectives into the design process.

We argue that reconceptualizing design thinking as a cognitive process mediated by game design creates opportunities for students to engage in reflective practice.

Unlike the traditional stepped or "ready-to-use toolbox" approach to design thinking (Johansson-Skoldberg et al., 2013), this pedagogical intervention encourages students to think critically and deeply about their own problem-solving methods. Such reflection allows students to develop a nuanced understanding of the complexities underlying entrepreneurial challenges.

The implications of our findings align with a growing body of literature linking games and game design with competency development (Clark et al., 2016; Connolly et al., 2012; Jabbar & Felicia, 2015; Kim & Bastani, 2017; Vandercruysse et al., 2012). From a constructionist perspective, this approach positions students as creators of knowledge (Kafai, 1995; Rahimi & Kim, 2021), rather than passive consumers. As games are "problem-solving spaces designed to engage players" (Gee & Hayes, 2012, p. 129), this intervention helps students develop a language to think about business concepts (Squire, 2012) while cultivating the cognitive and adaptive skills necessary for entrepreneurial success.

However, challenges in implementing this approach must be acknowledged. First, students' lack of design expertise may lead to surface-level engagement with the system represented by the game. For example, while students framed their design problem as the monopoly, their solutions focused on adding constraints rather than addressing the internal relationships (e.g., between game objects and attributes) that underpin the monopoly. This limitation reflects the need for higher critical thinking skills and a deeper understanding of the underlying content to effect more systemic change (Rahimi & Kim, 2019).

Second, the adoption of game-based learning introduces challenges for educators. Students accustomed to traditional instruction may resist new pedagogies that embrace ambiguity, iterative problem-solving, and the absence of right-versus-wrong answers (Garbuio et al., 2018). This resistance is often rooted in the narrow, exam-oriented mindset that dominates traditional academic structures (Günzel-Jensen & Robinson, 2017). For novice educators, navigating students' frustrations and managing their expectations are critical skills for successfully implementing design-based interventions.

Despite these challenges, the findings of this study illustrate the potential for game design to transform entrepreneurship education. Further studies might also explore the integration of methodologies like Lego Serious Play® into board game usage. This method leverages three-dimensional media to facilitate strategic reflection and creative problem-solving (Bürgi et al., 2005; O'Brien, 2019; Roos et al., 2004). Game design shares these characteristics and could potentially extend the benefits of such methodologies. However, the craft aspect of game design, linked to the hand-mind relationship (Roos et al., 2004), was not examined in the current study.

Research could also investigate games as embodied metaphors, produced by students in the role of game designers. This concept encompasses both the iterative creation process of a tangible metaphorical object and the resultant physical metaphor, which can serve as a powerful

tool for sense-making (Heracleous & Jacobs, 2008). Such studies could shed light on how students formulate and interpret new concepts, fostering critical reflection on their learning processes.

Ultimately, integrating game design into entrepreneurship education offers a promising pathway to cultivate adaptive, innovative, and resilient future entrepreneurs.

## Appendix

Entrepreneurial Thinking is a game for four players who compete as owners of industrial companies in a market represented on the main board (Figure 4). The main board depicts two provinces in Canada with eight cities connected by roads. The cities have information on the cost of building offices, factories, and warehouses and will receive markers that inform the customers' expectations (product quality and price). Offices, factories, and warehouses are essential to the company's operations. At the end of 24 rounds, the company that exhibits the highest capital wins the game.

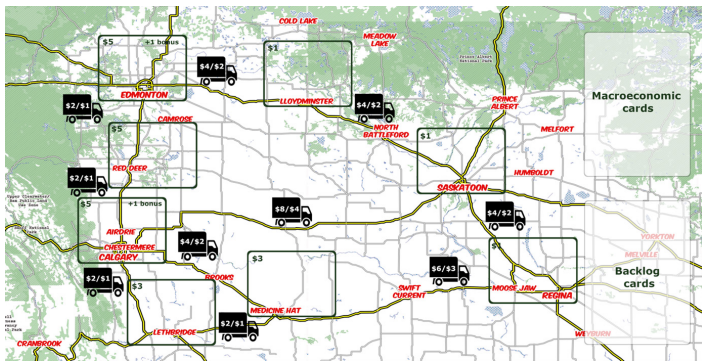


Figure 4. The main board.

The cities receive a demand marker representing customer expectations regarding product quality and willingness to pay for it. Customer expectations are also expressed by levels (from 1 to 3) for both Product and Price (Figure 5). All customers' expectations are unknown (placed face down) and must be revealed by paying for marketing research.



Figure 5. Examples of demand customer expectation markers.

### The players' boards

A personal board portrays the player's company (Figure 6). The company evolves based on players' strategy, managers hired, and investment capacity. The strategy is represented by the four P's of marketing (product, price, promotion and place). There are three levels to each component of the marketing mix. The lowest quality the business may provide, for instance, is represented by the first level of Product (level 1). To increase a product's quality, the company must improve the product's level to levels two or three. Players' chances of selling and/or becoming more lucrative rise as

their marketing mix develops.

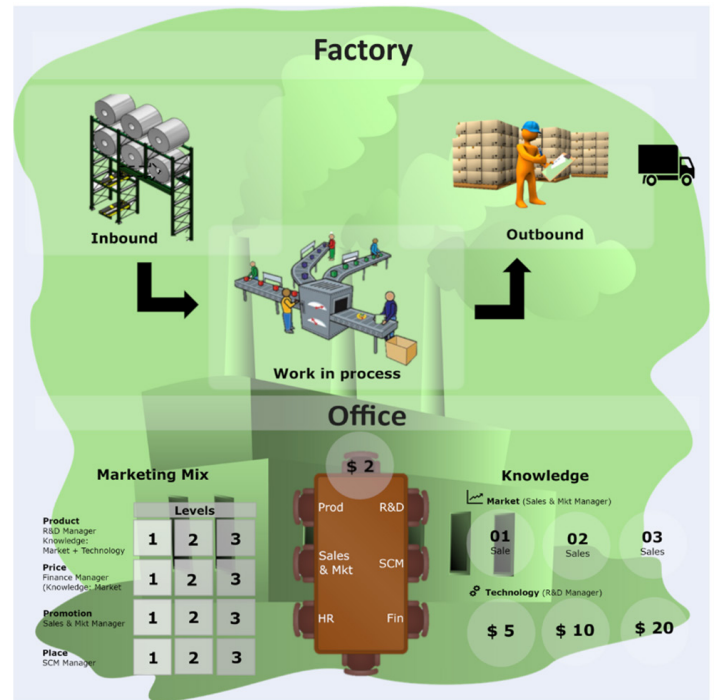


Figure 6. One of the player's boards.

However, to evolve their marketing mix, players must hire executives and/or increase organizational knowledge about the market and technology. Hiring managers is also an important decision in improving operational performance. This game's mechanism also encourages students' reflection on the importance of teamwork and cooperation. Executives such as supply chain managers allow companies to perform better in distribution, finance managers help in the pricing process, and research and development (R&D) managers work in product development. Table 5 summarizes the executive competencies.

Table 5. Manager skills.

Manager	Competencies
Human Resources (HR)	Allows a player to hire more than two managers.
Research & Development (R&D)	Allows a player to upgrade the Technology Knowledge and Product level.
Finance	Allows a player to upgrade Price level.
Sales & Marketing	Makes it possible to sell in different cities, upgrade the Market Knowledge, and the Promotion.
Production	Speeds up the production system (two movements with one decision).
Supply Chain Management (SCM)	Reduces the cost of shipping, allows a player to build a distribution center or contract Third-Party Logistics, and upgrades the Place level.

### Decision-making

To start the game, every player receives 10 dollars. However, players have access to additional funding options, including bank loans and the chance to pitch their business to potential investors. Players have up to four decisions to meet market demand, assure profitability, and surpass rivals during their turn. Topics such as investment, marketing, strategy, knowledge management, human resources, production

management, selling, distribution, and negotiations are examples of player decisions (Table 6).

Table 6. Examples of decisions in the Entrepreneurial Thinking game.

Areas	Examples of decisions
Finance	Increase the product price Borrow money from the bank
Human Resources	Hire executives to improve business processes, such as a Production Manager or Marketing and Sales Manager Lay off executives to save money
Operations	Buy raw materials Produce finished goods units
Marketing	Improve product quality Improve product promotion
Strategy	Focus the business in one city Try to expand the business to other cities
Sales	Sell in the current city Sell in another city

Demand and the market environment can alter, much like in real life, in response to economic developments revealed by macroeconomic cards (Figure 7) drawn from the deck before the start of a new round. Players, as entrepreneurs, must adapt their strategies to respond to these events.

On their personal board, players also run the factory by purchasing raw materials, producing, and sending the finished goods to the dispatch area (respecting the processing times). The raw materials must be received by players in their "Inbound" area. They can decide to transfer them to the "Working in process" area on the following round, and only then will they have finished items in the "Outbound" area. However, the Production Manager can allow a player to speed up the production process.

A limited number of little cubes in different colours for each stage represent the raw materials. Level 1 has 80 pieces (\$1 each), Level 2 has 40 pieces (\$2 each), and Level 3 has 20 pieces (\$3 each) of the raw material to make finished goods. Levels 2 or 3 of raw materials can only be purchased if the marketing mix area reflects those levels. The player must possess the corresponding raw material level to make a finished good (Level 1 raw materials only yield Level 1 goods, etc.). The finished good is produced from one unit of raw material.

### Product selling via a stochastic game mechanism

Product selling requires adherence to the supply-demand matching card (Figure 8). A player's supply is determined by their Product and Price levels in the marketing mix, while demand relies on customer expectation markers in cities. The matching cards provide information on the required dice roll to determine units sold and the resulting price per unit. Four dice options are available: D4 (a four-side die), D6 (a six-side die), D8 (an eight-side die), or two D6.

For example (Figure 8), if a player wants to sell a Product level 1 at Price level 1 in a city where the customer expectation marker shows Product Level 2 and Price Level 2, the player



Figure 7. Example of macroeconomic card.

consults the supply-demand matching card for their Product Level 1 offer. They locate the relevant customer expectation column (Level 2 for Product and Price) and the corresponding Price level column (Level 1). The intersection of these columns indicates that the player needs to roll a D4 to determine units sold and will receive \$3 per unit.

		Company Offer		
Customer Expectation		PRICE 1	PRICE 2	PRICE 3
PRODUCT	PRICE			
1	1	D6 Price \$3	D4 Price \$3	
	2	D6 Price \$3	D6 Price \$4	D4 Price \$4
	3	D6 Price \$3	D6 Price \$4	D6 Price \$5
2	1	D4 Price \$3		
	2	D4 Price \$3	D4 Price \$4	
	3	D4 Price \$3	D4 Price \$4	
3	1			
	2			
	3			

Figure 8. Supply-demand matching card example.

Exceeding inventory quantity when selling units results in a proportional backlog marker. The player must then draw a backlog card and follow the instructions. Back-ordered units must be addressed and fulfilled once the player has

sufficient completed goods in their inventory.

## References

- Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *American Educational Research Association, 41*(1), 16–25. <https://doi.org/10.3102/0013189X11428813>
- Ball, L. J., & Christensen, B. T. (2009). Analogical reasoning and mental simulation in design: Two strategies linked to uncertainty resolution. *Design Studies, 30*(2), 169–186. <https://doi.org/10.1016/j.destud.2008.12.005>
- Barab, S., & Squire, K. (2004). Design-based research: Putting a stake in the ground. *Journal of Learning Sciences, 13*(1), 1–14. [https://doi.org/10.1207/s15327809jls1301\\_1](https://doi.org/10.1207/s15327809jls1301_1)
- Bianchi, M., & Verganti, R. (2022). Entrepreneurs as designers of problems worth solving. *Journal of Business Venturing Design, 1*(1–2), 100006. <https://doi.org/10.1016/j.jbvd.2022.100006>
- Brown, A. L. (1992). Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences, 2*(2), 141–178. [https://doi.org/10.1207/s15327809jls0202\\_2](https://doi.org/10.1207/s15327809jls0202_2)
- Brown, T. (2008). Design thinking. *Harvard Business Review, 86*(6), 84–92. <https://doi.org/10.1145/2535915>
- Bürgi, P. T., Jacobs, C. D., & Roos, J. (2005). From metaphor to practice in the crafting of strategy. *Journal of Management Inquiry, 14*(1), 78–94. <https://doi.org/10.1177/1056492604270802>
- Casakin, H., Ball, L. J., Christensen, B. T., & Badke-Schaub, P. (2015). How do analogizing and mental simulation influence team dynamics in innovative product design? *Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 29*(02), 173–183. <https://doi.org/10.1017/S0890060415000050>
- Castronova, E., & Knowles, I. (2015). Modding board games into serious games: The case of climate policy. *International Journal of Serious Games, 2*(3), 41–62. <https://doi.org/10.17083/ijsg.v2i3.77>
- Chan, C.-S. (2015). Introduction of design cognition. In *Style and creativity in design. Studies in Applied Philosophy, Epistemology and Rational Ethics, 17*(pp. 9–78). Springer. [https://doi.org/10.1007/978-3-319-14017-9\\_2](https://doi.org/10.1007/978-3-319-14017-9_2)
- Chan, J., Paletz, S. B. F., & Schunn, C. D. (2012). Analogy as a strategy for supporting complex problem solving under uncertainty. *Memory & Cognition, 40*(8), 1352–1365. <https://doi.org/10.3758/s13421-012-0227-z>
- Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of Educational Research, 86*(1), 79–122. <https://doi.org/10.3102/0034654315582065>
- Collins, A. (1992). Toward a design science of education. In E. Scanlon & T. O’Shea (Eds.), *New directions in educational technology*. Springer-Verlag.
- Collins, A., Joseph, D., & Bielaczyc, K. (2004). Design research: Theoretical and methodological issues. *Journal of the Learning Sciences, 13*(1), 15–42. [https://doi.org/10.1207/s15327809jls1301\\_2](https://doi.org/10.1207/s15327809jls1301_2)
- Connolly, T. M., Boyle, E., Hainey, T., & Boyle, J. M. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education, 59*(2), 661–686. <https://doi.org/10.1016/j.compedu.2012.03.004>
- Creswell, J. W., & Poth, C. N. (2017). *Qualitative inquiry and research design: Choosing among five approaches*. Sage.
- Crilly, N. (2015). Fixation and creativity in concept development: The attitudes and practices of expert designers. *Design Studies, 38*, 54–91. <https://doi.org/10.1016/j.destud.2015.01.002>
- Denzin, N. K. (2017). *The research act*. Routledge. <https://doi.org/10.4324/9781315134543>
- Dew, N., Read, S., Sarasvathy, S. D., & Wiltbank, R. (2009). Effectual versus predictive logics in entrepreneurial decision-making: Differences between experts and novices. *Journal of Business Venturing, 24*(4), 287–309. <https://doi.org/10.1016/j.jbusvent.2008.02.002>
- Dinar, M., Shah, J. J., Cagan, J., Leifer, L., Linsey, J., Woodruff, G. W., Smith, S. M., & Hernandez, N. V. (2015). Empirical studies of designer thinking: Past, present, and future. *Journal of Mechanical Design, 137*(2), 1–13. <https://doi.org/10.1115/1.4029025>
- Dong, A., Garbuio, M., & Lovallo, D. (2016). A design perspective on the microfoundations of sensing capabilities. *California Management Review, 58*(4), 97–117. <https://doi.org/10.1525/cmrv.2016.58.4.97>
- Dorst, K. (2011). The core of ‘design thinking’ and its application. *Design Studies, 32*(6), 521–532. <https://doi.org/10.1016/j.destud.2011.07.006>
- Dorst, K., & Cross, N. (2001). Creativity in the design process: Co-evolution of problem–solution. *Design Studies, 22*, 425–437. [https://doi.org/10.1016/S0142-694X\(01\)00009-6](https://doi.org/10.1016/S0142-694X(01)00009-6)
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry, 12*(2), 219–245. <https://doi.org/10.1177/1077800405284363>
- Gaglio, C. M. (2004). The role of mental simulations and counterfactual thinking in the opportunity identification process. *Entrepreneurship: Theory and Practice, 28*(6), 533–552. <https://doi.org/10.1111/j.1540-6520.2004.00063.x>
- Games, I. A., & Squire, K. (2008). Design thinking in Gamestar mechanic: The role of gamer experience on the appropriation of the discourse practices of game designers. *Proceedings of*

Garbuio, M., & Lin, N. (2021). Innovative idea generation in problem finding: Abductive reasoning, cognitive impediments, and the promise of artificial intelligence. *Journal of Product Innovation Management*, 38(6), 701–725. <https://doi.org/10.1111/jpim.12602>

Garbuio, M., Lovallo, D., Dong, A., Lin, N., & Tschang, T. (2018). Demystifying the genius of entrepreneurship: How design cognition can help create the next generation of entrepreneurs. *Academy of Management Learning & Education*, 17(1), 41–61. <https://doi.org/10.5465/amle.2016.0040>

Garbuio, M., Lovallo, D., Porac, J., & Dong, A. (2015). A design cognition perspective on strategic option generation. *Advances in Strategic Management*, 32, 441–470. <https://doi.org/10.1108/S0742-332220150000032014>

Gee, J. P., & Hayes, E. (2012). Nurturing affinity spaces and game-based learning. In C. Steinkuehler, K. Squire, & S. Barab (Eds.), *Game, learning, and society: Learning and meaning in the digital age* (pp. 129–153). Cambridge University Press. <https://doi.org/10.1017/CBO9781139031127.015>

Gentner, D., Brem, S., Ferguson, R., Wolff, P., Markman, A. B., & Forbus, K. (1997). Analogy and creativity in the works of Johannes Kepler. In T. B. Ward, S. M. Smith, & J. Vaid (Eds.), *Creative thought: An investigation of conceptual structures and process* (pp. 403–459). American Psychological Association.

Gentner, D., Loewenstein, J., & Thompson, L. (2003). Learning and transfer: A general role for analogical encoding. *Journal of Educational Psychology*, 95(2), 393–408. <https://doi.org/10.1037/0022-0663.95.2.393>

Gick, M. L., & Holyoak, K. J. (1980). Analogical problem solving. *Cognitive Psychology*, 12(3), 306–355. [https://doi.org/10.1016/0010-0285\(80\)90013-4](https://doi.org/10.1016/0010-0285(80)90013-4)

Glen, R., Suci, C., & Baughn, C. (2014). The need for design thinking in business schools. *Academy of Management Learning & Education*, 13(4), 653–667. <https://doi.org/10.5465/amle.2012.0308>

Glen, R., Suci, C., Baughn, C. C., & Anson, R. (2015). Teaching design thinking in business schools. *International Journal of Management Education*, 13(2), 182–192. <https://doi.org/10.1016/j.ijme.2015.05.001>

Guenther, A., Eisenbart, B., & Dong, A. (2021). Creativity and successful product concept selection for innovation. *International Journal of Design Creativity and Innovation*, 9(1), 3–19. <https://doi.org/10.1080/21650349.2020.1858970>

Günzel-Jensen, F., & Robinson, S. (2017). Effectuation in the undergraduate classroom: Three barriers to entrepreneurial learning. *Education + Training*, 59(7/8), 780–796. <https://doi.org/10.1108/ET-03-2016-0049>

Harel, I. (1991). *Children designers: Interdisciplinary constructions for learning and knowing mathematics in a*

Hargadon, A. B. (2002). Brokering knowledge: Linking learning and innovation. *Research in Organizational Behavior*, 24, 41–85. [https://doi.org/10.1016/S0191-3085\(02\)24003-4](https://doi.org/10.1016/S0191-3085(02)24003-4)

Hassi, L., & Laakso, M. (2011). Conceptions of design thinking in the design and management discourse: Open questions and possible directions for research. *Proceedings of International Association of Societies of Design Research*, 1–10. Hassi-2011.pdf

Haynie, J. M., Shepherd, D., Mosakowski, E., & Earley, P. C. (2010). A situated metacognitive model of the entrepreneurial mindset. *Journal of Business Venturing*, 25(2), 217–229. <https://doi.org/10.1016/j.jbusvent.2008.10.001>

Heracleous, L., & Jacobs, C. D. (2008). Crafting strategy: The role of embodied metaphors. *Long Range Planning*, 41(3), 309–325. <https://doi.org/10.1016/j.lrp.2008.02.011>

Herstatt, C., & Kalogerakis, K. (2005). How to use analogies for breakthrough innovations. *International Journal of Innovation & Technology Management*, 2(3), 331–347. <https://doi.org/10.1142/S0219877005000538>

Huq, A., & Gilbert, D. (2017). All the world's a stage: Transforming entrepreneurship education through design thinking. *Education + Training*, 59(2), 155–170. <https://doi.org/10.1108/ET-12-2015-0111>

Jabbar, A. I. A., & Felicia, P. (2015). Gameplay engagement and learning in game-based learning: A systematic review. *Review of Educational Research*, 1–40. <https://doi.org/10.3102/0034654315577210>

Jansson, D. G., & Smith, S. M. (1991). Design fixation. *Design Studies*, 12(1). [https://doi.org/10.1016/0142-694X\(91\)90003-F](https://doi.org/10.1016/0142-694X(91)90003-F)

Johansson-Skoldberg, U., Woodilla, J., & Cetinkaya, M. (2013). Design thinking: Past, present and possible futures. *Creativity and Innovation Management*, 22(2), 121–146. <https://doi.org/10.1111/caim.12023>

Kafai, Y. B. (1995). *Minds in play: Computer game design as a context for children's learning*. Lawrence Erlbaum Associates.

Kafai, Y. B. (2006a). Constructionism. In R. K. Sawyer (Ed.), *The Cambridge Handbook of the Learning Sciences* (pp. 35–46). Cambridge University Press.

Kafai, Y. B. (2006b). Playing and making games for learning: Instructionist and constructionist perspectives for game studies. *Games and Culture*, 1(1), 36–40. <https://doi.org/10.1177/1555412005281767>

Kafai, Y. B., & Burke, Q. (2015a). Constructionist gaming: Understanding the benefits of making games for learning. *Educational Psychologist*, 50(4), 313–334. <https://doi.org/10.1080/00461520.2015.1124022>

Kafai, Y. B., & Burke, Q. (2015b). Constructionist gaming:

- Understanding the benefits of making games for learning. *Educational Psychologist*, 50(4), 313–334. <https://doi.org/10.1080/00461520.2015.1124022>
- Kaufman, G., & Flanagan, M. (2016). Playing the system: Comparing the efficacy and impact of digital and non-digital versions of a collaborative strategy game. *Proceedings of the DiGRA and FDG First Joint International Conference (DiGRA/FDG 2016)*, 1–16. <https://dl.digra.org/index.php/dl/issue/view/14>
- Kelley, T. (2001). *The art of innovation: Lessons in creativity from IDEO, America's leading design firm*. Doubleday.
- Kier, A. S., & McMullen, J. S. (2018). Entrepreneurial imaginativeness in new venture ideation. *Academy of Management Journal*, 61(6), 2265–2295. <https://doi.org/10.5465/amj.2017.0395>
- Kim, B., & Bastani, R. (2017). Students as game designers: Transdisciplinary approach to STEAM education. *Alberta Science Education Journal (ASEJ)*, 45(1), 45–53. [https://www.researchgate.net/publication/325430371\\_Students\\_as\\_Game\\_Designers\\_Transdisciplinary\\_Approach\\_to\\_STEAM\\_Education](https://www.researchgate.net/publication/325430371_Students_as_Game_Designers_Transdisciplinary_Approach_to_STEAM_Education)
- Kim, J., & Ryu, H. (2014). A design thinking rationality framework: Framing and solving design problems in early concept generation. *Human-Computer Interaction*, 29(5–6), 516–553. <https://doi.org/10.1080/07370024.2014.896706>
- Marasco, E., Gatti Junior, W., Kim, B., Behjat, L., & Eggermont, M. (2017). Curious conversations: Using game-based learning to develop creative culture within technical courses. *Papers in Postsecondary Learning and Teaching*, 2, 57–63. [EJ1306891.pdf](https://doi.org/10.1080/07370024.2014.896706)
- Matthews, J. H., & Wrigley, C. (2017). Design and design thinking in business and management education and development. *Journal of Learning Design*, 10(1), 41–54. <https://doi.org/10.5204/jld.v9i3.294>
- Mayer, R. E. (1989). Human nonadversary problem solving. In K. J. Gilhooly (Ed.), *Human and machine problem solving*. Plenum.
- McCullagh, K. (2010). Stepping up: Design thinking has uncovered real opportunities. *Design Management Review*, 21(3), 36–39. <https://doi.org/10.1111/j.1948-7169.2010.00076.x>
- McCullagh, K. (2013). Stepping up: Beyond design thinking. *Design Management Review*, 24(2), 3–5. <https://doi.org/10.1111/drev.10238>
- McKenney, S., & Reeves, T. C. (2012). *Conducting educational design research*. Routledge.
- Meinel, C., & Leifer, L. (2012). Design thinking research. In H. Plattner, C. Meinel, & L. Leifer (Eds.), *Design thinking research: Studying co-creation in practice*. Springer Berlin Heidelberg. <https://doi.org/10.1007/978-3-642-21643-5>
- Micheli, P., Wilner, S. J. S., Bhatti, S. H., Mura, M., & Beverland, M. B. (2019). Doing design thinking: Conceptual review, synthesis, and research agenda. *Journal of Product Innovation Management*, 36(2), 124–148. <https://doi.org/10.1111/jpim.12466>
- Moreno, D. P., Yang, M. C., Hernández, A. A., Linsey, J. S., & Wood, K. L. (2014). A step beyond to overcome design fixation: Design-by-analogy approach. In J. S. Gero & S. Hanna (Eds.), *Proceedings of Design Computing and Cognition (DCC'14)* (pp. 661–680). [https://doi.org/10.1007/978-3-319-14956-1\\_34](https://doi.org/10.1007/978-3-319-14956-1_34)
- Neck, H. M., & Greene, P. G. (2011). Entrepreneurship education: Known worlds and frontiers. *Journal of Small Business Management*, 49(1), 55–70. <https://doi.org/10.1111/j.1540-627X.2010.00314.x>
- Nielsen, S. L., & Stovang, P. (2015). DesUni: University entrepreneurship education through design thinking. *Education + Training*, 57(8/9), 977–991. <https://doi.org/10.1108/ET-09-2014-0121>
- Norman, D. (2010). *Design thinking: A useful myth*. Core 77. <https://www.core77.com/posts/16790/design-thinking-a-useful-myth-16790>
- Norman, D. (2013). *The design of everyday things*. Basic Books.
- O'Brien, J. (2019). Forming powerful MBA teams using Lego architecture. *Journal of Applied Learning & Teaching*, 2(1), 79–82. <https://doi.org/10.37074/jalt.2019.2.1.12>
- Ozkan, O., & Dogan, F. (2013). Cognitive strategies of analogical reasoning in design: Differences between expert and novice designers. *Design Studies*, 34(2), 161–192. <https://doi.org/10.1016/j.destud.2012.11.006>
- Papert, S. (1980). *Mindstorms: Children, computers, and powerful ideas*. Basic Books.
- Papert, S. (1991). Situating constructionism. In S. Papert & I. Harel (Eds.), *Constructionism* (pp. 1–11). Ablex. Situating Constructionism
- Pfeffer, J., & Fong, C. T. (2004). The business school 'business': Some lessons from the US experience. *Journal of Management Studies*, 41(8), 1501–1520. <https://doi.org/10.1111/j.1467-6486.2004.00484.x>
- Rahimi, F. B., & Kim, B. (2019). The role of interest-driven participatory game design: Considering design literacy within a technology classroom. *International Journal of Technology and Design Education*, 29(2), 387–404. <https://doi.org/10.1007/s10798-018-9451-6>
- Rahimi, F. B., & Kim, B. (2021). Learning through redesigning a game in the STEM classroom. *Simulation & Gaming*, 52(6), 753–774. <https://doi.org/10.1177/10468781211039260>
- Riverdale Country School, & IDEO. (2011). *Design thinking for educators*. <https://designthinkingforeducators.com/>



- Roos, J., Victor, B., & Statler, M. (2004). Playing seriously with strategy. *Long Range Planning*, 37(6), 549–568. <https://doi.org/10.1016/j.lrp.2004.09.005>
- Roozenburg, N. F. M. (1993). On the pattern of reasoning in innovative design. *Design Studies*, 14(1), 4–18. [https://doi.org/10.1016/S0142-694X\(05\)80002-X](https://doi.org/10.1016/S0142-694X(05)80002-X)
- Rosa, H. (2013). *Social acceleration: A new theory of modernity*. Columbia University Press.
- Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. MIT Press.
- Sarooghi, H., Sunny, S., Hornsby, J., & Fernhaber, S. (2019). Design thinking and entrepreneurship education: Where are we, and what are the possibilities? *Journal of Small Business Management*, 57(S1), 78–93. <https://doi.org/10.1111/jsbm.12541>
- Sengupta, P., Krinks, K. D., & Clark, D. B. (2015). Learning to deflect: Conceptual change in Physics during digital game play. *Journal of the Learning Sciences*, 24(4), 638–674. <https://doi.org/10.1080/10508406.2015.1082912>
- Shank, G. (1998). The extraordinary ordinary powers of abductive reasoning. *Theory & Psychology*, 8(6), 841–860. <https://doi.org/10.1177/0959354398086007>
- Smith, S. M., Linsey, J. S., & Kerne, A. (1995). Using evolved analogies to overcome creative design fixation. In T. Taura & N. Yukari (Eds.), *Design creativity* (pp. 35–39). Springer. [https://doi.org/10.1007/978-0-85729-224-7\\_6](https://doi.org/10.1007/978-0-85729-224-7_6)
- Sosa, R. (2015). Beyond ‘design thinking’. *International Association of Societies of Design Research (IASDR) Conference*. <https://www.researchgate.net/publication/283856180>
- Squire, K. (2003). Video games in education. *International Journal of Intelligent Simulations and Gaming*, 2(1), 49–62. <http://dx.doi.org/10.1145/950566.950583>
- Squire, K. (2012). Designed cultures. In C. Steinkuehler, K. Squire, & S. Barab (Eds.), *Games, learning, and society: Learning and meaning in the digital age* (pp. 10–31). Cambridge University Press. <https://doi.org/10.1017/CBO9781139031127.005>
- Stake, R. E. (1995). *The art of case study research*. Sage.
- Stumpf, S. C., & McDonnell, J. T. (2002). Talking about team framing: Using argumentation to analyse and support experiential learning in early design episodes. *Design Studies*, 23(1), 5–23. [https://doi.org/10.1016/S0142-694X\(01\)00020-5](https://doi.org/10.1016/S0142-694X(01)00020-5)
- Taber, K. S. (2008). Exploring conceptual integration in student thinking: Evidence from a case study. *International Journal of Science Education*, 30(14), 1915–1943. <https://doi.org/10.1080/09500690701589404>
- Van Burg, E., & Romme, A. G. L. (2014). Creating the future together: Toward a framework for research synthesis in entrepreneurship. *Entrepreneurship: Theory and Practice*, 38(2), 369–397. <https://doi.org/10.1111/etap.12092>
- Vandercruysse, S., Vandewaetere, M., & Clarebout, G. (2012). Game-based learning: A review on the effectiveness of educational games. In M. M. Cruz-Cunha (Ed.), *Handbook of research on serious games as educational, business and research tools* (pp. 628–647). IGI Global. <https://doi.org/10.4018/978-1-4666-0149-9.ch032>
- Visser, W. (2006). Designing as construction of representations: A dynamic viewpoint in cognitive design research. *Human-Computer Interaction*, 21, 103–152. [https://doi.org/10.1207/s15327051hci2101\\_4](https://doi.org/10.1207/s15327051hci2101_4)
- Von Kortzfleisch, H. F. O., Zerwas, D., & Mokanis, I. (2013). Potentials of entrepreneurial design thinking® for entrepreneurship education. *Procedia - Social and Behavioral Sciences*, 106, 2080–2092. <https://doi.org/10.1016/j.sbspro.2013.12.237>
- Welsh, A. A., & Dehler, G. E. (2013). Combining critical reflection and design thinking to develop integrative learners. *Journal of Management Education*, 37(6), 771–802. <https://doi.org/10.1177/1052562912470107>
- Wrigley, C., & Mosely, G. (2023). *Design thinking pedagogy*. Routledge. <https://doi.org/10.4324/9781003006176>
- Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Sage.
- Zupan, B., & Nabergoj, A. S. (2016). Incorporating design thinking in entrepreneurship education. *European Conference on Innovation and Entrepreneurship*, 876–883. [https://doi.org/10.1007/978-3-319-24112-7\\_10](https://doi.org/10.1007/978-3-319-24112-7_10)



---

## Impact and implementation of experiential learning: An industry-university partnership case study

---

Cubie L. L. Lau<sup>A</sup> *A* *University College Dublin, Singapore*

Shawn Wong<sup>B</sup> *B* *University College Dublin, Singapore*

---

### Keywords

Experiential learning;  
higher education;  
industry partnerships;  
Kolb's learning cycle;  
Singapore.

### Abstract

Management education faces challenges. Expectations from various stakeholders, governments, employers and learners have compelled higher education institutions to reimagine students' learning experiences and address the skills gap in the job market. One major challenge is course design and delivery. Education needs to be both relevant and practical as students are one step away from entering the workforce. Therefore, incorporating experiential learning into the curriculum is highly desirable. Experiential learning pedagogy is growing in popularity in higher education as it provides students with invaluable experience working on real business cases. It also prepares them for their professional endeavours ahead.

---

### Correspondence

cubie.lau@ucd.ie <sup>A</sup>

---

### Article Info

Received 25 January 2024  
Received in revised form 16 October 2024  
Accepted 8 December 2024  
Available online 7 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.5>

This paper shows an industry collaborative project of University College Dublin (UCD) in Singapore. The project required students to collect firsthand data and apply their knowledge and skills to building a sustainable three-sided marketplace of online food delivery service. The four components of Kolb's learning cycle – concrete experience, reflection observation, abstract conceptualisation, and active experimentation – have been shown to transform students' learning experiences and achieve a variety of learning outcomes. This paper also documents the project goals, work progress, obstacles encountered, and reflections.

## Introduction

The world is changing fast, and companies and governments are looking for graduates who are prepared to solve open problems and will be career and industry-ready (Teng, 2023). To meet this demand, more universities have responded to integrate industry experience with learning into their curricula and, more importantly, work closely with industry partners in internships and curriculum structure (Lim, 2023).

Innovation in curriculum and learning is important, especially in countries where education can reshape learners' destinies and competition is keen. Singapore is an example. As an education hub, Singapore's education environment is welcoming and open to partnership and collaboration. The environment presents both opportunities and challenges. As of 2017, the Council for Private Education stated that approximately 77,000 local and 29,000 international students were enrolled in private tertiary colleges in Singapore with the most popular offering UK university qualifications via partner institutions (Spurling, 2017). The number has increased after the COVID-19 pandemic due to Singapore's effective management of the pandemic (Business Times, 2022). There are more than 120 private education providers in Singapore that offer higher education (Spurling, 2017), and the competition is rising. To stay on top, private education institutions (PEIs) need to, among other things, provide hands-on learning, flexibility, and double majors.

The aim of this paper is to describe an experiential learning approach in the teaching of business strategy at the University College Dublin (UCD) Singapore campus. It describes how Kolb's four-stage learning cycle transforms student experience into effective learning. It also reveals the challenges of designing and implementing such a pedagogical approach.

## Evolving education landscape in Singapore

The word 'education' derives from two Latin roots: *educare*, to train, to mould, and *educere*, to draw out, to lead out (Gioia, 2019). Education is the transmission of knowledge, skills, and character traits. It is the process of facilitating learning which can take place in various forms.

Singapore is a city in Southeast Asia of about six million people. With few natural resources, human capital development through education has always been a main policy priority over the decades (Kwek et al., 2023; NCEE, 2016). The Singapore education system is evolving. It has drawn inspiration from diverse educational models, for example, Germany's vocational education system, which emphasises practical skills and industry relevance (Kong, 2024). It has also changed from a narrow to a more balanced holistic student development. The transition to and success of holistic education also depends on pedagogical innovation, instructional quality improvement, and tighter industry-academia tie-ups (Kwek et al., 2023; Teng, 2023). Education Minister Chan Chun Sing added that educators need to update their skills as "beyond transmitting knowledge, they are facilitators of discovery and learning" (Teng, 2023). They also need to explore new pedagogies

and ensure the relevance, innovation, and currency of the curriculum (Garate, 2023; Sam, 2022).

On the other hand, companies cannot and must not passively wait for the 'perfect worker' to be developed for them, he said. Companies must be active partners in shaping students' interests and skill sets early and must work with academia to train workers, said Education Minister Chan Chun Sing in an interview with the Singapore newspaper, The Straits Times (Teng, 2023).

## Studying in a higher private education institution

Higher education is offered at institutions such as colleges, universities, community colleges, and vocational-technical schools. These are platforms for students to pursue further education in their fields of interest. Institutions provide advanced knowledge, information, theories, and case studies for them. Students can learn more about their respective subjects and get prepared before they enter their fields.

"Education is the systematised acquisition of experience. The university is the place to do it", (W. Woon, cited in Lim, 2023). Singaporean students, who do not meet the education qualifications of the public-funded universities or who have other reasons, attend private education institutions (PEIs). Many international students are sent from places like mainland China by families who want their young ones to have a degree and opt for PEIs. The welcoming education environment in Singapore has opened huge opportunities for international students and foreign universities alike. One study states that over one-third of the private sector student intake in Singapore was international (Spurling, 2017), and the number of international students was approximately 58,000 in 2021 (Go, 2022).

The private education sector has traditionally been perceived as an alternative education option for Singapore students who have missed out on their education qualifications due to mainly low academic performances (Go, 2022). However, things have changed over time. The private education sector provides a variety of unique experiences that can be extremely beneficial, as well as assist students in becoming productive members of Singapore's workforce. PEIs provide a faster route to the working world. PEIs also provide flexibility, double-degree courses, and hands-on learning not available in other universities (Lim, 2023). Therefore, they have attracted not only local but also international students, often from neighbouring countries. For example, a graduate from Curtin University Singapore, an Australian school, commented that the experience was beneficial because it allowed him to interact with mostly international students and instructors without needing to head overseas (Yeo, 2024).

University College Dublin (UCD) whose courses are offered in Singapore via Kaplan Higher Education Academy (a private education institution), are subjected to different operating contexts when compared to Singapore's public universities. The competition among private providers is very tough, not to mention the competition between public and private universities. There are more than 120 private education

providers in Singapore (Spurling, 2017). A few key players dominate the sector. For example, Kaplan runs a Singapore campus that teaches thousands of students enrolled in degree programmes offered by ten universities from the UK, Ireland, and Australia. It offers over 450 academic and professional certification programme options for higher learning and skills development (Kaplan, 2023). Given the growth of international students and competitors in Singapore, it is important that private education institutions (PEIs) take a proactive stance towards student learning experiences. A one-size-fits all model will soon be dated.

### **Moving towards a skills-first approach**

Common approaches in higher education have mainly relied on lectures, projects, presentations, case studies, assignments, tests, and exams. With current methods, it would be a professor or lecturer who transmits information to the students in the form of a lecture, with limited learning outcomes. The students in this type of course are like an empty cup, waiting for the lecturer to pour knowledge into the cup. This teaching method is a form of passive learning in which students do not need to examine their feelings, thoughts, and understanding of the subject matter. In other words, the lecturer spoon-feeds the students. Freire (1970), in *The pedagogy of the oppressed*, famously called (and critiqued) this depositing approach to education the 'banking concept of education'. Learners are expected to receive, memorise and repeat information as a passive learner. These methods are not entirely ineffective, but they are not enough or efficient to meet the needs of today's society. Without a doubt, students can get knowledge related to the subject they chose and the field. However, we also need to equip students with the necessary skills to navigate the real world. An article published by the World Economic Forum (2019) suggests that the Fourth Industrial Revolution and ever-changing demands of the job market have created new challenges to the higher education model. For example, there is a shift towards a "skills over degrees" model (World Economic Forum, 2019).

Chamorro-Premuzic and Frankiewicz (2019) said, "Employers need skills, not just knowledge or titles. Students want jobs, not knowledge or titles" (pp. 2-3). Nowadays, employers are not only looking for good results and knowledge but also skills such as active networking, continual upskilling (Lau, 2023), adaptability, creativity (Thian, 2024), and job-specific skills and experience, which employers desire (SIT, 2023). These factors are increasingly important in the job market. Singapore Education Minister Chan Chun Sing put forward, "The skills to learn, learn fast, unlearn, and relearn, become more important than getting a particular grade at a particular point in life" (cited in Ng, 2022).

In a panel discussion on aligning curricula with a skills-based economy, Mr. Patrice Choong from Ngee Ann Polytechnic (Thian, 2024) stressed that "university graduates are looking to boost their internship and experiential learning experiences" (p. 4). Students can bring together skills from academia and experience when they graduate. To drive the ecosystem forward towards a skills-based hiring approach, collaboration between employers, adult learning providers,

and educators is, therefore, key. Teaching 'hands-on' skills to students will give them a chance to stand out from other candidates when they apply for jobs after graduation (Volansky, 2020).

### **Reimagining education: The post-COVID-19 pandemic era**

The world has been fighting the COVID-19 pandemic since early 2020. Many key industries are affected, forcing them to alter their business practices. In the period of COVID-19, due to policies such as lockdowns, many overseas students could not take physical classes and exams. Universities moved from in-person to home-based learning. Teachers and students were forced to adapt their teaching and learning styles. In particular, the pandemic has reshaped pedagogical designs, disrupted learners' interactions and socialisation and disturbed instructors' and learners' involvement (Sutton & Jorge, 2020; Salinas-Navarro et al., 2024).

There are pros and cons of remote learning. Students and teachers did not have to commute and this saved time on commuting. Also, schools saved a lot of money on electricity and water bills. However, there are disadvantages. Some students found it challenging to communicate with each other and stay focused. Many students experienced academic burnout due to the lack of connection and interaction with classmates (Canty et al., 2020; Kwan, 2022). In Singapore, there was even a case where online learning was hacked, causing students' concern about privacy and security (Tan et al., 2022).

Furthermore, remote learning has made it hard for teachers to connect with the students and increase student engagement. Students valued the in-class experience with the opportunity to inquire and review material and appreciated the online experience for its demand for self-directed thinking, though they also longed for interpersonal dialogue (Kemp, 2020; Stafford, 2020). Wisely blending face-to-face and online learning tasks with student preference and game-based learning platforms such as Kahoot! and Mentimeter will make online learning less boring and more engaging.

The COVID-19 pandemic has also changed the way we work, we upskill and improve our capabilities (Sutton & Jorge, 2020). Melanie Weaver Barnett at the University of Michigan's Ross School of Business told People Matters (Kang, 2020), "The lightning-fast changes associated with working in the COVID-19 pandemic have revealed vulnerabilities that make it clear organisations have significant gaps to fill in their capability sets. Some of these critical gaps appear in areas of supply chain resilience, digitisation and leading virtual teams" (p. 3). To fill skill gaps, some companies actively work with learning institutions to train their employees in the skills they need. For example, Mastercard in Asia Pacific has partnered with the National University of Singapore (NUS) to enable employees to access subsidised courses in important functional areas. For example, data analytics and data science, machine learning, and cybersecurity, and other soft skills such as higher-order cognitive thinking, emotional intelligence, and social skills for the future of work (Kang,

2020). In an online seminar, Mr. Raghav Gupta, Managing Director (India and APAC) of Coursera shared a similar view. He commented that the future of industry requires professionals who have a combination of digital, data, and human skills. He said, "I think that is a good starting point for academia to think about for getting students ready for the future of work" (Gupta et al., 2021). How can higher education providers help students acquire degrees and, at the same time, real-world skills simultaneously?

### **Experiential learning: A path to practical proficiency**

There is no doubt that the pandemic, plus changing expectations and experiences of learners and employers have changed the ways of teaching and learning. Nowadays, higher education requires active approaches for effective learning and student engagement (Salinas-Navarro et al., 2024). Educational reform requires student participation. Nothing works if students do not work. Serdyukov (2017) says, "When we try to innovate education, we often leave students out of the equation. We do not innovate in students' learning, their mind, attitudes, behaviours, character, metacognition, and work ethics enough. Yet, we try everything we can to improve teaching, while what we actually need is to improve learning" (p. 20).

Gono and de Moraes (2023) posit that greater engagement through student motivation, effective communication, and involvement in the learning process is necessary. Engaging students means experiencing learning through a hands-on process (Garate, 2023). What is needed is an ability to approach live problems from a variety of perspectives. Exclusively studying theory is not enough, students need to practise and gain hands-on experience too. Theory and hands-on experience complement each other and are both indispensable. As such, university-industry partnerships are good springboards for innovation, especially in a world where there is an urgent need to translate knowledge into feasible solutions to address real-world problems (Kong, 2024). The opportunity to be creative, engage in diverse projects, solve real-world problems, and gain some meaningful project experience is desirable (Shelley & Goodwin, 2018). Practice brings students closer to society, and at the same time enables them to transform abstract theoretical knowledge into the ability to understand and solve practical problems (Garate, 2023). If students can experience real case analysis in the process of learning, it will help students transform and expand theoretical knowledge, and enhance their ability to use knowledge to solve real-life problems.

### **Kolb's experiential learning theory**

Experiential learning is a way for students to learn through hands-on experience. It is more effective than just learning from textbook materials. Solving real-life issues is also a critical employability skill for students and the learning process resonates well with Kolb's experiential learning theory. David Kolb's (1984) experiential learning theory is a comprehensive framework that explores how individuals acquire and develop new knowledge, skills, and perspectives through real-world experiences. It encourages

students' active participation, critical thinking, creativity, problem-solving, cooperation, and communication skills. There are many ways to include experiential learning in the curriculum, work-based scenarios, field trips, simulations, internships, and industry collaborative projects (Riipen, n.d.). Kolb suggests that individuals learn in a cycle through four phases; they are concrete experience, reflective observation, abstract conceptualisation, and active experimentation (Kolb, 1984; Norwich University, n. d.). Kolb's learning cycle suggests that learning is an iterative process. The cycle starts with a hands-on experience, followed by reflection on that experience. These reflections are then assimilated and distilled into abstract concepts and finally lead to new experiences (Rusconi, 2024). Learners learn best when they actively engage in each step. His model promotes a dynamic, cyclical, and engaging approach to learning that aligns well with the demands of modern higher education.

### **University-industry collaboration in teaching and learning**

University-industry collaboration is increasingly perceived as a vehicle to promote learning, innovation, and practical impact (NTU, 2024; NUS, 2024; SUTD, 2024). An industry project is a university-industry partnership whereby students work in teams to solve real-world challenges. Students put their knowledge into practice and solve business problems relating to a specific, sizable industry project. They frame the project, review the relevant literatures, and prepare the proposal. Industry projects have mutual benefits to the companies and students involved as they help to create a learning community that develops future-ready graduates (Crawford et al., 2020; NUS, 2024). Students can sharpen critical thinking and communication skills through close team collaborations, consultations, and formal presentations. Therefore, many universities in Singapore and around the world have embedded industry projects as part of experiential learning courses into their curriculum (Lim, 2023; NUS, 2024; SUSS, n. d.). For example, in a sustainable and green capstone project at NUS Business School, students engage in experiential learning where they analyse and solve problems related to the sustainable and green finance projects provided by industry organisations (NUS, 2024).

### **UCD-industry partnership**

In a business strategy module delivered by UCD in Singapore, students can learn not only in classrooms but also in selected companies. There are challenges and problem-solving activities for them to complete. This may also involve mind-work and collaborative learning. An industry project offers students a setting that closely simulates post-graduation work environment. It is expected that the project stimulates their logical, interpersonal, and verbal intelligence throughout their cooperation and problem-solving process. Lastly, the project is a kind of concurrent and prospective learning as they would be learning together through the real case and the knowledge from classes.

With the fast-changing work environment, it is crucial for institutions to create a unique learning experience for students; make them interested in learning and help them to become career-ready. The offering of real-life examples rather than “dry” academic assignments seems to work. UCD Singapore campus has started to embrace teaching pedagogy that instills learning of twenty-first century competencies to prepare their students to be future-ready during and after the pandemic. Since then, we have worked with multiple company sponsors, to name a few, a leading event management company on transiting from physical to virtual meetings, small-medium sized enterprises in India on promoting the use of bamboo-based packaging, and an online food delivery platform provider on building a sustainable multi-sided marketplace.

## A real-life case study

In the following pages, we will look at one effort using an industry collaborative project at UCD Singapore Campus. UCD has offered degree programmes in Singapore for over 20 years in partnership with Kaplan Higher Education Academy. With approximately 3,000 students and three full-time UCD staff members dedicated to the Singapore campus, these programmes demonstrate UCD’s strong global engagement in higher education and the business environment (UCD Michael Smurfit Graduate Business, 2024). UCD offers various pathways in its undergraduate programmes. For example, Business Analytics, FinTech, Digital Business, and Management (UCD Michael Smurfit Graduate Business, 2024).

## Project requirements and objectives

In our Singapore campus, we started the first institutionalised industry-university partnership in a common core module, Corporate and Competitive Strategy, back in 2021. The industry project accounts for 40% of the final grade. The industry project offers final-year undergraduate students an opportunity to solve real-world challenges. Working in teams of three to five students, these senior undergraduate students learn to apply the theories, concepts, and frameworks that they have learnt to investigate a business challenge faced by an external party (a company). The case study featured in this paper was a project on building a sustainable multi-sided marketplace we partnered with foodpanda, one of the leaders in the online food delivery industry. Students played the role of junior consultants to understand the value propositions of online food delivery platforms and the interests of various stakeholders (particularly customers, riders, and restaurants), and finally presented their project findings to industry partners. Approximately 200 undergraduate students in the strategy class went through the project from inception to completion in less than two months.

The project aims to give students a holistic and integrative consulting experience that requires an extensive range of skills and knowledge as follows:

- Identify real-world needs and transform them into business strategies;
- Collect first-hand data to understand challenges and expectations faced by different stakeholders (see Appendix 1 for questions designed);
- Appraise the key findings of the project;
- Apply strategy concepts and frameworks and evaluate alternatives;
- Recommend solutions in a video and a poster presentation;
- Demonstrate creativity, teamwork, and problem-solving skills to resolve the challenges in the entire process (see illustrative quotes in Table 2).

Figure 1 illustrates the four components of Kolb’s model (1984) that relate to our UCD-industry project. Illustrative quotes of students’ reflections are shown in Table 1.

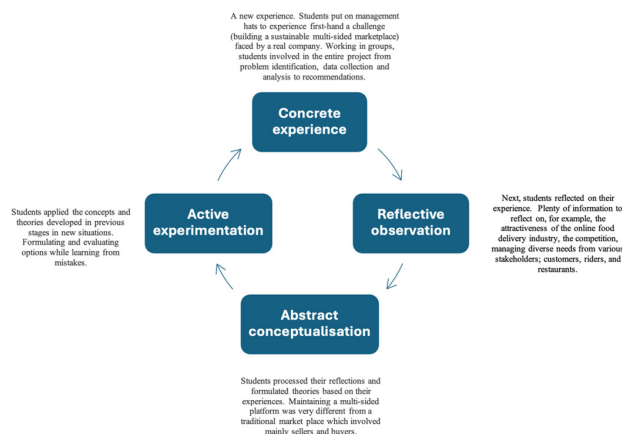


Figure 1: Kolb’s learning cycle in an industry project.

## Real benefits

In addition to Kolb’s experiential learning cycle, students also benefitted professionally and personally. See examples below:

Table 1: Illustrative quotes of students' reflections of an experiential learning experience.

Kolb's learning cycle	Illustrative quotes from students' reflections (reactions to the project)
<b>Concrete experience (Doing)</b>	<p>Student A: In this report, I was in-charge of the PESTLE analysis and 5 Forces analysis, presentation videos editing and the final person to consolidate the group essay. So, through this report or in fact this module, I have learned that what exactly a company will consider and make decisions form those strategies.</p> <p>Student B: Through this module.... I gained a comprehensive understanding of what is required to effectively manage business strategy and the challenges that managers must face and learned about some of the strategic managers' decisions.</p>
<b>Reflective observation (Observing)</b>	<p>Student C: Research online, read books, filter information from Korean newspapers about the food delivery industry, from which to draw information to introduce the industry and make a PESTEL table. Through the process of teamwork, I learned how to teamwork as well as better understand the Korean market in terms of online work and fast service.</p>
<b>Abstract conceptualisation (Thinking)</b>	<p>Student D: I thought of adopting a low-cost supplier strategy to solve the problem of high pricing in the catering industry currently served by foodpanda, minimising foodpanda's online food delivery costs, attracting consumers with the advantage of lower delivery costs, and expanding foodpanda at the same time. Expand the scope of business between foodpanda and restaurants, grocery stores, and office companies.</p> <p>Student E: I learned a lot of things from the study. It helps me to understand penetration strategies to secure a competitive market position.</p>
<b>Active experimentation (Planning)</b>	<p>Student B: Through this module, I was able to apply a range of techniques learned in class to analyse a company's internal and external environment to help develop strategy, implement it, and assess whether it is still appropriate in light of changes in the organisational environment. I can also present independent data analysis of current strategies of listed companies using course concepts and tools and provide recommendations for the organisation's future strategic direction based on this analysis.</p> <p>Student F: I am assigned to interview the customers and rides, drawing out the SGM [strategic group map], coming out with action recommendations for key issue 1. To come up with action recommendations, I challenged myself to think outside the box. This project has given me some valuable insight that will be useful in the future.</p>

Table 2: Illustrative quotes of students' reflections on skills development opportunities.

<p>Student G: The group has shown great teamwork during the whole assignment though we procrastinated a bit. But at the end the way, we made it through together and finished all of our work.</p> <p>Student F: In addition, I gained a fuller understanding of the importance of managing project time and accurate communication between team members during group work. I think these experiences will help me in my future work with multiple people.</p> <p>Student H: This assignment has been very fun and hard. But we did our best to finish it even if the deadline is quite cramped.</p> <p>Student I: In this group assignment, I learned 1) poster making, that is, learning PS and AI software for page typesetting and layout.</p>
--

Based on discussions with participating students after these projects, we see that this project has been a memorable experience for them. It is also expected that students' employability could be improved after the project. Students can master new skills, such as project management, media production, and editing.

For the schools or educators, this project shows that we can innovate in terms of course design and delivery in a way that is more effective than traditional methods. Also, university-industry projects enhance the image and reputation of the school (Lutchen, 2024). Since the first-hand experience is more profound, students can easily recall their own experiences. They can remember what they learned in the project and the module.

The personal experience of these students enabled the school to help students in career planning. The real-life experiences can help educators make suggestions more effectively so that the school can fully play the role of an intermediary or bridge, formulate appropriate plans and activities, share seminars, and meet student needs.

Industry collaborative projects let students take on actual projects from businesses. This provides a dual benefit in which businesses get fresh perspectives, and students gain hands-on experience. This is a win-win collaboration. As Lutchen (2024) remarks, "Businesses benefit from a pipeline of well-prepared personnel, while higher ed institutions gain enviable reputations for providing them" (p. 6). There are tangible benefits for industry partners. In particular, they can leverage on our Gen Z students who are very diverse in socio-cultural backgrounds to investigate their business challenges and explore fresh perspectives through out-of-the-box thinking. Our results suggest that industry projects are worth trying and that such engaging activities can facilitate learning and skills development. See industry partners' feedback on their perceptions of the university-industry partnership below:

Mr. Stephen Ho, Group Chief Operating Officer, SkyLab Holding, comments,

The teams have categorically done the initial analysis – be it from an industry standpoint, the interviews, the riders, the F&B operators, or even the customers. Then, through all this analysis, it is very important for them to come up concrete recommendations... apart from all the generic trends out there, specific recommendations that companies themselves can take away with. More importantly, it is to help them build a competitive advantage in the market (Kaplan Higher Education Academy, 2022a).

He also says, "It has been a very enjoyable process. Some of your [students'] ideas were very interesting, very refreshing and you would actually suggest things that I might not necessarily have thought of myself."

Ms. Arunika Prakash, Senior Analyst, Vendor performance and experience, foodpanda (APAC) remarks,

It is a very good concept because it emphasises on application-based learning. Students get to apply academic knowledge that they have to a real, ongoing business challenge. Hence, when they start to work, they understand very well what is needed to navigate through a business problem.... This project builds the skills and competencies that students would require in a real working world (Kaplan Higher Education Academy, 2022b).

Ms. Giet Koh, Regional head, Vendor performance and experience, foodpanda (APAC) compliments,

Many of the students' work and ideas are already work-in-progress that the company has been embarking on and even in across industry when we look at other food delivery competition companies apart from ours they are also embarking on such initiative. I see great potential in many of the ideas that the students have put forth (Kaplan Higher Education Academy, 2022b).

### Challenges of university-industry partnerships

A coin has two sides. This particular case also shows that industry projects are not easy to design or carry out. One key challenge, from our personal experience, is that experiential learning, for example, industry collaborative projects require effective and smooth collaboration with multiple stakeholders (i.e. industry partners) working together to create, refine, implement, and assess a project (Rybnicek & Königsgruber, 2019). In one project, it took us and the industry partners more than five meetings to agree on the final problem statement.

While there are many ways to include experiential learning in the curriculum, implementation is where many institutions hit a roadblock (Riipen, n. d.). This is often because it takes time to find organisations to work with. The external party often has to adjust to the university's time schedules and presentation formats, and vice versa.

As mentioned previously, the learning experience will not work without students' engagement. Getting students engaged from the beginning and having them take the initiative is always challenging (Garate, 2023). Hands-on experience may mean more work for students as it requires several learning stages, from concrete experience and observation to active experimentation. Therefore, we must also be able to select a context, a problem, or a concrete reality that is rich in stimuli to motivate students to participate and learn from it (Garate, 2023).

The workload of the professors also increases as they are the main contact points for the entire project. The role of educators in this approach would be like a resource provider and facilitator. In our case, in addition to in-class mentoring, we also offered two one-hour open drop-in sessions to students. On the other hand, they take care of the students and give guidance where appropriate, they also look for ways to stimulate them to think more deeply or seek better answers. This is perhaps one reason why some faculty often resist change. Deans and other academic officers may be reluctant to fix what they do not see as broken (Lutchen, 2024). There are other restraining factors, for example, professors' lack of coaching and mentoring skills and sometimes their ignorance about action learning (Sutton & Jorge, 2020).

### Conclusion

With the increasing demands of modern higher education, universities need to produce students who can adapt and deal with complex problems creatively. This calls for a more learner-centric and skills-centric pedagogy. At University College Dublin, we value innovation in teaching and unique learning experiences for students. We believe these can be achieved through the delivery of an experiential learning experience, in our case, an industry collaborative project. Experiential learning is learning through real-life experience. It gives students the ability to understand the implications of principles and theories learned in the classroom through lived experiences. Incorporating projects that mirror real-world experiences can offer additional depth to our curriculum, and at the same time, it can help develop students' employability skills, since our students are required to work on the entire project in a short period of time and in teams. The paper presents a live case study for such a learning experience. The case study demonstrates how educators can infuse Kolb's learning stages through industry collaborative projects. The paper also presents key challenges for their implementation.

### Acknowledgements

Our heartfelt thanks go to Edmund Cheung and Vy Nguyen, who helped us with this article. We are also grateful to the reviewers for their valuable comments and suggestions.

### References

- Business Times*. (2022). Foreign enrolment in Singapore private schools picks up as borders reopen. *The Business Times*. <https://www.businesstimes.com.sg/singapore/economy-policy/foreign-enrolment-singapore-private-schools-picks-borders-reopen>
- Canty, A. J., Chase, J., Hingston, M., Greenwood, M., Mainsbridge, C. P., & Skalicky, J. (2020). Addressing student attrition within higher education online programs through a collaborative community of practice. *Journal of Applied Learning and Teaching*, 3(1), 140-152. <https://doi.org/10.37074/jalt.2020.3.s1.3>
- Chamorro-Premuzic, T., & Frankiewicz, B. (2019) 6 reasons why higher education needs to be disrupted. *Harvard Business Review*, 97(3). <https://hbr.org/2019/11/6-reasons-why-higher-education-needs-to-be-disrupted>.
- Crawford, J., Baker, W., & Parsell, M. (2020). Learning from Tasmania: Designing a distinctive student learning experience. *Journal of Applied Learning and Teaching*, 3(S1), 7-11. <https://doi.org/10.37074/jalt.2020.3.s1.2>
- Freire, P. (1970). *Pedagogy of the oppressed*. Penguin Random House.
- Garate, M. (2023). Beyond the classroom: Why experiential learning is crucial in today's world. *Times Higher Education*. <https://www.timeshighereducation.com/campus/beyond->



- classroom-why-experiential-learning-crucial-todays-world
- Gioia, M. (2019). *Educare, educere, explorare*. <https://www.self-directed.org/tp/educare-educere-explorare/>
- Go, A. (2022). *Singapore private education sector need stronger sectoral network*. LinkedIn. <https://www.linkedin.com/pulse/singapore-private-education-sector-need-stronger-sectoral-alan-go/>
- Gono, S., & de Moraes, A. J. (2023). Student appraisals of collaborative team teaching: A quest for student engagement. *Journal of Applied Learning and Teaching*, 6(1), 222-233. <https://doi.org/10.37074/jalt.2023.6.1.26>
- Gupta, R., Lawrence, A., & Takabayashi, M. (2021). *The 21st-century curriculum and the future of skills-based education*. Coursera. <https://www.timeshighereducation.com/hub/coursera/p/21st-century-curriculum-and-future-skills-based-education>.
- Kang, M. (2020). *Covid-19 has surfaced these skill gaps: Now we need to fill them*. People Matters. <https://www.britishcouncil.sg/blog/covid-19-skill-gaps>
- Kaplan. (2023). *Our university partners: Academic partnerships that connect dreams to Degrees*. Kaplan Higher Education Academy. <https://www.kaplan.com.sg/why-kaplan-university-partners>
- Kaplan Higher Education Academy. (2022a). *Kaplan industry project with University College Dublin – Our project sponsor*. <https://www.facebook.com/watch/?v=5491099050980269>.
- Kaplan Higher Education Academy. (2022b). *Kaplan industry project with University College Dublin: Our expert panelists*. [https://www.google.com/search?q=Geat+foodpanda+Kaplan&rlz=1C5CHFA\\_enSG1114GB1115&oq=Geat+foodpanda+Kaplan&gs\\_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQIRigATIHCAIQIRigATIHCAQIRigAdIBCTEwODg5ajBqOagCALACAQ&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:-860d4f71,vid:FQcPG3jxzlw,st:0](https://www.google.com/search?q=Geat+foodpanda+Kaplan&rlz=1C5CHFA_enSG1114GB1115&oq=Geat+foodpanda+Kaplan&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQIRigATIHCAIQIRigATIHCAQIRigAdIBCTEwODg5ajBqOagCALACAQ&sourceid=chrome&ie=UTF-8#fpstate=ive&vld=cid:-860d4f71,vid:FQcPG3jxzlw,st:0)
- Kemp, N. (2020). University students' perceived effort and learning in face-to-face and online classes. *Journal of Applied Learning and Teaching*, 3(S1), 69-77. <https://doi.org/10.37074/jalt.2020.3.s1.14>
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development* (Vol. 1). Englewood Cliffs, NJ: Prentice-Hall.
- Kong, L. (2024). Time to rethink higher education in Singapore and set our own agenda. *The Straits Times*. <https://www.straitstimes.com/opinion/time-to-rethink-higher-education-in-singapore-and-set-our-own-agenda>.
- Kwan, J., (2022). Academic burnout, resilience level, and campus connectedness among undergraduate students during the Covid-19 pandemic: Evidence from Singapore. *Journal of Applied Learning and Teaching*, 5(S1), 52-63. <https://doi.org/10.37074/jalt.2022.5.s1.7>
- Kwek, D., Ho, J., & Wong, H. M. (2023). *Singapore's educational reforms toward holistic outcomes (un)intended consequences of policy layering*. Center for Universal Education at Brookings. [https://www.brookings.edu/wp-content/uploads/2023/03/Brief\\_Singapores-educational-reforms-toward-holistic-outcomes\\_FINAL.pdf](https://www.brookings.edu/wp-content/uploads/2023/03/Brief_Singapores-educational-reforms-toward-holistic-outcomes_FINAL.pdf).
- Lau, D. (2023). *Employers and HR experts say academic qualifications shouldn't be totally done away with, as survey shows changing attitudes*. <https://www.todayonline.com/singapore/skills-qualifications-degree-jobs-hiring-2173161>
- Lim, K. (2023). The big read in short: Are S'pore's universities nimble enough to stay relevant? *Today*. <https://www.todayonline.com/big-read/big-read-short-are-spores-universities-nimble-enough-stay-relevant-1844401>
- Lutchen, K. R. (2024). *A new model for university-industry partnerships*. Harvard Business Publishing. <https://hbsp.harvard.edu/inspiring-minds/a-new-model-for-university-industry-partnerships>.
- Nanyang Technological University (NTU). (2024). *Industry research collaborations*. <https://www.ntu.edu.sg/research/industry-research-collaborations>.
- National Center on Education and the Economy (NCEE). (2016) *Empowered educators: How high-performing systems shape teaching quality around the world. Country brief Singapore: A teaching model for the 21st century*. <https://ncee.org/wp-content/uploads/2017/02/SingaporeCountryBrief.pdf>.
- Ng, W. K. (2022). Definition of success in Singapore education system must change: Chan Chun Sing. *The Straits Times*. <https://www.straitstimes.com/singapore/parenting-education/definition-of-success-in-singapore-education-system-must-change-chan-chun-sing>.
- Norwich University. (n. d.) *The 4 components of the experiential learning cycle*. <https://online.norwich.edu/online/about/resource-library/4-components-experiential-learning-cycle>
- NUS. (2024). *BMG5302 Sustainable and green capstone project B*. <https://nusmods.com/courses/BMG5302/sustainable-and-green-capstone-project-b>
- Riipen. (n. d.). *From experience to expertise: Decoding Kolb's experiential learning theory*. <https://www.riipen.com/blog/experiential-learning-theory>
- Rusconi, G. (2024). *Learning Kolb's learning cycle by David Kolb explained*. <https://cloudassess.com/blog/kolb-learning-cycle/#:~:text=The%20cycle%20starts%20with%20a,tested%2C%20leading%20to%20new%20experiences>
- Rybniczek, R., & Königsgruber, R. (2019). *What makes industry-university collaboration succeed? A systematic review of the literature*. ResearchGate. from [https://www.researchgate.net/publication/327618582\\_What\\_makes\\_industry-university\\_collaboration\\_succeed\\_A\\_systematic\\_review\\_of\\_the\\_literature](https://www.researchgate.net/publication/327618582_What_makes_industry-university_collaboration_succeed_A_systematic_review_of_the_literature)

Salinas-Navarro, D. E., Da Silva-Ovando, A. C., & Palma-Mendoza, J. A. (2024). Experiential learning labs for the post-COVID-19 pandemic era. *Education Sciences*, 14(7), 707. <https://doi.org/10.3390/educsci14070707>.

Sam, C. Y. (2022). Post-COVID-19 and higher education. *Journal of Applied Learning and Teaching*, 5(1), 156-164. <https://doi.org/10.37074/jalt.2022.5.1.21>

Serdyukov, P. (2017, April 3). Innovation in education: What works, what doesn't, and what to do about it? *Journal of Research in Innovative Teaching & Learning*. <https://www.emerald.com/insight/content/doi/10.1108/JRIT-10-2016-0007/full/html#sec007>

Shelley, A., & Goodwin, D. (2018). Optimising learning outcomes through social co-creation of new knowledge in real-life client challenges. *Journal of Applied Learning and Teaching*, 1(2), 26-37. <https://doi.org/10.37074/jalt.2018.1.2.4>

SIT. (2023). *Skills-based careers: How competency-based education is changing the learning landscape*. <https://www.singaporetech.edu.sg/news/skills-based-careers-how-competency-based-changing-learning-landscape>

Spurling, T. (2017). *Singapore's public and private providers strive to stay on top*. *The PIE News*. <https://thepienews.com/analysis/singapore-education-international-students/>

Stafford, V., (2020). EdTech review: Teaching through Zoom – what we've learned as new online educators. *Journal of Applied Learning and Teaching*, 3(2), 150-153. <https://doi.org/10.37074/jalt.2020.3.2.14>

SUSS. (n. d.) *Industry project in event management (EMT388)*. <https://www.suss.edu.sg/courses/detail/emt388>

SUTD. (2024). *Capstone: A university-industry partnership*. <https://www.sutd.edu.sg/Student-Development/Capstone-Programme/For-Industry-Partners>.

Sutton, M. J. D., & Jorge, C. F. B. (2020). Potential for radical change in higher education learning spaces after the pandemic. *Journal of Applied Learning and Teaching*, 3(1), 124-128. <https://doi.org/10.37074/jalt.2020.3.1.20>

Tan, S., Rudolph, J., Crawford, J., & Butler-Henderson, K. (2022). Emergency remote teaching or andragogical innovation? Higher education in Singapore during the COVID-19 pandemic. *Journal of Applied Learning and Teaching*, 5(S1), 64-80. <https://doi.org/10.37074/jalt.2022.5.s1.8>

Teng, A. (2024). Focus on 5 key areas to keep education system relevant in uncertain world: Chan Chun Sing. *The Straits Times*. [https://www.straitstimes.com/singapore/parenting-education/focus-on-5-key-areas-to-keep-](https://www.straitstimes.com/singapore/parenting-education/focus-on-5-key-areas-to-keep-education-system-relevant-in-uncertain-world-chan-chun-sing)

education-system-relevant-in-uncertain-world-chan-chun-sing.

Thian, S. Y. (2024). *Singapore employers need to hire on skills, beyond degrees, to address the talent gap – HR panel*. <https://govinsider.asia/intl-en/article/singapore-employers-need-to-hire-on-skills-beyond-degrees-to-address-the-talent-gap-hr-panel>.

UCD Michael Smurfit Graduate Business School. (2024). *Singapore campus*. <https://www.smurfitschool.ie/aboutus/globalcampus/singapore/>

Volansky, K. J. (2020). What are best practices to teach "hands-on" skills in a blended environment? *Journal of Applied Learning and Teaching*, 3(1), 80-89. <https://doi.org/10.37074/jalt.2020.3.1.6>.

World Economic Forum. (2019). *The 4 biggest challenges to our higher education model – and what to do about them*. <https://www.weforum.org/agenda/2019/12/fourth-industrial-revolution-higher-education-challenges/>

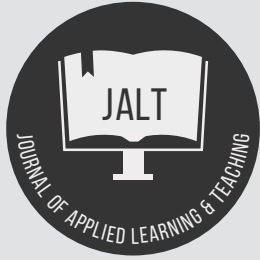
Yeo, N. (2024). Private university degrees 'less prestigious' but provide faster route to working world, say graduates. *Today*. from <https://www.todayonline.com/features/private-university-degrees-less-prestigious-provide-faster-route-working-world-say-graduates-2415311>

## Appendix

### Appendix 1: Illustrative examples of interview questions designed by students.

Customers	Riders	Vendors
How often do you use online food delivery?	Why do you choose to work together with the online food delivery platforms?	Have you partnered with any online food delivery platforms? Why?
How was the food quality?	From 1 to 10, how would you rate these platforms based on your experience with the two platforms (Gojek and Grab)?	Please rate your experience with the one you've worked with the longest.
Was the delivery time fast enough?	Can you describe one or two of your latest experience in details specifically?	Previously you mentioned that your restaurant is working with Grab, foodpanda and Deliveroo. Among these 3 online delivery platforms, is there any platform that you prefer over other and maybe you can share with us why?
The type of meal you typically order from delivery apps?	What do you think can be further improved or fixed by Gojek or other online food delivery platforms?	Name at least one improvement you want to see.
Which platforms have you used? Please rate your experience with the most recent food delivery service. From 1-10, 1 is very poor, 10 is excellent.		
Please tell us how your overall experience was, describe one or two recent order experiences with specific details.		
Name at least one improvement you want to see.		

Copyright: © 2025. Cubie L. L. Lau and Shawn Wong. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## A protocol for a scoping review on understandings of inclusion in Higher Education Institutions in the Republic of Ireland

---

Sadhbh O'Dwyer <sup>A</sup>	A	<i>School of English, Irish, and Communication, University of Limerick, Ireland</i>
Thomas J. O'Shaughnessy <sup>B</sup>	B	<i>Student Affairs Division, University of Limerick, Ireland</i>
Darina M. Slattery <sup>C</sup>	C	<i>School of English, Irish, and Communication, University of Limerick, Ireland</i>

---

### Keywords

Higher Education;  
inclusion;  
Ireland;  
scoping review;  
protocol.

---

### Correspondence

sadhbh.odwyer@ul.ie <sup>A</sup>

---

### Article Info

Received 20 October 2024  
Received in revised form 20 December 2024  
Accepted 21 February 2025  
Available online 28 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.27>

### Abstract

**Background:** This paper describes the protocol for a scoping review to map understandings of inclusion in Higher Education Institutions (HEIs) in the Republic of Ireland. To-date, there have been no scoping reviews published of the most current literature on inclusion in Irish HEIs.

**Method:** Scoping reviews can inform decision-making and research as they involve rigorous identification and analysis of literature on a chosen subject. This search protocol will use the Arksey and O'Malley (2005) scoping review model to investigate empirical research and other relevant research, including grey literature, on inclusive practice in Irish HEIs from the years 1996 to 2023. The PRISMA extension for scoping reviews (PRISMA-ScR) will steer the scoping review itself. The following databases will be searched: ERIC, Scopus, Web of Science (Social Sciences Citation Index), and ASSIA; Google Scholar will be the final search tool. Thematic analysis will be used for appraisal and analysis of the data to assess inclusion in Irish HEIs.

**Results:** This review is part of a wider study into inclusive practice in Irish Higher Education. It is envisaged that the scoping review that will follow this protocol will be published by Autumn 2025.

**Conclusion:** This paper outlines the methodology for a comprehensive investigation into current understandings of inclusion in Irish HEIs. By systematically searching and analyzing relevant literature from 1996 to 2023, this review will identify key themes, gaps, and emerging trends in the field. The findings will help inform future research, policy development, and institutional strategies to enhance inclusion in Irish universities.

## Introduction

The aim of this paper is to present a protocol for a scoping review on inclusion in Irish Higher Education Institutions (HEIs). This research study is motivated by a desire to investigate practices in inclusion in Irish HEIs so that they may be fully inclusive of all the people who attend them. This research meets with four of the UN's Sustainable Development Goals (SDGs): Quality Education (SDG 4), Gender Equality (SDG 5), Decent Work and Economic Growth (SDG 8) and Reduced Inequalities (SDG 10).

The Republic of Ireland has a population of just over 5 million, with 20 universities and a host of other Higher Education Institutions (HEIs), some of which are private and independent (Higher Education Authority, 2023). The majority of HEIs in the Republic of Ireland are state-funded – 25 institutions in total receive public funding (Higher Education Authority, 2023). Notably, the Irish context is a mix of established “traditional” universities and more recent “technological” universities. This binary divide is a product of the 1960s where the Irish government of the time, following the introduction of free secondary education in 1967, set up regional technical colleges focusing on engineering and science (Borooah & Knox, 2023). These technical colleges became technological universities in 2019. This expansion of HEIs has been mirrored by a growth in higher educational attainment in the population. Over half of 25–62 year olds in Ireland have a university degree, and Ireland is well above the EU-27 average in third-level attainment (Central Statistics Office, 2023a).

Tuition fees were removed from Higher Education in 1996 in a move to encourage greater access to tertiary education at a time of economic growth in Ireland. This change in tuition fees saw more women than before accessing HEIs (McCoy & Smyth, 2011). By 2004, over 55% of young people in Ireland attended a HEI compared to 20% in 1980 (O'Connell et al., 2006). These high rates of university attainment have been helped by the promotion of Equality, Diversity, and Inclusion (EDI) and access initiatives in Ireland such as the Disability Access Route to Education (DARE), the Higher Education Access Route (HEAR), and the Programme for Access to Higher Education (PATH). There has been an increase in the number of disabled students entering HEIs in Ireland since the inception of the DARE programme in 2009, with the HEAR and PATH programmes also drawing in students who may have been under-represented in Higher Education previously, such as those from families with lower socio-economic income (Keane et al., 2023). Table 1 shows the increase of learners accessing HEIs through the DARE programme and the drop in the numbers of learners entering HE through the HEAR programme, between 2018 and 2022. DARE applications have continued to grow, representing

Table 1. Enrolment details of the DARE and HEAR programmes.

Year	DARE Applications	HEAR Applications
2018	9% of entrants	12% of entrants
2022	11% of entrants	10% of entrants

a growing number of disabled learners accessing Higher Education. However, it is concerning that there is a drop in numbers of learners from socio-economically disadvantaged students and shows that more needs to be done to ensure the HEAR programme better serves the needs of students from less affluent backgrounds (Atif, 2024).

Another change in Irish society has been Ireland's shift as a country of net immigration to net migration (Central Statistics Office, 2023b). There has, therefore, been increasing diversity in the student populations of Irish HEIs, which has led universities to focus on issues of inclusion in their institutions (Arellanes & Hendricks, 2022; Department of Further and Higher Education, Research, Innovation and Science, 2022). With more people attending university from more varied backgrounds, HEIs need to facilitate everyone who wishes to pursue a university degree. The aim of this paper is to present a protocol for a scoping review on inclusion in Irish HEIs. This research study is motivated by a desire to investigate practices in inclusion in our HEIs so that they may be fully inclusive of all the people who attend them.

The Salamanca Protocol caused a worldwide shift in governmental attitudes towards inclusion in education (Spain, 1994). The Ireland of the 1980s and 1990s, however, trailed behind other countries in terms of inclusive education. It was only in 2004, with the Education of Persons with Special Educational Needs (EPSEN) Act, that inclusive practice became a reality in the Irish educational sector (Zhao et al., 2021). However, 20 years on from the EPSEN Act, parts of the Act still remain to be implemented (Mulholland & O'Connor, 2016); another example of dissonance between words and actions is demonstrated by the fact that even though Ireland signed the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in 2007, it took until 2018 before the UNCRPD was ratified (Department of Children, Equality, Disability, Integration and Youth, 2021). In the Higher Education context, the Irish Human Rights Equality Commission Act came into law in 2014, which requires public bodies—including universities—to integrate a human rights and equality assessment into strategic planning processes and outcomes. The National Access Plan 2022–2026 requires that

the higher education student body, at all levels and across all programmes, reflects the diversity and social mix of Ireland's population, and that our higher education institutions are inclusive, universally designed environments which support student success and outcomes, equity and diversity (Higher Education Authority, 2023, p. 51).

In Universal Design for Learning (UDL), teaching and assessment are designed with multiple means of representation (the “what” of learning), expression (the “how” of learning), and engagement (the “why” of learning) (Burgstahler, 2020; O'Shaughnessy, 2021). This is supported by the roll out of the UDL badge initiative and the development of A National Charter for UDL in Irish HE to support UDL as a “vehicle for greater coherence and collaboration on access and inclusion, both within and across institutions” (AHEAD Educational Press, 2024, p. 2).

Therefore, the concepts of inclusion, universal design, equity, and diversity are now considered essential practices for Irish HEIs and as such, these concepts will therefore guide this research protocol. Figure 1 traces the trajectory of inclusive practice policy impacts on Irish Higher Education.

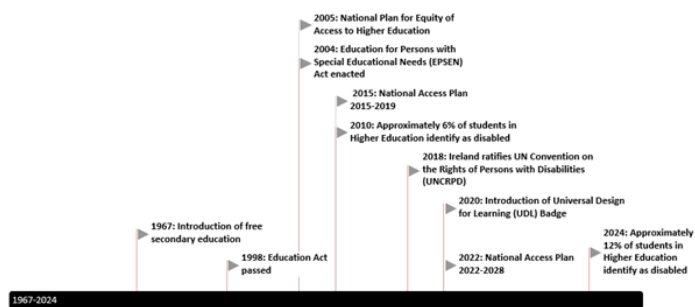


Figure 1. Trajectory of inclusive practice policy impacts in Irish higher education.

### Contested understandings of inclusion, belonging, and EDI

The challenge with researching inclusion is that there is no consensus on what inclusion means in education (Finkelstein et al., 2021; Forlin et al., 2013). According to UNESCO (2017), inclusive education is a way to identify and remove all barriers to education, including barriers to inclusive teaching, pedagogy, and curricula. This sense of “barriers” echoes the seminal work of Ainscow (2005), for whom inclusion is a set of actions to overcome barriers to student participation and learning. When discussing how to dismantle these barriers, different theorists propose different approaches. For example, Florian and Black-Hawkins (2011) advise that one needs to look to inclusive pedagogy to understand the reasoning behind teaching practices and for teachers to reflect on their practice.

For Moriña et al. (2020), the focus should not just be on inclusive practice (the teaching techniques that support the learning and engagement of all students), but on an inclusive pedagogy that comprises the beliefs, knowledge, design and actions that guide teaching and learning in higher education. Of interest in the Irish context is Moriña’s emphasis on design. As mentioned in the National Access Plan, UDL is considered an inclusive co-design process. UDL has been championed in Irish HEIs with initiatives such as the UDL Digital Badge delivered by AHEAD, an independent not-for-profit organisation that promotes inclusive environments in Irish HEIs and the workplace (AHEAD, 2024). However, the concern remains that the term “inclusion can be used as a panacea, a word that might register the presence of difference while keeping its participation delayed” (Dolmage, 2017, p. 84).

Other theorists have raised similar concerns about the term inclusion, arguing instead for the concept of belonging as a less contested concept (Slee, 2010; Strnadová & Nind, 2020). Belonging has less negative policy connotations (Hall, 2013). Slee (2019, p. 917) argues that belonging is central to achieving inclusion as “at the heart of inclusion [...] lies the principle and practices of belonging”. Belonging is about “feeling at home” (Yuval-Davis, 2006, p. 197) in a

“space of familiarity, comfort and security” (Antonsich, 2010, p. 645). Belonging is “tied to the quality of interaction and acceptance by others” (Renwick et al., 2019, p. 9). Given that no definition of inclusion has been universally accepted (Florian, 2014), developing an understanding of inclusion as encompassing belonging is a positive step towards developing an understanding of inclusion.

A further contested area is that of Equality, Diversity and Inclusion (EDI) initiatives. Ahmed has long argued that EDI initiatives in academia can often be performative rather than genuinely tackling issues of disenfranchisement, racism and injustice (Ahmed, 2012, 2017). “One-offs”, the term that is often applied to one-off training in EDI, can be another example of performative inclusion initiatives in the university space as “by itself, a one-off EDI workshop is never going to effect change” (Leung, 2022, p. 759). In addition, a wide variety of different terms are used in academia to describe EDI initiatives including:

“equity, diversity and inclusion”, “equality, diversity and inclusion”, “diversity, equity and inclusion”, “belonging, dignity, and justice”, “diversity, equity, inclusion and belonging”, “diversity, dignity, and inclusion”, “equity, diversity, inclusion, and accessibility”, “justice, equity, diversity, and inclusion”, “inclusion, diversity, equity and accessibility”, “inclusion, diversity, equity and accountability”, and “equity, diversity, inclusion, and decolonization (Wolbring & Nguyen, 2023, p. 168).

It is apparent that there is a lack of clarity around the meanings of the different concepts that play a key role in driving inclusion in HE in Ireland. As a result, such concepts are worthy of investigation.

### Methods

A scoping review aims to identify and better understand the state of research on a given topic (Grant & Booth, 2009). This research design is for a scoping review rather than a systematic literature review. As no scoping review has been carried out on the various understandings of inclusion in the Irish HEI context, the proposed research will address this gap in the knowledge base. A scoping review is beneficial to explore the breath of research on a topic; to identify gaps in the research literature on a topic; and to summarise and disseminate findings from the literature (Grant & Booth, 2009). This protocol paper is guided by the scoping review methodology proposed by Arksey and O’Malley (2005). The scoping review itself will be presented in line with the PRISMA extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018).

Arksey and O’Malley (2005) recommend that scoping reviews use the following steps:

1. Identify the research question and write the protocol
2. Identify relevant studies
3. Study the selection

4. Chart the data (quality appraisal)
5. Collate, summarise and report the results

Arksey and O'Malley (2005) do not include qualitative appraisal of the studies in a scoping review. However, for some commentators, this is considered a lack in their research methodology (Levac et al., 2010). Our project is focused on understandings of inclusion; therefore, we feel that qualitative thematic analysis would be a better fit for the research rather than the quantitative analysis that is typically found in scoping reviews. Therefore, for Step 5, we will apply thematic analysis as utilised by Braun and Clarke (2013) to the results to determine the relevance of the data (returned papers) to advancing understandings of inclusion in Irish HEIs. This form of thematic analysis enables rich and detailed accounts of data interpretation (Braun & Clarke, 2013).

### Review objectives

A scoping review identifies the breadth of knowledge on a research area rather than the depth of research itself (Prihodova et al., 2015). The primary objective of this paper is to create a protocol for a scoping review on inclusion in Irish HEIs. The research question is driven by the Irish Higher Education Authority National Access Plan, which emphasises inclusion, universal design, equity and diversity (National Action Plan A Strategic Action Plan for Equity of Access, Participation and Success in Higher Education 2022-2028, 2022). While legislation is now in place for inclusive environments in Irish HEIs, a scoping review has yet to be published on inclusion practices in Irish HEIs. Therefore, this paper will address the following research question: *What are the current understandings of inclusion as it impacts students in Irish HEIs?*

### Inclusion/Exclusion criteria

There are a wide range of the search terms when it comes to inclusion, as shown in the Power to Fly glossary (2024); as a result, a broad range of papers will likely be returned. Therefore, it is crucial that we have strong inclusion/exclusion criteria. Included studies must satisfy the following criteria:

1. Peer-reviewed studies that describe issue of inclusion encompassing EDI, UDL, belonging and diversity in HEIs in the Republic of Ireland. The concept of belonging is growing in use in Ireland and so will be a key search term alongside inclusion.
2. As tuition fees were removed from HEIs in the Republic of Ireland in 1996, we include studies from 1996 to 2023 as this period marked a change in access to Higher Education in Ireland.
3. Relevant grey literature, such as Masters and Doctoral theses on inclusion in Ireland.

4. Studies written in English. While relying on English-language papers may present a language bias, it is considered that this impact will have minimal effect considering that Ireland is an English-speaking country and studies on Irish HEIs are more likely to be written in English.

5. Research methodologies that can be qualitative, quantitative, mixed methods, literature reviews and meta-analyses.

Excluded studies will include:

1. Studies that focus on issues of inclusion, EDI, UDL, belonging and diversity in HEIs in Northern Ireland, the UK, and elsewhere.
2. Studies that focus on staff rather than students; for example, studies on the gender pay divide and Athena Swan initiatives.
3. Personal correspondence, emails, reviews, and letters.
4. Studies that focus on workplace transitions and work placements. These typically include studies on clinical placements such as the experiences of nurses with dyslexia on hospital placements.

### Search strategies

Studies will be identified using thematic combinations derived from the National Access Plan. These themes include (1) Ireland (2) inclusion (3) belonging (4) EDI (5) UDL (6) diversity (7) higher education. Furthermore, within each thematic combination, search terms will be separated by the Boolean operators AND or OR. An asterisk will be attached to the stem of the word "inclusion" as the "inclus" wildcard will enable more comprehensive searches of terms like inclusion/inclusive. As noted earlier, there is a lack of consensus on what inclusion means and there are different terms used to describe EDI initiatives. Terms like Justice, Equity, Diversity and Inclusion (JEDI) are common in US HEIs but are not so common in Ireland (Wolbring & Nguyen, 2023). The research team are highly aware of such differences within the literature and therefore the decision was made that the search terms "EDI" and "diversity" will be used as these terms are commonly used in Irish HEIs.

A selection of combinations of Boolean phrases are outlined in Table 2. These studies will be identified by searching for literature on inclusion in Google Scholar and the following databases: ERIC, Scopus, Web of Science (Social Sciences Citation Index), and ASSIA. These studies will be identified by titles, abstracts and keywords.

In addition to the Boolean phrases, reference lists from papers identified in the searches will be examined to ensure that all relevant literature will be captured to evaluate inclusion and inclusive practices in Irish HEIs.

Table 2. Example of search terms used.

1. "Ireland" AND "inclusion" OR "belonging" AND "higher education" OR "university"
2. "Ireland" AND "inclusion" OR "belonging" AND "EDI" AND "higher education" OR "university"
3. "Ireland" AND "inclusion" OR "belonging" AND "UDL" AND "higher education" OR "university"
4. "Ireland" AND "UDL" OR "EDI" AND "higher education" OR "university"
5. "Ireland" AND "diversity" AND "higher education" OR "university"

### Study selection and quality appraisal

The initial search will be carried out by the researcher assigned to this project, who will use Zotero and Covidence software to prepare studies for screening and remove duplicates. Covidence is a cloud-based systematic literature review management platform which is GDPR-compliant. Using Covidence, it is possible to collect, store, screen and synthesise the data. All research titles, abstracts, and key words will be assessed to ensure relevance to the research project. The inclusion/exclusion criteria outlined above will support the study selection process. Papers that are not centred on inclusion in Irish HEIs will be removed from the process. Once a title or abstract has been identified, the full text will be read to ensure that they are within the remit of this study. Furthermore, the reference lists of the texts will be hand-searched for additional studies and sources. This may include grey literature. For balance and transparency, two reviewers are available for consultation. All steps of the study selection process (identification, screening, eligibility, and inclusion) will be outlined in a PRISMA flow diagram (Tricco et al., 2018).

### Analysis

Thematic analysis, a technique for finding, analysing and interpreting meaning patterns, will be used to analyse the selected studies (Braun & Clarke, 2013). Research questions for scoping reviews are typically quite wide in scope as the aim is to draw on a diverse range of sources and methodologies (Peters et al., 2020). The analysis will assess the following themes:

1. The different understandings of inclusion and belonging in Irish HEIs particularly in terms of teaching, learning and assessment practices.
2. What views do staff and students in Irish HEIs have of diversity in terms of teaching, learning and assessment practices?
3. How UDL is understood and operationalised in Irish HEIs.
4. How EDI is understood and operationalised in Irish HEIs.

### Results

The results of this scoping review will be presented using the PRISMA extension for scoping reviews PRISMA-ScR (Tricco et al., 2018). All the stages of the scoping process will

be presented in the recommended PRISMA flow diagram. Arskey and O'Malley (2005) recommend the use of a data charting table which will be refined iteratively by the researchers during the full-text screening process. The data charting table will fit with the research aims and research questions of this project (Peters et al., 2020). The data collected in this scoping review will include the following:

- Author/year
- Location
- Type of source
- Study aims
- Research questions
- Study design
- Participant details
- Sample size if applicable
- Key findings
- Recommendations

The results of the scoping review will include a narrative summary which will detail how the results link with the objectives of the review. While Ireland has made significant strides in recent years to promote inclusive education in HEIs, challenges persist in terms of barriers to inclusion, effectiveness of inclusion initiatives, and implications for policy and planning. Any limitations or gaps in the literature will also be identified.

Figure 2 details the process for selecting studies following the PRISMA flowchart (Tricco et al., 2018). The results of the scoping review will be presented in a future paper.

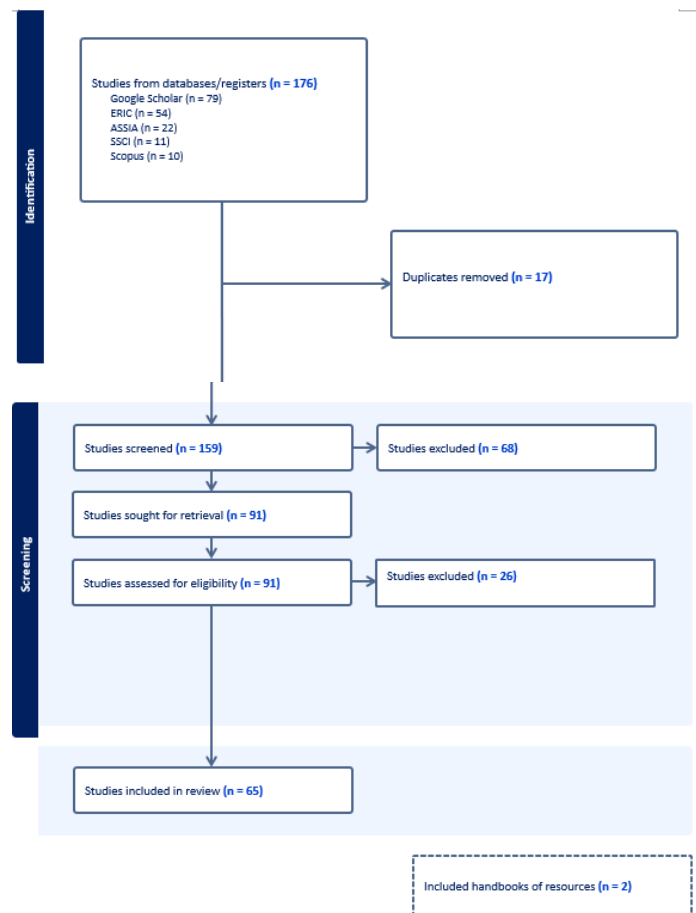


Figure 2. Prisma flowchart of the studies selected for the scoping review.

## Proposed timeline and researcher involvement

This scoping review will be completed within six months. The start time is October 2024 and the finish time is April 2025.

## Ethics and dissemination

Ethics approval for this research project was granted from the Faculty of Arts Humanities and Social Sciences in the University of Limerick on 1 December 2023.

## Funding

This research is funded by the Higher Education Authority (HEA) of Ireland as part of the Programme for Access to Higher Education (PATH) 4 funding stream. This is a dedicated fund to support increased participation in Higher Education of under-represented groups and to support inclusive higher education environments.

## References

AHEAD. (2024). *AHEAD UDL*. <https://www.ahead.ie/udl>

AHEAD Educational Press. (2024). *ALTITUDE Project*. ALTITUDE - The National Charter for Universal Design in Tertiary Education. AHEAD Educational Press.

Ahmed, S. (2012). *On being included: Racism and diversity in institutional life*. Duke University Press.

Ahmed, S. (2017). *Living a feminist life*. Duke University Press.  
Ainscow, M. (2005). Developing inclusive education systems: What are the levers for change? *Journal of Educational Change*, 6(2), 109–124. <https://doi.org/10.1007/s10833-005-1298-4>

Antonsich, M. (2010). Searching for belonging – An analytical framework. *Geography Compass*, 4(6), 644–659. <https://doi.org/10.1111/j.1749-8198.2009.00317.x>

Arellanes, J. A., & Hendricks, M. (2022). Teaching ethnic-specific coursework: Practical suggestions for promoting diversity, equity, and inclusion within the classroom. *Teaching of Psychology*, 49(4), 369–375. <https://doi.org/10.1177/00986283211013050>

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32. <https://doi.org/10.1080/1364557032000119616>

Atif, A. (2024). *DARE HEAR by numbers 2018 – 2022 research report*. Irish Universities Association. <https://www.iaa.ie/publications/dare-hear-facts-and-figures-2018-2022-executive-summary/>

Borooah, V., & Knox, C. (2023). Inequalities in undergraduate participation and performance in Irish higher education. *Higher Education Quarterly*, hequ.12476. <https://doi.org/10.1111/hequ.12476>

[org/10.1111/hequ.12476](https://doi.org/10.1111/hequ.12476)

Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. SAGE.

Burgstahler, S. (2020). *Creating inclusive learning opportunities in higher education: A universal design toolkit*. Harvard Education Press.

Central Statistics Office. (2023a). *Population and labour force projections 2017–2051*.

Central Statistics Office, C. (2023b). *Educational attainment thematic report 2023*. Central Statistics Office. <https://www.cso.ie/en/releasesandpublications/ep/p-eda/educationalattainmentthematicreport2023/>

Department of Children, Equality, Disability, Integration and Youth. (2021). *Ireland's first report to the United Nations Committee on the rights of persons with disabilities*. <https://www.gov.ie/en/publication/75e45-irelands-first-report-to-the-united-nations-committee-on-the-rights-of-persons-with-disabilities/#>

Department of Further and Higher Education, Research, Innovation and Science. (2022). *2022 Annual report department of further and higher education*. Research, Innovation and Science.

Dolmage, J. T. (2017). *Academic ableism: Disability and higher education*. University of Michigan Press. <https://doi.org/10.3998/mpub.9708722>

Finkelstein, S., Sharma, U., & Furlonger, B. (2021). The inclusive practices of classroom teachers: A scoping review and thematic analysis. *International Journal of Inclusive Education*, 25(6), 735–762. <https://doi.org/10.1080/13603116.2019.1572232>

Florian, L. (2014). *The SAGE handbook of special education*. <http://www.credoreference.com/book/sageukhsped>

Florian, L., & Black-Hawkins, K. (2011). Exploring inclusive pedagogy. *British Educational Research Journal*, 37(5), 813–828. <https://doi.org/10.1080/01411926.2010.501096>

Forlin, C. I., Chambers, D. J., Loreman, T., Deppler, J., & Sharma, U. (2013). *Inclusive education for students with disability: A review of the best evidence in relation to theory and practice*.

Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal*, 26(2), 91–108. <https://doi.org/10.1111/j.1471-1842.2009.00848.x>

Hall, E. (2013). Making and gifting belonging: Creative arts and people with learning disabilities. *Environment and Planning A: Economy and Space*, 45(2), 244–262. <https://doi.org/10.1068/a44629>

Higher Education Authority, H. (2023). *Higher education institutions*. Dublin, Ireland. <https://www.gov.ie/en/>



publication/5088c-list-of-publicly-funded-higher-education-institutions/

Keane, E., Heinz, M., & Lynch, A. (2023). Factors impacting on the retention of students from under-represented groups in initial teacher education in Ireland. *Tertiary Education and Management*, 29(1), 5–23. <https://doi.org/10.1007/s11233-022-09108-5>

Leung, S. (2022). The futility of information literacy & EDI: Toward what? *College & Research Libraries*, 83(5). <https://doi.org/10.5860/crl.83.5.751>

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. *Implementation Science*, 5(1), 69. <https://doi.org/10.1186/1748-5908-5-69>

McCoy, S., & Smyth, E. (2011). Higher education expansion and differentiation in the Republic of Ireland. *Higher Education*, 61(3), 243–260. <https://doi.org/10.1007/s10734-010-9375-x>

Moriña, A., Sandoval, M., & Carnerero, F. (2020). Higher education inclusivity: When the disability enriches the university. *Higher Education Research & Development*, 39(6), 1202–1216. <https://doi.org/10.1080/07294360.2020.1712676>

Mulholland, M., & O'Connor, U. (2016). Collaborative classroom practice for inclusion: Perspectives of classroom teachers and learning support/resource teachers. *International Journal of Inclusive Education*, 20(10), 1070–1083. <https://doi.org/10.1080/13603116.2016.1145266>

*National Action plan a strategic action plan for equity of access, participation and success in higher education 2022-2028, Government of Ireland.* (2022). <https://hea.ie/policy/access-policy/national-access-plan-2022-2028/#:~:text=The%20National%20Access%20Plan%20continues,on%20participation%20and%20student%20success.>

O'Connell, P. J., McCoy, S., & Clancy, D. (2006). Who went to college? Socio-economic inequality in entry to higher education in the Republic of Ireland in 2004. *Higher Education Quarterly*, 60(4), 312–332. <https://doi.org/10.1111/j.1468-2273.2006.00326.x>

O'Shaughnessy, T. J. (2021). Universal design for learning and accessibility: A practitioner approach. In F. Fovet (Ed.), *Advances in educational technologies and instructional design* (pp. 25–47). IGI Global. <https://doi.org/10.4018/978-1-7998-7106-4.ch002>

Peters, M. D. J., Marnie, C., Tricco, A. C., Pollock, D., Munn, Z., Alexander, L., Mclnerney, P., Godfrey, C. M., & Khalil, H. (2020). Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis*, 18(10), 2119–2126. <https://doi.org/10.11124/JBIES-20-00167>

Power to Fly. (2024). *Diversity and inclusion acronyms: A 2024 glossary*. Power to Fly. <https://powertofly.com/up/diversity-and-inclusion-acronyms>

Prihodova, L., Guerin, S., & Kernohan, W. G. (2015). Knowledge transfer and exchange frameworks in health and their applicability to palliative care: Scoping review protocol. *Journal of Advanced Nursing*, 71(7), 1717–1725. <https://doi.org/10.1111/jan.12642>

Renwick, R., DuBois, D., Cowen, J., Cameron, D., Fudge Schormans, A., & Rose, N. (2019). Voices of youths on engagement in community life: A theoretical framework of belonging. *Disability & Society*, 34(6), 945–971. <https://doi.org/10.1080/09687599.2019.1583551>

Slee, R. (2010). Revisiting the politics of special educational needs and disability studies in education with Len Barton. *British Journal of Sociology of Education*, 31(5), 561–573. <https://doi.org/10.1080/01425692.2010.500089>

Slee, R. (2019). Belonging in an age of exclusion. *International Journal of Inclusive Education*, 23(9), 909–922. <https://doi.org/10.1080/13603116.2019.1602366>

Spain, M. de E. y C. (1994). *The Salamanca statement and framework for action on special needs education*. UNESCO. <https://unesdoc.unesco.org/ark:/48223/pf0000098427>

Strnadová, I., & Nind, M. (2020). *Belonging for people with profound intellectual and multiple disabilities*. Routledge.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., ... Straus, S. E. (2018). PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169(7), 467–473. <https://doi.org/10.7326/M18-0850>

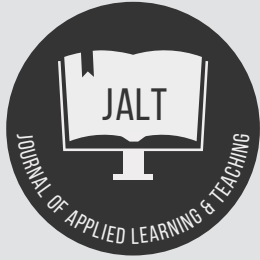
UNESCO. (2017). *A Guide for ensuring inclusion and equity in education*. UNESCO. <https://doi.org/10.54675/MHHZ2237>

Wolbring, G., & Nguyen, A. (2023). Equity/equality, diversity and inclusion, and other EDI phrases and EDI policy frameworks: A scoping review. *Trends in Higher Education*, 2(1), 168–237. <https://doi.org/10.3390/higheredu2010011>

Yuval-Davis, N. (2006). Belonging and the politics of belonging. *Patterns of Prejudice*, 40(3), 197–214. <https://doi.org/10.1080/00313220600769331>

Zhao, Y., Rose, R., & Shevlin, M. (2021). Paraprofessional support in Irish schools: From special needs assistants to inclusion support assistants. *European Journal of Special Needs Education*, 36(2), 183–197. <https://doi.org/10.1080/08856257.2021.1901371>

Copyright: © 2025. Sadhbh O'Dwyer, Thomas J. O'Shaughnessy and Darina M. Slattery. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Leading a transnational university campus: An interview with James Trotter about academic leadership and working in multicultural higher education environments

---

Faiza Qureshi<sup>A</sup> *A* *Murdoch University, Dubai campus*

James Trotter<sup>B</sup> *B* *Murdoch University, Dubai campus*

---

### Keywords

---

Academic leadership;  
artificial intelligence;  
Dubai;  
higher education;  
multicultural;  
transnational education;  
transnational university campus.

### Abstract

---

In Transnational Higher Education, which encompasses teaching and learning across national borders, the necessary qualities, skills, and knowledge for educational leaders have transformed to meet changing international contexts (Morris et al., 2024). This interview considers some of these aspects from the perspective and experiences of a very experienced academic leader in higher education. James Trotter, featured in this interview, discusses his experiences from a successful career spanning over thirty years in higher education from which he retired in September 2024, and which included in the last decade an academic leadership role of spearheading an offshore transnational university campus. Dr. Trotter provides advice from a journey which started off as a teaching role to becoming a leader in academia. The interview also highlights the increasing importance of the transnational education sector in the context of higher education, of being an academic leader in a multicultural transnational higher education context and grappling with the challenges of working as a leader in a transnational context, especially ones such as Artificial Intelligence and its impacts on education.

---

### Correspondence

faiza.queshi@murdoch.edu.au <sup>A</sup>

---

### Article Info

Received 7 September 2024  
Received in revised form 3 December 2024  
Accepted 25 December 2024  
Available online 20 January 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.10>

## Snapshot of 30 years of trajectory: Teaching to academic leadership

**Faiza Qureshi (F.Q.):** Dr. Trotter, I appreciate that you agreed to share insights and advice from your thirty years of immense leadership experience in higher education with JALT's readership. Looking back, your affiliation with Murdoch University in Perth began in the Theology Program in 1994, and since then, you have held several leadership roles, including Academic Chair of the Theology Program, Associate Dean of Learning and Teaching (School of Arts), Deputy Dean (School of Arts) and more recently, a very successful run as the Dean and Academic President of the Murdoch University Campus in Dubai, United Arab Emirates (UAE) for almost the last decade. During this period, the Dubai campus achieved a five-star rating from the local regulator, Knowledge and Human Development Authority (KHDA) in the UAE under your leadership. As you set your eyes on retirement in September of this year (2024), we hope to glean your advice on leadership and working in multicultural higher education contexts, specifically navigating leadership roles in the important realm of higher education provision through Transnational Education (TNE/TNHE). To begin, could you tell us about your leadership journey and how it evolved over the span of 30 years in higher education?

**James Trotter (J.T.):** It's hard to believe it's been 30 years. I think one of the most important things to say about my leadership journey is that it started with not wanting to be a leader. I started my academic career with no intention of ever being anything but a teacher. I love teaching, and in my first annual performance review, the Dean asked me whether I would like to prepare to be a leader one day. I laughed out loud and said, well, that's not me. I'll never want to go down a path like that. Years later, we met after he retired, and I was in leadership positions, and we had a good laugh about that.



Figure 1: Dr. Trotter at the TNE campus in the UAE, 2024.

*I started my academic career with no intention of ever being anything but a teacher. I love teaching, and in my first annual performance review, the Dean asked me whether I would like to prepare to be a leader one day. I laughed out loud and said, well, that's not me.*

However, it was an important starting point for me because I valued the regular academic work of teaching, researching and supporting students. And coming from that starting place, I then saw how much good leadership made space for good academic work and, alternatively, how poor leadership makes academic work that much more difficult. As a result, I came into this with the idea that what I wanted to be as a leader was someone who created space for academics to be academics, not to be burdened with massive amounts of administration. Being an academic is important and valuable work, and good academic leaders allow that to happen. So, my journey went from being focused on teaching to being an academic chair, then being an associate dean, learning and teaching. From there, I went into being on the academic council and even served a year as the deputy president of the academic council. And from there I was involved in a variety of working parties and served a term on the university senate.

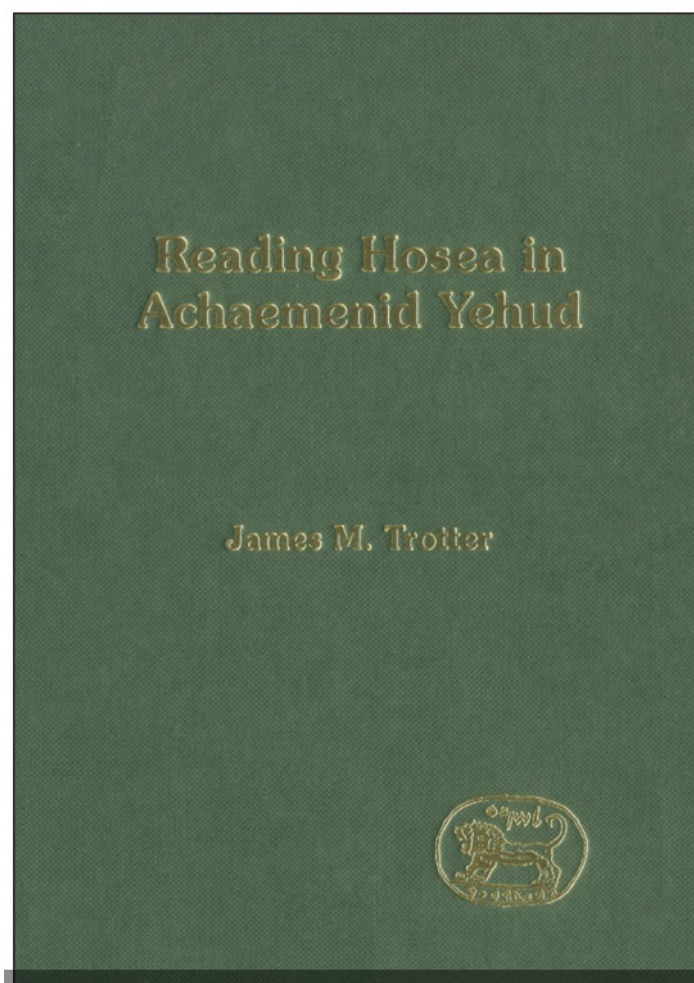


Figure 2: Book authored by Dr. Trotter, published in 2001.

So, it was a gradually evolving, expanding experience of being involved in the university's leadership in a variety of different ways. As the Deputy Dean of the School of Arts, I had the good fortune to work with an excellent dean who was really supportive and encouraged me to expand my academic experience with specialised leadership training. I ended up going to the Harvard Business School for their general management programme, a six-month programme with two intensive on-campus experiences, one four-week and one three-week period living on the campus and

attending classes every day. It was transformative. There were just over 100 people from all over the world, all from different industries. It was challenging, difficult, personally invasive, and incredibly valuable and useful, finding out things about myself and about who I am, what I can do, what I can't do. It's important as a leader to know those things, not only your strengths but also your weaknesses. Sometimes, it's more important to know what you can't do and where you need support than it is to know what you can do. The ability to see yourself clearly and know your limitations can help you avoid some major errors.

**F.Q.:** Thank you for taking us through the highlights of your academic journey. As you mentioned, it is important to have good leaders and mentors, such as the ones that you have had, to help shape one's career. Apart from having a supportive head who understood academic work, what factors would you say aided your trajectory towards academic leadership roles?

**J.T.:** All those experiences. You start out as an academic, knowing your discipline and the people around you. Of course, the university is so much bigger than that, so getting that experience of working across schools and across faculties is important. In my career, we have had schools and faculties and disciplines, I can't even remember all the different kinds of structures we've had. But working across all those different areas of the university and working with people from all those different backgrounds was really important. Understanding how the university operates, and certainly being on the academic council and on the senate, you see very different aspects of the university and its internal and external operations. You see mainly the academic side with the academic council and the larger business side of how things operate with the senate. So, that breadth of experience was important.

**F.Q.:** How did you have to adapt to the leadership roles in academia?

**J.T.:** I think business acumen was something I had to learn, but I think the most difficult part of leadership is the people part. Organisations aren't machines made up of a collection of parts operating without thought or feelings. They are composed of people working together, sometimes well, sometimes not so well. We're all human beings, and we come from different places and perspectives and have different struggles going on in our lives. There is a lot happening in the lives of people beyond the workplace. Supporting the people in the university with empathy and humanity is critical to good leadership.

*Supporting the people in the university with empathy and humanity is critical to good leadership.*

I think that was one of the most eye-opening experiences for me when I moved into the deputy dean role. Suddenly, I was aware of a whole range of things that were going on in the lives of other staff members that I hadn't been aware of before, in terms of people facing difficulties around illness, a death in their family, or other kinds of struggles that were

going on in their lives. And I was very fortunate to have a dean, Prof Rikki Kersten, who always said people come first. And when people were going through those kinds of issues, we always looked for a way to provide as much support as possible, whether it meant finding teaching relief for them or some other form of support. It was important to recognise that people were human beings first, and all of those personal aspects of their lives were more important than the job. Getting the work done was obviously important, but that only happens when people feel valued, supported, and trusted.

## **Transition to transnational higher education**

**F.Q.:** From an academic to a leader, that is quite a leap! How does that work out in a dynamic transnational set-up of an international university? TNE offshore campuses must also be a different and complex experience in terms of culture, local regulations and academic experience. Having been a leader for so long at the Perth campus and then moving to Dubai, UAE, for almost a decade now, what would you say is different about academic leadership in both contexts from the perspective of someone who has had the opportunity to work in both? TNE is a very competitive sector in the UAE, and there are tens of foreign universities here, along with more than 200 nationalities living in this very multicultural country.

**J.T.:** It's an expansion of that experience. I came in with the perspective that the people are the most important part. You try to be open and understanding. Fortunately, Murdoch is a very multicultural place to begin with. So, I already had experience working with people from a wide range of different cultural backgrounds. Obviously, not to the extent that I experienced in Dubai, where we have such a diverse population, but certainly to a large extent. Again, the experience at Harvard Business School, where more than 50 countries were represented among the students in my cohort, was a valuable opportunity to live and value diverse backgrounds and experiences. Those experiences of understanding and accepting cultural differences were important to prepare me for coming to Dubai and the rich diversity here.

At the same time, there are obviously a lot of similarities between an academic setting in Dubai and elsewhere in the world. One of the beautiful things about academic life is that you deal with so many highly intelligent, talented people. It is a rich life and I have been very fortunate to be part of it.

The intelligence and high levels of education found in an academic team are some of the important benefits available to academic leaders. You have this amazing resource to draw on. You have this talented team who will accomplish amazing things if you let them and support them. To me, a big part of my leadership is trying to get out of the way and make space for the team to get on with their work.

One of the specific issues that was different in coming to the Dubai campus, and one that I've tried to address during my time in Dubai, was that there tended to be a misconception at the home campus about the Dubai campus and the

people who work here. There was a general perception that staff in Dubai were not academics in the same way as staff on the home campus. This misconception of what the academics at the Dubai campus were like was mainly rooted in a lack of connection and interaction between the campuses. I believe that over my time here, that's changed. I think there's more collegiality and cooperation across the campuses. Staff on the home campus now see academic staff in Dubai as colleagues and peers rather than as lower down on the academic ladder. A big part of addressing those misconceptions is done by building avenues of communication and facilitating regular communication between academics at different locations.

Strangely enough, the pandemic helped in those efforts because, suddenly, we were all thrown into a world where meetings didn't take place face-to-face; they happened online using all these virtual tools. That made it much easier to have meetings across the university's three campuses, Perth, Singapore and Dubai. Having that common shared experience helped to break down some of the barriers that may have previously existed.

*Strangely enough, the pandemic... made it much easier to have meetings across the university's three campuses, Perth, Singapore and Dubai. Having that common shared experience helped to break down some of the barriers that may have previously existed.*

We've seen that continue. There are still tools that we use after the pandemic experience that facilitate cross-campus interaction. As a consequence, the pandemic is in our shared past, but the bridges built to get through it are still present. There's a lot more interaction, conversation and collaboration that takes place across the campuses now than was true in the past.

**F.Q.:** The pandemic was quite a challenge for everyone in academia. However, in your seven years here, what would you say has been your biggest challenge as an academic leader in a transnational university setup? And how did you manage to navigate it?

**J.T.:** It's difficult to pick one. When I first arrived, we were in the last year and a half of a relationship with a partner, and transitioning then to a new partnership was very difficult.

But maybe COVID was the biggest challenge, simply because it came on so suddenly. We first started hearing about COVID in January 2020, and by the middle of April, we were teaching fully online, and we had to do that for a year and a half. Fortunately, we could see what was approaching and make preparations. So, with the strengths of the home campus, we were able to put in place training and some preparation for online delivery that helped us make a very rapid transition. We did that, and within less than a week, the government announced that we were all in lockdown and all teaching had to go fully online. So, that was a very challenging time. But, out of that came, again, some amazing

experiences. The team here used their experiences of preparing and transitioning to online delivery to put together some fantastic resources that they were able to share with university staff in Singapore and Perth. They created videos about how to do online delivery and documents about how to support students in online delivery, all while doing online delivery for the first time in their teaching careers. That just says volumes about the amazing people that I have had the privilege to work with here. That, again, went a long way towards promoting the idea that staff on different campuses are colleagues, working together and supporting each other. People in Perth and Singapore really appreciated all that effort by the Dubai staff.

**F.Q.:** Transnational Education is playing an increasingly important role in the context of higher education. Australian TNE, the context in which you have worked in an academic leadership role in the last decade, has grown by 128% between 2016-17 and 2021-22 (Riaz & Trifiro, 2024). From your perspective, what are some insights on the crucial role transnational education provision plays in the landscape of higher education?

**J.T.:** TNE plays an incredibly valuable role in a number of ways. It provides educational opportunities for students that they might not otherwise have. A number of students who study at TNE campuses might not have other alternatives. If we genuinely believe in the power of higher education to transform the lives of our students for the better, and I do, then we should celebrate and support every opportunity to make higher education more accessible to more people so that issue of access is vitally important. I think the more we can open up opportunities for higher education to people, the better. TNE helps to do that and also supports the broader goals of internationalisation in higher education.

The home campus of Murdoch University is infinitely better because of its TNE campuses. It provides international connections and intercultural experiences for the staff on the home campus that they wouldn't otherwise have. In addition, the more we can open up opportunities for students from the three campuses to be mobile and have experiences on different campuses, the better because students grow in ways that they can't otherwise by having international experiences and being exposed to different cultures and perspectives on the world. We need to facilitate that movement between campuses as much as possible. In terms of research, TNE campuses have opened up opportunities for research that would never have existed with just the home campus.

*If we genuinely believe in the power of higher education to transform the lives of our students for the better, and I do, then we should celebrate and support every opportunity to make higher education more accessible to more people.*

**F.Q.:** Along with all of these opportunities and benefits for institutional expansion and the chance to share high-quality higher education, TNE projects also pose financial and reputational risks (Emery & Worton, 2016). What, in your



Figure 3: Dr. Trotter at the Dubai campus's graduation ceremony in 2018.

experience and opinion, are some of these risks and the best ways for an academic leader to mitigate them? How does an academic leader mitigate these and support the TNE campus?

J.T.: Financial risk is difficult. The biggest financial risk is making a significant investment and seeing no return; you don't get students, or, due to some unexpected event, you suddenly lose students. Often, these can be events that are outside your control, like pandemics. Suddenly, you have to adapt and learn to do things in new ways. How do you deliver quality academic programmes in that kind of environment?

Part of it is also the risk to your reputation. Consequently, you have to be constantly vigilant in terms of the quality of your staff and the quality of teaching. We have regulators who constantly look at the quality of our activities or ask about what we are doing to ensure quality. What are you doing to mitigate risk? But it comes down ultimately to what you're doing day to day on the ground with the people who

are delivering the courses. And you have to be sure that you have good, committed people who are always doing their best for the students and for the quality of the student outcomes.

Of course, the university has its processes in terms of assessment moderation ensuring that the content, academic assessment tasks and the experiences of the students are not exactly the same, but certainly equivalent across campuses. Those regular quality assurance processes are vital both to excellent outcomes and the protection of the institution's reputation.

F.Q.: Apart from the accessibility of education for students who are in TNE locations, what benefits do you see to the host countries for increasing, allowing and facilitating TNE setups?

J.T.: Research outcomes would be one. You can access expertise from the home campus and from the staff at the branch campus that might not otherwise exist without the TNE operations in the host country. Also, TNE operations provide diverse educational opportunities for the host country's population. It's not a one-size-fits-all in higher education. People need different things to start their academic journey and then move on in life and become valuable contributors to the country's social life. TNE broadens access and opportunity. Having the diversity that TNE provides, in addition to a very strong and robust national university system, adds to the social strength of the country and the possibilities for entrepreneurship, high-quality educational outcomes and the benefits of diverse perspectives.

*Having the diversity that TNE provides, in addition to a very strong and robust national university system, adds to the social strength of the country and the possibilities for entrepreneurship, high-quality educational outcomes and the benefits of diverse perspectives.*

F.Q.: What, according to you, are some of the ways that host countries could provide an ideal environment for TNE to flourish and to capitalise on all these benefits?

J.T.: It's about creating a regulatory framework in which the branch campus, as it is here, can operate efficiently and effectively. Obviously, you want recognition of your courses and your degrees. That's an important issue because if there are problems with that, then that becomes a problem for your students and your graduates. Also, supporting research is an important aspect of support that host countries can do. Research by branch campuses can be a massive contribution to the societies in which they operate, but it doesn't happen without a framework to support it and, ideally, some kind of financial support to make it happen.

F.Q.: It seems like TNE can also play a crucial role in promoting equity, diversity and inclusion. What are your thoughts on that?

J.T.: It's both an important contributor and an area of delicate negotiation. Here on the Dubai campus, we have students from more than 50 different countries. If they were in their home country, they wouldn't always get along with some of the other people on the campus. In that way, we reflect the UAE. Most of our staff and students are guests in the UAE. We bring our different experiences and perspectives, but we also learn together and learn to get along together in our host country.

We also have a variety of philosophical and religious perspectives. Thus, ensuring everyone treats each other appropriately and fairly – and they're all treated equitably – is a delicate matter. That sense that everyone is treated fairly is a key component of harmonious co-existence. At the same time, the benefit is that people gain new understanding by being in the same classroom with people with very different perspectives. Hopefully, the result is that they learn to be accepting and live and work together in a peaceful and harmonious way.

*We also have a variety of philosophical and religious perspectives... That sense that everyone is treated fairly is a key component of harmonious co-existence... The benefit is that people gain new understanding by being in the same classroom with people with very different perspectives. Hopefully, the result is that they learn to be accepting and live and work together in a peaceful and harmonious way.*

### **Rise of artificial intelligence**

F.Q.: Higher Education leaders and academics need to prioritise adopting AI while focusing on pedagogy, policy, and culture (Tan et al., 2024). Based on your extensive experience in higher education, what would be your advice for those facing this newest challenge to higher education? How do you see it playing out specifically in TNE? What are some other challenges that you see on the horizon for TNE in the higher education context?

J.T.: I think AI is one of the greatest challenges that's come along in my career. Certainly, when it comes to assessment issues and how you help students learn to use AI ethically and appropriately, that will be a major issue for the foreseeable future. Initially, many people said, 'oh, we're going to ban our students from using AI'. I think that's unrealistic. You can't do that. The fact is how they use AI is going to be part of how they navigate the world and how they work. So, saying that their time at university is going to be an AI-free time and then somehow, they're going to go out into the workplace and have to use it and engage with it: we just can't do that. Education needs to prepare students for the real world in which they will live and work. So, we have to figure out how to teach our students to use AI appropriately. And part of that comes down to reimagining assessment.

You can't just have assessment tasks where they can give the question to the AI chatbot and get an answer in a matter of a few seconds. Obviously, there will be some students who are going to be tempted to do that. The tools for detecting that are less than perfect. So, we need to figure out how we assess in creative ways that have the students engage with AI as part of creating an appropriate response to the assessment task. But also in ways that require them to demonstrate that they have an understanding of the content. Students need to learn how to ask the right questions of artificial intelligence to get the most appropriate answers, and that requires a level of understanding of the discipline. It's about training them to be critical users of AI. In terms of TNE, I'm not sure it's that different from anywhere else.

Students need to learn how to ask the right questions of artificial intelligence to get the most appropriate answers, and that requires a level of understanding of the discipline. It's about training them to be critical users of AI.

Those same issues exist at the home campus and in the TNE environment. But we also need to figure out how to get this right because I suspect this is going to be dwarfed by what will come in the future. With quantum computing on the horizon poised to alter the power of computers in a dramatic fashion. I don't think most of us can even imagine the change that's coming with quantum computing and the power it will unleash. So, I suspect the development of AI and our struggles with it are going to look small in comparison. Imagine AI with the power of quantum computing.

F.Q.: What would you have done in the next couple of years to grapple with all these issues?

J.T.: It's difficult in the branch campus environment because we're so tied to the decisions that are made on the home campus. But what I'd like to see is a radical rethink of how we teach and assess that considers the fact that AI exists. It will continue to exist, and it will continue to become increasingly powerful and accurate.

*What I'd like to see is a radical rethink of how we teach and assess that considers the fact that AI exists.*

F.Q.: As an academic leader, what would you say is the most appropriate use of AI in research and how do we use it ethically?

J.T.: Right now, you can get some pretty crazy answers from AI and some really good ones. But that's going to change. AI is going to continue to improve. So, as academics, how do we deal with that? It's not just with our students. There are clear cases where people have used AI to write academic papers. So, we must also come to terms with that in relation to our research agendas. We all agree that presenting the work of AI as our own academic research would be wrong, but how should we use AI? What are the guidelines for the use of AI in academic research? This is another area where we are at the beginning of the process.



Figure 4: Dr. Trotter at The Observatory on Borderless Higher Education Global Forum in Dubai, 2018.

### That's a wrap: Reflection and advice

**F.Q.:** What have been some of the most memorable experiences as an academic leader across the 30 years?

**J.T.:** The most memorable experiences have been the successes of staff and students. Seeing people achieve the goals that they've set for themselves, whether it's accomplishing a higher degree or promotion or the publication of cutting-edge research. Or even sometimes, when someone moves on to another university to another academic position. You're sad to see a talented colleague leave and move to another university, but healthy institutions are places where people grow, develop, and flourish. So, you're also happy for them when they move to something that's a better position for them and step up in their career. That's one of the things that leaders need to try and create: an environment in which people flourish. When they flourish, one of the natural

consequences of that is that they will sometimes move on to other places.

That's a sign that you've created a healthy environment. If they're leaving because it's a terrible place, then obviously that's not what you want. But if they're leaving because other people see the strength in your team, that you have people who are creative and productive, and they want to offer them new opportunities, well, then you've done something right.

**F.Q.:** What's next for you after such a long and successful career in HE?

**J.T.:** There are all the stereotypical answers: hobbies and travel and a bit of relaxation. I definitely have plans to do some of those things. But I usually tell the new students in orientation that their education is going to open doors for them that they can't yet imagine. One of the most important things for them is to be flexible and open to new opportunities and new experiences. It's something I've tried to do throughout my career. So now, I'm going to try and apply it to my retirement and realise that it will hopefully be a long period of time. So, I need to be open and flexible and adapt to new opportunities that come along.

**F.Q.:** Finally, Dr. Trotter, what would be your advice to future and current academics in leadership roles in TNE?

**J.T.:** My advice would be to enjoy it because it's an amazing opportunity and experience. Sometimes, it's easy with the day-to-day work that comes along to get lost in the challenges, and there are always challenges. It's not all sunshine and roses. Sometimes, bad things happen that you have to deal with, and there are really difficult situations with students or staff. But still, in the midst of that, enjoy the experience and just be open to learning from it because there's so much that you can learn in this environment. If you keep your focus on the transformative power of higher education and on your students and staff, there will be much joy.

*If you keep your focus on the transformative power of higher education and on your students and staff, there will be much joy.*

**F.Q.:** Thank you so much, Dr. Trotter, and I wish you all the best for the next phase of your journey!

### References

Emery, V., & Worton, M. (2016, July). *Challenges for the leadership of transnational education in higher education: Balancing risk and innovation*. Leadership Foundation for Higher Education. 6678\_lfhe\_insights\_challenges\_1583336344.pdf

Morris, G. R., Cao, Q. Q., Weng, W., Tesema, F. B., & Zhao, T. (2024). Planning ahead: Exploring the leadership competencies that transnational higher education leaders and managers need. In G. Morris & S. Kozuch (Eds.),



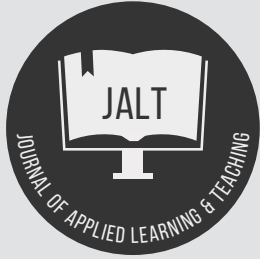
*Engaging higher education teachers and students with transnational leadership* (pp. 1-14). IGI Global. <https://doi.org/10.4018/979-8-3693-6100-9.ch001>

Riaz, N. & Trifiro, F. (2024, January). *The untapped value of transnational education*. University World News. <https://www.universityworldnews.com/post.php?story=20240126230211149>

Tan, S., Rudolph, J., & Tan, S. (2024). Riding the generative AI tsunami: Addressing the teaching and learning crisis in higher education. In J. Rudolph, J. Crawford, C. Y. Sam, & S. Tan (Eds.). *The Palgrave Handbook of crisis leadership in higher education* (pp. 135-154). Springer Nature.

Trotter, J. M. (2001). *Reading Hosea in Achaemenid Yehud*. London; New York: Sheffield Academic Press.

Copyright: © 2025. Faiza Qureshi and James Trotter. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



---

## Edubuntu: The overhaul and rebirth of an educational operating system

---

Poramate Tarasak<sup>A</sup>                      A                      *Institute for Innovative Learning, Mahidol University, Thailand*

Curtis J. Bonk<sup>B</sup>                              B                      *School of Education, Indiana University, U.S.A.*

Suthiporn Sajjanroj<sup>C</sup>                      C                      *Institute for Innovative Learning, Mahidol University, Thailand*

DOI: <https://doi.org/10.37074/jalt.2025.8.1.16>

---

### Abstract

Computer operating systems are often an overlooked part in providing quality education. When discussing digital education tools, most practitioners and researchers mainly focus on hardware (e.g. PC, notebook, tablet, and smartphone) and software applications that directly interact with students. While Microsoft Windows is widely recognized, other alternatives remain relatively unknown. This paper introduces an alternative approach by examining the potential of open-source operating systems such as Linux, particularly focusing on Edubuntu, a flavour of Ubuntu operating system, designed specifically for education. It also explores available default applications and investigates how Edubuntu can provide expansive learning opportunities that develop learners' interest and help cultivate 21st century skills. Importantly, we pose the question of how to harness the potential of Edubuntu potential effectively. We then illuminate Edubuntu's capacity to support traditional subjects as well as promote computational thinking and geographic education. Lastly, we analyze Edubuntu with respect to instructional software design standards and summarize key consideration factors in designing an educational operating system.

**Keywords:** Edubuntu; educational needs; educational operating system; open source software for education; sustainable development; teaching computational thinking; teaching geography.

### Introduction

In efforts to utilize digital technology for bridging educational gaps, various global initiatives have been implemented. One of the most famous projects is perhaps One Laptop Per Child (OLPC) from MIT, whose mission was to provide low-cost laptop technology to underprivileged children as a learning tool (OLPC, 2005). Although the project

was deemed unsuccessful (Ames, 2021), it was a valuable lesson in hardware and software design for a minimal-cost computer. The system design attempted to produce a laptop for under USD\$100, whose functionality was solely to support the education of young children. An OLPC laptop had its own desktop environment called Sugar, running on the free Linux operating system (OS). As such, it was packed with free open-source software (OSS) for learning subjects such as science, mathematics, programming and music (OLPC, 2013).

To achieve the UN sustainable goal under the quality education category, OSS and Linux are perhaps indispensable components of any educational computing project and initiative due to such software providing free license of use as well as free distribution in nature (Pan & Bonk, 2007a, 2007b). There was debate whether to adopt OSS to teach children, as it may not be beneficial in the real-world employment settings (van Rooij, 2019). However, technological advancement and the proliferation of diverse devices and platforms, it is crucial for learners to gain experience and understanding across multiple platforms. Increased exposure and familiarity with various tools and technologies enhance adaptability to new ones, aligning with highly valued 21st century skill sets sought by employers.

A systematic review of 69 research studies showed that OSS use was challenged by poor documentation, limited functionality, lack of awareness, and a general lack of OSS knowledge and programming skills (Talib et al., 2019). Their follow-up study with 400 school teachers in the United Arab Emirates (UAE) found that these teachers faced many barriers to integration and use of OSS, including internet access as well as sufficient time and organizational support needed to integrate OSS in computing courses at the high school level (Talib et al., 2019).

The difficulties in applying OSS in education are well-recognized (Özusağlam & Poşpoş, 2016). One reason is the lack of support from IT staff and the absence of easy-to-understand online documentation and tutorials. Another problem is the constant barrage of new open course technology tools and opportunities (Pan & Bonk, 2007a, 2007b), as well as the short-lived nature of many, if not most, of those tools and systems (Butler et al., 2022). Nevertheless, recent trends in using community support resources such as stackoverflow.com, askubuntu.com, or social media groups are increasingly becoming the norm for any internet users. The ability to tap into such gigantic knowledge banks and connections at any moment will gradually mitigate the fear of OSS adoption across educational sectors and discipline areas, especially, when artificial intelligence (AI) assistants have advanced to the point that masses of people are comfortable using them (Rudolph et al., 2023) and depend on them (Huang et al., 2023; Hwang et al., 2020).

The new era of educational technology has made online learning activities and tools a ubiquitous part of one's daily routine and lifelong learning opportunities. The general OS functional requirement of simple and efficient resource management is not sufficient for a special-purpose usage such as education (Hansen, 1973). A well-designed OS for education should be lightweight and feature a simple and beautiful interface. Being lightweight and having small memory/CPU footprint features allow the OS to be installed on any machines or even just on a thumb drive. Previous criticisms pointed out that using technology for education effectively goes beyond being a mere tool (Ames, 2021; Souter, 2021). Students cannot learn on their own without the guidance of teachers or assistance with technical issues related to the use of laptops, tablets, and other technology devices. Therefore, an ideal educational OS should also include an ample selection of pre-installed software that allows students to work independently with minimal need for teachers' technical expertise to support them. In this regard, there are many existing educational OSs to consider. A feature comparison of selected OSs is presented in Table 1.

Table 1: Educational OS feature comparisons.

OS name	Linux Distribution	Student Levels	Teaching Subjects	Status
Edubuntu	Ubuntu	Primary to Higher education	Various	Active
UberStudent	Ubuntu	Secondary	Various	Active
Qimo	Ubuntu	Early Childhood to Primary	Math, Drawing, Computer Skills, Brain Training	Discontinued
AcademiX	Debian	Primary to Higher education	Various	Active
Debianedu/Skolinux	Debian	Primary to Secondary	Various	Active
Sugar	Many	Early Childhood to Primary	Arts, Math, Physics, Brain Training	Active
MentOS	Many	Higher Education	Operating System	Active

Since Ubuntu is the most popular Linux distribution and Edubuntu is promoted officially on the Ubuntu flavor website (Canonical Ltd, 2024), we selected Edubuntu to investigate its functionalities and applications.

## Edubuntu operating system

Edubuntu was first released in 2005 based on the Ubuntu Linux distribution (Edubuntu, 2024). It was developed in cooperation with teachers from many countries and originally targeted users aged from six to 18. Importantly, Edubuntu has been instrumental in expanding learning opportunities and cultivating 21st century skills. For instance, in India, it was utilized to teach computer science through innovative curricula like Computer Masti, leveraging applications such as GCompris, Childs Play, Tux Paint, Tux Math, KDE Educational Games, and Scratch (Baru et al. 2009). Similarly, in the Republic of Macedonia, the Bureau for Development of Education specified Edubuntu to be taught in the following subjects: Computer Science, Mathematics, Physics, Chemistry, Geography, Music, and Latin (Barbareev, 2015). Notably, in that initiative, teachers received formal training before introducing Edubuntu to the students. Several other countries also have used Edubuntu in schools such as the U.S.A., Belgium, Serbia, Malaysia, and Ghana (Ubuntu Community, 2013).

Despite its initial impact, Edubuntu faced discontinuation in 2016 due to its' lead developers moving to another project (Graber, 2016). Being left unmaintained for about six years until December 2022, Edubuntu found new leadership under Amy Eickmeyer from the United States and her team, who embarked on reviving and enhancing the operating system (Eickmeyer, 2022). The revitalized Edubuntu, which was built on Ubuntu OS release 23.04 Lunar Lobster, boasts easier installation procedures, a new logo, and a revamped website (edubuntu.org), ensuring continued accessibility and relevance in fostering digital literacy. Since then, Edubuntu has undergone a few major change releases, versioning 23.10 Mantic Minotaur, 24.04 Noble Numbat, and 24.10 Oracular Oriole. The review in this paper focuses only on Edubuntu release 24.04 Noble Numbat. Despite it being an older version than 24.10, this release is quite recent and has long-term support for three years (Eickmeyer, 2024).

To provide a comprehensive scope for this study, we focused on Edubuntu's educational features, examining its application in teaching and learning processes and how students can leverage its tools for learning digital technology. Our key research questions are as follows:

1. What are the features and functionalities of Edubuntu, particularly in the context of educational use?
2. What education applications are included by default in Edubuntu, and what are their primary purposes?
3. How can the included educational applications be integrated into teaching and learning processes?

## Methodology

Our research takes an exploratory approach. To address RQ1 and RQ2, we conducted an in-depth review of Edubuntu's features, documentation, and user interface. In the process, we identified potential use cases within educational settings

and evaluated the system's effectiveness in meeting educational goals. Additionally, two case examples – computational thinking and geography – were created to answer the RQ3.

## Edubuntu 24.04 general specification

In this section, we provide an overview of the fundamental functions of Edubuntu. This detailing of many applications and features available for Edubuntu aims to assist teachers and educators who are considering adopting the platform by outlining the necessary requirements for installation and key considerations such as administrative applications, memory management, user interface, main utilities, and system services.

## Installation

To save disk space or to customize to a student level, installations of Edubuntu can target a specific group of students: preschool, primary, secondary or tertiary (shown in Figure 1). It can be installed from an .iso image downloaded from a server or, if the existing OS is already Ubuntu, from the command line `'apt-get install edubuntu-desktop'`. The .iso image file size is 6.2GB, which is beyond DVD capacity, can be written on a USB stick of a larger size for installation.

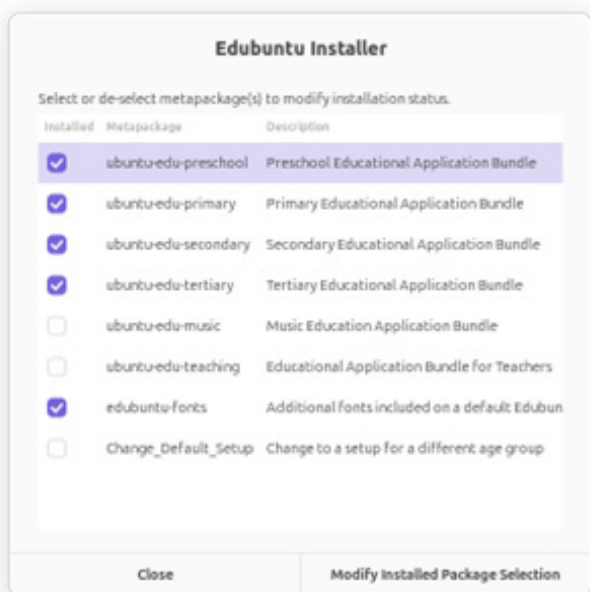


Figure 1: Edubuntu installer.

Apart from installation on a hard disk, Edubuntu can be fully run on a USB stick without installation by booting the PC/notebook with it and selecting the 'Try Edubuntu' (see Figure 2). In this manner, Edubuntu can be easily utilized as a low-cost teaching material and is highly portable. The cost of one cheap USB stick being able to contain Edubuntu is less than USD\$2.

It is important to note that the use of Edubuntu and most of its applications (except for the Web browser, mail client, dictionary, maps, and weather applications) do not require internet connections which makes it quite useful in the Global South (Schotgues, 2022; Zhang et al., 2020). In effect, it would be well-suited to teaching/learning in remote areas in the Global North as well.

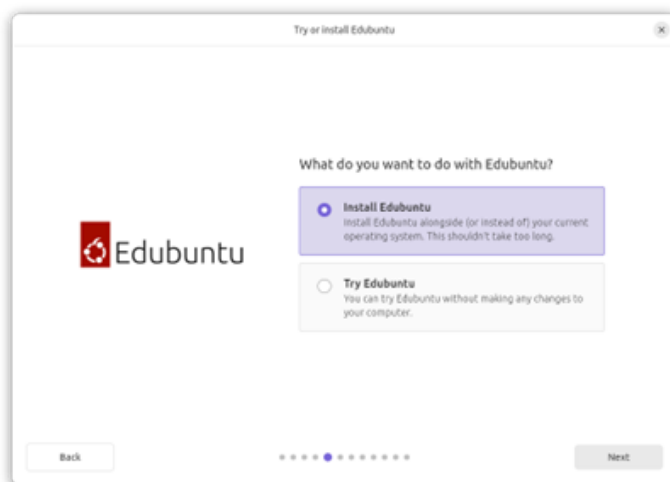


Figure 2: Installation options.

## Administrator

In addition to student tools, there are also administrative applications. Notably, Edubuntu Menu Administrator allows the administrator to hide selected applications from non-administrator users for simplicity of use (see Figure 3).



Figure 3: Edubuntu menu administrator.

## Alphabetical overview

By default, Edubuntu applications are arranged alphabetically so that the students can see an example of alphabet sorting when they enter the system. Naturally, the applications addressing the same subject are grouped in the same folder, e.g. Art, Mathematics, Language and Learning, Science, etc. (see Figure 4).

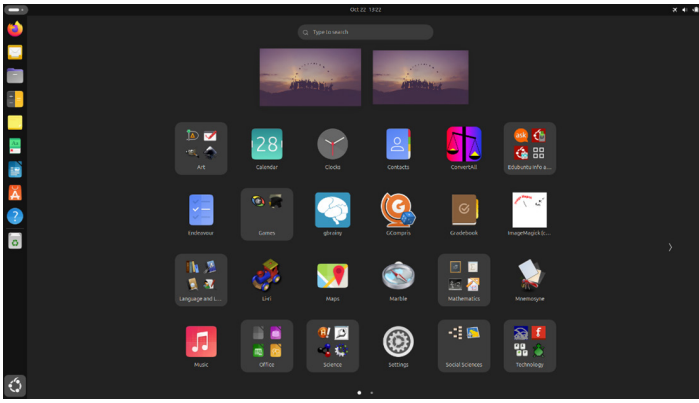


Figure 4: Edubuntu application overview.

### Office applications

For general administrative tasks, most applications carry from the parent Ubuntu distribution. These applications make Edubuntu convenient for general use as well.

- Web browser:** Similar to Ubuntu, Edubuntu is pre-installed with Firefox as a default Web browser.
  - Mail client:** Edubuntu selects Geary as a default mail client due to its simplicity and small footprint, which works well with older machines.
  - Office suite:** LibreOffice Writer, LibreOffice Base, LibreOffice Calc, LibreOffice Draw, LibreOffice Impress, and LibreOffice Math are available for administrative and productive tasks.
  - Image tool:** ImageMagick and Gimp handle simple and complex image manipulation tasks, respectively.
  - Others:** Calendar, Calculator, Dictionary, Endeavour, Notes, Maps, Music, and Weather are included in the default installation.
- Educational applications will be explored in further detail in the next section.

### Resource utilization

For OSS to be adequately accepted and integrated across educational sectors, it must be easy to access and use while requiring limited computational resources and power. It is the latter in which Edubuntu excels, thereby driving up the range of possibilities in which it could be properly installed and used. Importantly, Edubuntu consumes a small amount of CPU and memory resources. With the first author's machine, running it idly on Acer Aspire 3 (Intel Core i5-1135G7 @2.4GHz) notebook with clean installation takes only about 3% CPU load on two cores and only 1.3GB of RAM (see Figure 5). It is important to mention that Edubuntu can run on much older computers than our pilot test setting and it can also operate when offline.

As a result, it can play a huge role in communities which lack modern technological resources and Internet access. Stated another way, it can potentially play a significant role in society in addressing educational equity and access. As detailed throughout this manuscript, there is much potential educational power in this free and low-resource capacity learning platform.

### Educational applications in Edubuntu 24.04

The educational applications in Edubuntu version 24.04, supporting 21st century skills, can be categorized into two primary groups: (1) Applications designed for teaching and learning specific subjects such as mathematics, science, social



Figure 5: CPU and memory consumption when running Edubuntu 24.04 idly.

sciences, and astronomy; and (2) Applications emphasizing particular skills like learning retention, critical thinking, logical reasoning, analytical skills, design proficiency, and typing speed. The applications are specifically designed for age groups ranging from early childhood to higher education. Notably, during system configuration, users have the option to select the student grade level, which results in the automatic installation of a specific set of applications tailored to one's individual educational needs.

### Applications for specific subject areas

The system pre-organizes the applications in this category by grouping them together in the subject group folder, facilitating easy access for students. Each subject group is specifically aligned with the corresponding subject areas, which are not restricted to science and technology, but also extend to include the social sciences, languages, and arts. These subject groups are detailed below.

#### Mathematics

Several technology tools are included for mathematics in Edubuntu. For instance, Cantor serves as a front-end interface to manipulate mathematical expressions, supporting various kinds of back-end engines such as Julia, Kalgebra, Lua, etc. (KDE, n.d.). Cantor can handle advanced mathematical manipulation and visualization through programming. Moreover, Kalgebra handles algebraic expressions as inputs and plots them in the figure, whereas Kig generates geometrical plots from the menu bar. Kmplot is more general, accepting mathematical expressions and outputting advanced plot types like polar plots or differential plots. Kbruch is specifically designed for teaching fractions, and kids can also enjoy Tux Math games to improve their mathematical skills.

## Science

Edubuntu offers three applications tailored to chemistry education. First, Kalzium provides information on the periodic table and atomic properties, allowing students to explore and enhance their learning retention. Second, Chemtool is equipped with a useful drawing tool for chemical molecules, capable of exporting drawings into various file formats. Third, Atomix, a chemistry learning game, promotes critical thinking by challenging students to construct given molecules by maneuvering atoms through a maze-like map.

For physics education, one application, named Step, functions as a motion simulation tool, educating students about the laws of physics through the connection of various objects and running simulations to observe their movements and interactions. Another tool is Light Speed, which simulates the characteristics of objects moving near the speed of light, fostering students' curiosity and enabling them to adjust speeds while observing physical changes.

Astronomy students will find delight in the Stellarium application, as it accurately depicts stellar constellations from any selected location worldwide. This tool ignites their imagination, allowing them to explore new positions by simply clicking anywhere on the sky screen while also providing accurate information about deep-space objects. Another valuable scientific tool is Rocs, which serves as a graph theory analysis tool. Rocs is instrumental in solving graph theory problems, such as the minimum vertex cover problem (Canabrava & Cord-Landwehr, 2015).

## Social sciences

One such tool is 'Gramps', aptly named for its function as a genealogy tool, enabling users to display their family tree in various formats such as pedigree, fan chart, or descendant fan. Exploring one's own family history can contribute to the development of information literacy, a vital skill in the 21st century, as genealogy research necessitates the ability to locate, evaluate, and utilize information from diverse sources (Sheppard, 2012). Another tool, KGeography, is designed to assess students on their knowledge of city locations within a selected country through interactive map quizzes.

## Marble virtual globe

With Marble, the virtual globe and world atlas application, students can explore diverse aspects of Earth, Geography, and History. The Atlas view offers the topography of the Earth, while clicking on city markers reveals concise details about each location. Importantly, adopting a learner-centered approach and fostering students' learning autonomy, Marble provides numerous options for map views to be selected and explored. For example, users can examine average rainfall patterns using the precipitation map view or analyze temperature variations through the temperature map view. Moreover, users have the capability to journey back in time and observe Earth's historical changes, such as those dating back to 1689, utilizing the historical map view.

Marble also offers a Moon map feature for those who are interested in celestial exploration.

## Language and learning

Learners can explore tools like Scribus, a professional desktop publishing tool ideal for creating books, brochures, and cards. A few e-book applications are included in this folder, including Calibre, an e-book management tool, that not only facilitates format conversion but also enables users to fetch e-books from the Internet. For those who want active and engaging learning, KLetres, Kanagram, KHangMan, and ulcc cater well for their needs. These tools not only enhance language learning experiences but also provide ample opportunities for active and engaging learning.

## Arts

Gimp and Inkscape are commonly used for image manipulation and graphics design for professionals. Also in Edubuntu is LibreCAD, a specialized CAD/CAM design and drawing application. Dia is an application for drawing a flowchart or a diagram. In addition, kids can enjoy drawing on TuxPaint. These tools foster creative expression as well as enhance visualization skills that are increasingly valued and promoted in the innovation-driven, knowledge-based economies of the twenty-first century.

## Applications emphasizing particular skills

There are numerous pre-package applications offering students the opportunity to enhance critical thinking, logical reasoning, and analytical skills. By adopting a gamified approach, learners are engaged in a diverse range of idea generation and creative endeavors. These applications help facilitate the process of analyzing and refining new ideas.

## gBrainy

Games and challenges can elevate learner motivation by arousing curiosity and intrigue. One example is gBrainy, which is a brain teaser application with four types of exercises: (1) logic puzzles, (2) mental calculations, (3) memory trainers, and (4) verbal analogies. The application keeps historical scores for comparison among exercises.

## gCompris

GCompris is designed to help children engage in analytical reasoning and develop an understanding of relationships between numbers while learning basic arithmetic functions. It offers more than 100 activities inside to enhance children's skills in computing, reading, arithmetic, science, geography, gaming, and other areas (KDE, 2024).

## Technology

Fritzing is a circuit design tool that a teacher may utilize to teach electronics. The tool produces realistic artwork of a printed circuit board (PCB). During the design process, students can choose from various electrical components (e.g., resistor, transistor, integrated circuit, switch, LED) and board components from vendors such as Arduino, Spark, and Intel, and place them on the breadboard. Students can manually connect the components or request an autoroute to automatically wire the connections. Once the PCB design is completed, the schematic drawing can be exported for creating authentic prototypes. Additionally, the real PCB can be ordered directly from the application and manufactured by Fritzing Fab in Germany.

Three applications are included for teaching programming. One is Kturtle, which teaches programming basics by controlling the movement of a turtle through a program script. Basic256 is an IDE to teach middle to high-school students with the BASIC language. It has output windows in both text and graphics. The other is Laby, which teaches simple C, C++, or Perl languages by controlling the movement of an ant robot to find an exit from a labyrinth.

Elementary students are able to enjoy a typing game on Tux Typing. A mature learner may prefer a more formal practice typing tutor with Klavaro, providing correct typing instruction and improving typing speed.

## Games

The gamification of learning is increasingly relied upon to engage learners. Edubuntu includes games suitable for young learners. Jigzo offers simple jigsaw puzzles, while Blinken is an educational game designed to help learners promote their cognitive abilities and pattern recognition skills. The game presents a sequence of colors and asks the player to memorize the order of flashing lights on the screen. As the levels progress, the sequences become longer and more challenging. In effect, Ri-li is a fun arcade-style game where players control a train's movement with precise input. Along the way, Ri-li helps learners improve their coordination between screen visuals and hand movements.

## Mnemosyne

Flash cards are a widely used memory technique in learning. This application is a flash card study program designed to help learners remember new vocabulary or associations with images. It includes a flash card browser for managing flash cards, allowing users to schedule their learning sessions and view statistics, such as retention scores.

## Edubuntu for teaching and learning

Edubuntu has the potential to be utilized in instructional design. The following section presents two examples of how Edubuntu can provide teachers with valuable tools to educate their students. Possible applications of Edubuntu in

higher education are also discussed.

## Teaching computational thinking with Edubuntu

Computational thinking (CT) has received enormous attention from educators and policymakers worldwide, aiming to integrate it effectively into early-level curricula (Kotsopolous et al., 2017). CT, regarded as the third fundamental element in scientific research alongside theory and experimentation (Cansu & Cansu, 2019), notably influences problem-solving methods (Oden & Ghattas, 2014). Essentially, CT explores merging human thought with computer technical capabilities to enhance problem-solving processes. Recent progress in computer science education includes the use of coding, graphical interfaces, hybrid models, and unplugged activities to foster K-12 learners' computational thinking skills (Taub et al., 2012; Voogt et al., 2015; Weintrop et al., 2016).

Scholars have examined the process of teaching computational thinking and synthesized it into a framework of pedagogical experiences for CT including unplugged, tinkering, making, and remixing (Kotsopolous et al., 2017). Unplugged experiences typically involve no technology, whereas the rest require the use of a computer device. Tinkering refers to making changes to existing examples to learn the effect of such changes. Essentially, tinkering entails trial and error approaches to continually refine or improve the process or product. In contrast, making refers to creating a new object or artifact from scratch. The process of making engages the learner in designing or generating products. Finally, remixing refers to the ability to reuse other objects as a component in solving a computational problem.

In addition to the teaching of CT, an article "Exploring Computational Thinking," from the Google Research team (Kao, 2010) defines the cognitive thought process of CT: decomposition, pattern recognition, abstraction, and algorithms. The process starts with a problem or task, which the student decomposes into several subproblems. Once recognizing repeated patterns or sequences, the student comes up with a reusable function and/or looping of the steps. Abstraction transforms the problems into commands and variables. Then, algorithms can be designed to solve each specific subproblem.

The pedagogical framework for CT provides guidance for teachers in creating effective learning activities (Kotsopoulos et al., 2017). Additionally, Google's cognitive thought process offers teachers a means to evaluate students' understanding and proficiency in CT (Kao, 2010). Notably, suggested Edubuntu applications may combine pedagogical roles and cognitive thought processes in designing the learning instruction, as summarized in Table 2.

To implement the Edubuntu application, GCompris is a great option for introducing young children to the basic programming concepts. For example, in the Simplified Tower of Hanoi game, children transfer stacks from one tower to another, and, in the process, they learn to create systematic and logical steps that process inputs and generate outputs. Such a procedure fosters algorithmic thinking through

Table 2: Edubuntu applications with their pedagogical roles and thought processes.

Application	Pedagogical Roles (Kotsopolous et al., 2017)	Thought Processes (Kao, 2010)
GCompris (Simplified Tower of Hanoi)	Tinkering, Making	Algorithms
GCompris (A sliding-block puzzle game)	Tinkering	Algorithms
GCompris (Path encoding /Path decoding)	Tinkering	Abstraction
Ri-li	Tinkering	Decomposition
GCompris (Programming maze)	Making	Algorithms, Decomposition
KTurtle	Tinkering, Making, Remixing	Pattern recognition, Abstraction, Algorithms
Laby	Tinkering, Making, Remixing	Decomposition, Pattern recognition, Abstraction, Algorithms

trial and error as they solve the problem. Another game, Programming maze, prompts children to guide a penguin to its destination by organizing a simple sequence of actions (see Figure 6). This activity teaches them to select actions and create foundational sequences, nurturing their algorithmic thought process.

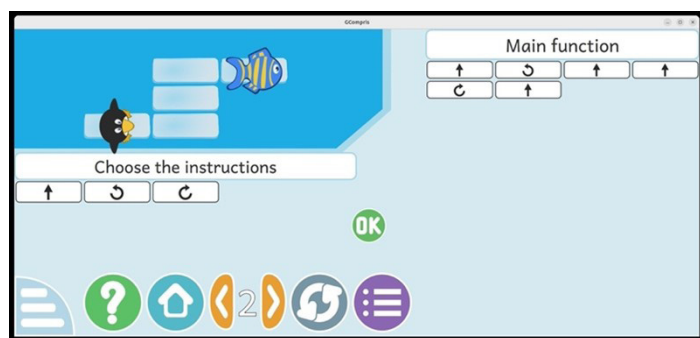


Figure 6: GCompris (Programming maze).

KTurtle is a valuable tool for teaching CT skills. Through scenario-based teaching, students engage in activities where they replicate movement patterns through coding scripts. Beginners can learn and experiment with TurtleScript examples provided. The application enables students to modify code and observe changes in the turtle's movements on the screen, fostering exploration and experimentation. Figure 7 illustrates how KTurtle utilizes TurtleScript for programming. The application also provides ready-made code for the students to reuse in their assignments. For example, if students want to set the canvas size to be 200x200 pixels and the canvas color to black, they can issue these commands:

```
canvassize 200,200
canvascolor 0,0,0
```

In the application, students begin creating their own code by learning concepts such as variable assignment, mathematical operations, Boolean logic, and comparing operators. For example,  $\$n=1$  and  $\$answer = 10 > 3$ . Students can also attempt to remix the code by using these commands to move and control the turtle.

```
forward 20
turnright 30
```



Figure 7: KTurtle.

Finally, students learn how the pattern of coding was created using the conditional expression and loop expression based on the provided code.

```
If ($n == 1) {
    print "hello 1"
} else {
    print "hello not 1"
}
repeat 5 {
    forward 3
    turnleft 1
    backward 2
}
```

For a more enthusiastic learner, one may practice programming exercises in Laby, in which the learner will write or tinker a code in C, C++, or Perl. The objective of the application is to move an ant robot to the exit while avoiding an obstacle. The learner will become familiar with the syntax of the programming language, attempt to debug a program, and observe the resulting run. An example of C code in Laby is shown below:

```
#include "robot.h"
void ant()
{
    right();
    forward();
    take();
    left();
    forward();
    drop();
    escape();
}
```

The C commands in the ant() function are taken from the robot.h library. They are written to serve tasks specifically in Laby.

### Teaching geography with Edubuntu

Another prominent subject that Edubuntu can leverage is Geography. According to (Bednarz et al., 2013), geography is viewed as an essential skill/knowledge in the global economy and is mandatory in K-12 education in the United States. Geography is literally and figuratively a rather vast subject



area. It is not merely the factual information of specific places and locations. Geography addresses questions of “Where?” and “Why there?” (Roberts, 2003). It also involves the human, event, and time dimensions that interrelate with the locations. In Geography for Life, geography skills consist of: (1) asking geographic questions, (2) acquiring and (3) organizing geographic information, and (4) analyzing, and (5) answering geographic questions (Heffron & Downs, 2012).

With GCompris, young learners at primary school level attempt to locate the country and region in “Locate the countries” and “Locate the region” activities by matching the given shapes to the location on the map (see Figure 8). Moreover, young people can learn about important landmarks from the “Explore monuments” activity.

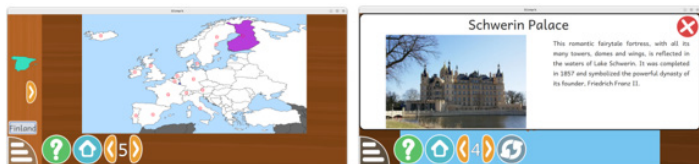


Figure 8: Locate the region (left), explore monuments (right).

A similar place-matching activity is present in KGeography, functioning at a more difficult level due to no boundary clues between the regions (see Figure 9). Knowledge acquisition of capitals and flags of provinces are included in the form of questions and answers.

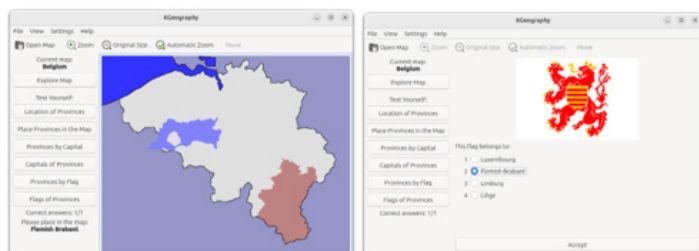


Figure 9: Region placement activity in KGeography (left), questions about flags (right).

A more advanced geography lesson can be conducted with Marble. Although Marble is not a Geographic Information System (GIS) tool, it can easily be used for inquiry-based learning. For example, the teacher may ask a student, “Where is Kota Kinabalu?” and “What is the distance between Bangkok and Singapore?” The student needs to query the location from the search box and then practice measuring the distance on the map (see Figure 10). Marble can also perform area measurements from a polygon created by measurement points. More sophisticated learners may create new maps by themselves that can be viewed on Marble. With some guidance from the teacher, students are able to develop their spatial thinking and can become active learners using the aforementioned geography skills.



Figure 10: Inquiry-based learning on Marble.

## Edubuntu for higher education

Pre-service teachers, who enroll in an undergraduate Education program, will find Edubuntu particularly beneficial due to its comprehensive collection of software for K-12 and elementary schools. They can apply theoretical knowledge in teaching pedagogy and demonstrate it on the Edubuntu platform in various subjects as discussed earlier. Before employing it in a real classroom, pre-service teachers need to be competent in this technology-enhanced learning tool. Fortunately, many of the skills learned in Edubuntu are transferable to other general Unix OSs; for example, to the macOS which is well-known for all Apple notebook users.

The Edubuntu OS itself is worth an exploratory topic in the Operating Systems course in the Computer Science department. Since Edubuntu is a flavour of Linux, the students may be asked to create another flavour of Ubuntu which targets a different domain of interest, such as healthcare, entertainment, business and entrepreneurship, etc. By dissecting the system design of Edubuntu, the instructor can guide the development of different tools and features of new Ubuntu flavours such as the resource management, real-time scheduling, and interface design.

## Analysis of Edubuntu under the instructional software design standard

The framework to design an educational OS is not found in the literature. Nevertheless, in this paper, we adopt the standards for instructional computing software design and development (Schaefermeyer, 1990) in order to analyze Edubuntu. Over three decades ago, Schaefermeyer (1990) identified the minimum characteristics that any educational software should include. Four key criteria are detailed below.

### 1. Design of learning activities

This standard refers to the matching of learning activities with the learning objectives. Also, the targeted audience should be specified. In Edubuntu, the learning objectives depend on each installed software tool, but they may not be clearly stated in the documentation as most instructions in the Help section only explain how to use such software. For the targeted audience, Edubuntu allows administrative setting options to select student levels, as mentioned in the Edubuntu 24.04 general specification section. After choosing the student level, the list of available applications is customized accordingly.

## 2. Identify the curriculum role used

There are three curriculum roles: (1) Adjunct, (2) Mainline, and (3) Management (Cohen, 1983). Adjunct role refers to a supplementary resource or instructional material to the regular curriculum. Mainline is a unit that is used as a complete subject, which may include tests and tutorials. Management relates to the learning records, data analysis, and measurement of outcomes. Edubuntu software primarily assumes an adjunct role as software developers for the various tools normally creates an application focusing on a particular knowledge or skill. In some applications, there may be a management feature in storing the learning progress or analyzing the learning outcome.

## 3. Identify mode of instruction to be employed which best achieves the objective

In the literature, there are five modes of instruction: (1) drill and practice, (2) tutorial, (3) games, (4) simulation, and (5) problem solving. Depending on each application, one or more modes of instruction can be facilitated. For example, GCompris includes all the modes of instruction while Light Speed! and Fritzing entail the simulation mode.

4. Other standard aspects that are found in Edubuntu include making the program menu driven, formatting instructional text for screen display, embedding graphics into content, using feedback appropriately, and employing random generation. These aspects and features are included in most Edubuntu applications.

## Recommendations for educational OS design

From our scrutinization of Edubuntu and briefly scanning other educational OSs, we outline the following key consideration factors in designing an educational OS.

### 1. Light weight

Light weight means the OS consumes small CPU and memory resources. Due to the digital divide, the PCs or notebooks in remote schools do not generally have high specifications. They likely have relatively low-performance CPU and small amount of memory. To capture the greatest number of students, the OS should be light weight so it can run on an older machine.

### 2. Able to run offline

Again, due to the digital divide, the schools in remote area may have limited Internet access. The OS as well as its educational applications should be able to operate without the Internet. Once the OS is installed on the machine, it shall not require further online connection to run.

### 3. Packing with comprehensive educational applications

In general, the educational OS shall contain applications to support teaching and learning in several subjects and student levels. The purpose of each application may attempt to improve knowledge in a particular subject or skills in general such as creativity, problem-solving, logical thinking, etc.

### 4. Ease of installation or can run without installation

The OS installation shall be done by a person with basic computer knowledge in less than an hour. In the case of Edubuntu, the OS is packaged within a standard USB flash drive. The installation can be done easily on a machine with a standard USB port, without an Internet connection. It can even run by itself as well without installation in a trial mode.

### 5. Low-cost or free

Open-source Linux-based OS normally provides free license and usage. This fits well in schools or countries with low income. However, we should not interpret that the free OS will provide low-quality educational content. That normally depends on the application inside and many high-quality well-known educational software is free such as Scratch (Scratch Foundation, n.d.).

### 6. Attractive and colorful user interface

As with standard educational software, colorful icons and user interface attract students and learners to be more engaged in the learning content. The OS may include several themes that customize visual style.

### 7. Customizable according to the student level or interest

For example, the menu and list of software available can be customized according to the student level or interest. More granularity of the selected options enables more personalized learning. Ease of customization also encourages wider adoption of the OS.

### 8. Able to update or install a new application as needed

As knowledge and skills are constantly changing, new applications addressing those needs shall be easily downloaded from the Internet. A team of developers is required to constantly take care of the OS maintenance and software repository update, as well as new major and minor releases.

## Conclusions

Various forms of media have demonstrated their positive impact on students' learning. However, each of these forms of learning media has distinct qualities that, when effectively

integrated, can enhance students' comprehension and skill development (Kozma, 1994). The lessons learned from the OLPC initiatives have emphasized that having a technology tool or device alone is insufficient. It is also crucial to incorporate pedagogical aspects in order to effectively facilitate students' learning and harness the potential of the tool in alignment with their educational objectives.

Without a doubt, the skills and competencies needed to successfully function and innovate in this global world are dramatically expanding. At the same time, new pathways to educational resources and opportunities are needed; in particular, for those in the Global South (Gunawardena, 2014; Zhang et al., 2020). Before Internet access expands globally (*The Economist*, 2019), the world community desperately needs to find and test low-cost solutions. Open-source software platforms like Edubuntu are one such solution. Since Edubuntu can be used in an offline mode, there are fewer technical issues and access concerns, making it an ideal solution for regions of the world with limited internet access and low-capacity hardware (Gunawardena, 2014; Zhang et al., 2020; Schotgues, 2022).

The tools and applications now available in Edubuntu are rapidly expanding and potentially transforming learning possibilities for learners ranging from the young to the more seasoned and from those living in the Global South to the Global North. The time is ripe to rapidly install and revisit research on this OSS platform, and, in the process, stretch human learning for many into new and uncharted territories where researchers can document novel uses of this learning platform as well as monitor and analyze significant areas of high impact and predict and promote pristine regions waiting to be explored and mined. The overhaul and rebirth of Edubuntu should be welcomed and embraced by educators, shared and utilized with learners, and documented and reported by researchers.

## References

Ames, M. (2021, October 27). Laptops alone can't bridge the digital divide. *MIT Technology Review*. <https://www.technologyreview.com/2021/10/27/1037173/laptop-per-child-digital-divide>

Barbareev, K. (2015, September 24-26). Between traditions and innovations in the system of training of teachers [Paper Presentation]. *17th International BASOPED Conference - Traditions and innovations in the education of the Balkan countries*, Varna, Bulgaria.

Baru, M., Khan, F., & Iyer, S. (2009). Computer Masti: Use of FOSS for teaching computers in Indian primary schools. *National Conference on Open Source Software, Mumbai, India*. [cm-ncoss09.pdf](http://cm-ncoss09.pdf)

Bednarz, S. W., Heffron, S., & Huynh, N. T. (2013). A road map for 21st century geography education. *Geography education research. Recommendations and Guidelines for Research in Geography Education*.

Butler, S., Gamalielsson, J., Lundell, B., Brax, C., Mattsson, A., Gustavsson, T., Feist, J., Kvarnström, B., & Lönroth, E. (2022). Considerations and challenges for the adoption of open source components in software-intensive businesses. *Journal of Systems and Software*, 186, 111152. <https://doi.org/10.1016/j.jss.2021.111152>

Canabrava, T., & Cord-Landwehr, A. (2015). *The Rocs handbook*. KDE documentation. <https://docs.kde.org/stable5/en/rocs/rocs/index.html>

Canonical Ltd. (2024). *Ubuntu flavours*. <https://ubuntu.com/desktop/flavours>

Cansu, S. K., & Cansu, F. K. (2019). An overview of computational thinking. *International Journal of Computer Science Education in Schools*, 3(1), 17-30. <https://doi.org/10.21585/ijcses.v3i1.53>

Cohen, V. B. (1983). Criteria for the evaluation of microcomputer courseware. *Educational Technology*, 23(1), 9-14. <http://www.jstor.org/stable/44423772>

Edubuntu. (2024, October 15). In *Wikipedia*. <https://en.wikipedia.org/wiki/Edubuntu>

Eickmeyer, E. (2022, December). Announcing Edubuntu revival. *Ubuntu Community Discourse*. <https://discourse.ubuntu.com/t/announcing-edubuntu-revival/32929>

Eickmeyer, E. (2024, April 25). Edubuntu 24.04 LTS released. *Ubuntu Community Discourse*. <https://discourse.ubuntu.com/t/edubuntu-24-04-lts-released/44455>

Graber, S. (2016, March 21). *Edubuntu 16.04 and beyond*. Ubuntu Mailing Lists. <https://lists.ubuntu.com/archives/ubuntu-devel/2016-March/039281.html>

Gunawardena, C. (2014, March 19). MOOCs: Students in the global south are wary of a 'sage on the stage.' *The Guardian*. <https://www.theguardian.com/education/2014/mar/19/cost-barrier-students-global-south>

Hansen, P. B. (1973). *Operating system principles*. Prentice-Hall Inc., United States.

Heffron, S. G., & Downs, R. M. (2012). *Geography for life: National geography standards* (Second Edition). Washington, DC: National Council for Geographic Education.

Huang, X., Zou, D., Cheng, G., Chen, X., & Xie, H. (2023). Trends, research issues and applications of artificial intelligence in language education. *Educational Technology & Society*, 26(1), 112-131. [https://doi.org/10.30191/ETS.202301\\_26\(1\).0009](https://doi.org/10.30191/ETS.202301_26(1).0009)

Hwang, G.-J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, 1, 100001. <https://doi.org/10.1016/j.caeai.2020.100001>

Kao (2010, October 25). Exploring computational thinking. *Google Research Blog*. <https://research.google/blog/exploring-computational-thinking>

- KDE (2024, December 8). *GCompris*. <https://www.gcompris.net/index-en.html>
- KDE (n.d.). *Cantor - KDE's frontend to mathematical applications*. <https://cantor.kde.org>
- Kotsopoulos, D., Floyd, L., Khan, S., Namukasa, I. K., Somanath, S., Weber, J., & Yiu, C. (2017). A pedagogical framework for computational thinking. *Digital Experiences in Mathematics Education*, 3, 154-171. <https://doi.org/10.1007/s40751-017-0031-2>
- Kozma, R. B. (1994). Will media influence learning? Reframing the debate. *Educational Technology Research and Development*, 42, 7-19. <https://doi.org/10.1007/BF02299087>
- Oden, T., & Ghattas, O. (2014, January). Computational science: The "third pillar" of science. *TAMEST News*. <https://tamest.org/news/newscomputational-science-the-third-pillar-of-science/>
- OLPC. (2005). *About OLPC*. <https://laptop.org/aboutolpc/>
- OLPC. (2013, August 5). *Software components*. [https://wiki.laptop.org/go/Software\\_components](https://wiki.laptop.org/go/Software_components)
- Özusağlam, E., & Poşpoş P. (2016). Comparison of open source softwares in mathematics education. *Konuralp Journal of Mathematics*, 4(1), 225-238.
- Pan, G., & Bonk, C. J. (2007a). The emergence of open-source software in China. *International Review of Research in Open and Distance Learning*, 8(1). <https://doi.org/10.19173/irrodl.v8i1.331>
- Pan, G., & Bonk, C. J. (2007b). The emergence of open-source software in North America. *International Review of Research in Open and Distance Learning*, 8(3). <https://doi.org/10.19173/irrodl.v8i3.496>
- Roberts, M. (2003). *Learning through enquiry: Making sense of geography in the key stage 3 classroom*. Geographical Association.
- Rudolph, J., Tan, S., & Tan, S. (2023). War of the chatbots: Bard, Bing Chat, ChatGPT, Ernie and beyond. The new AI gold rush and its impact on higher education. *Journal of Applied Learning and Teaching*, 6(1), 364-389. <https://doi.org/10.37074/jalt.2023.6.1.23>
- Schaefermeyer, S. (1990). Standards for instruction computing software design and development. *Educational Technology*, 30(6), 9-15. Standards for instructional computing software design and development | Educational Technology
- Schotgues, B. (2022). Sub-Saharan teachers' conditions and circumstances: A review. *Journal of Applied Learning and Teaching*, 5(2), 10-22. <https://doi.org/10.37074/jalt.2022.5.S2.5>
- Scratch Foundation. (n.d.). *About Scratch*. <https://scratch.mit.edu/about>
- Sheppard, S. (2012). *Visualizing climate change*. <http://dx.doi.org/10.4324/9781849776882>
- Souter, D. (2021, January 13). Inside the digital society: Lessons from little laptops. *LSE Blog*. [https://eprints.lse.ac.uk/108802/1/parenting4digitalfuture\\_2021\\_01\\_13\\_one\\_laptop\\_per.pdf](https://eprints.lse.ac.uk/108802/1/parenting4digitalfuture_2021_01_13_one_laptop_per.pdf)
- Talib, M. A., Einea, O., Nasir, Q., Mowakeh, M. F., & Eltawil, M. (2019). Enhancing computing studies in high schools: A systematic literature review & UAE case study. *Heliyon*, 5(2), e01235. <https://doi.org/10.1016/j.heliyon.2019.e01235>
- Taub, T., Armoni, M., & Ben-Ari, M. (2012). CS unplugged and middle-school students' views, attitudes, and intentions regarding CS. *ACM Transactions in Computing Education*, 12(2), 1-29. <https://doi.org/10.1145/2160547.2160551>
- The Economist*. (2019, June 8). The second half of humanity is joining the internet: They will change it, and it will change them. *The Economist*. <https://www.economist.com/leaders/2019/06/08/the-second-half-of-humanity-is-joining-the-internet>
- Ubuntu Community. (2013, May 27). *Ubuntuschools*. Ubuntu Wiki. <https://wiki.ubuntu.com/Education/UbuntuSchools>
- van Rooij, S. W. (2019). Adopting open-source software applications in U.S. higher education: A cross-disciplinary review of the literature. *Review of Educational Research*, 79(2), 682-701. <https://doi.org/10.3102/0034654308325691>
- Voogt, J., Fisser, P., Good, J., Mishra, P., & Yadav, A. (2015). Computational thinking in compulsory education: Towards an agenda for research and practice. *Education and Information Technologies*, 20(4), 715-728. <https://doi.org/10.1007/s10639-015-9412-6>
- Weintrop, D., Beheshti, E., Horn, M., Kai, O., Jona, K., Trouille, L., & Wilensky, U. (2016). Defining computational thinking for mathematics and science classrooms. *Journal of Science Education and Technology*, 25(1), 127-147. <https://doi.org/10.1007/s10956-015-9581-5>
- Zhang, K., Bonk, C. J., Reeves, T. C., & Reynolds, T. H. (Eds.). (2020). *MOOCs and open education in the global south: Challenges, successes, and opportunities*. Routledge. <https://doi.org/10.4324/9780429398919>

Copyright: © 2025. Poramate Tarasak, Curtis J. Bonk and Suthiporn Sajjapanroj. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

---

## Syndicates, mafias, and extortioners: The guerilla leadership in the higher education institutions in India

---

Sayan Dey<sup>A</sup>

A

*Assistant Professor, Department of English Studies, Bayan College (affiliated with Purdue University Northwest), Oman*

---

### Keywords

Guerilla leadership;  
higher education;  
India;  
mafia;  
syndicates;  
'threat-fire-silence'.

---

### Correspondence

sayandey89@yahoo.com <sup>A</sup>

---

### Article Info

Received 31 October 2024

Received in revised form 5 January 2025

Accepted 6 January 2024

Available online 3 February 2025

**DOI:** <https://doi.org/10.37074/jalt.2025.8.1.18>

### Abstract

With the National Education Policy (NEP) 2020, the higher education systems in India are subjected to rapid infrastructural, cultural, and pedagogical transformations. Due to the rapidity, the quality of the changes is highly questionable, and the quantity of academic productions is getting increasingly incentivized. To institutionalize a fast-paced development syndrome, it is essential to embrace brutal, abusive, devastating, dictatorial, and unauthorized approaches. To ensure that the leadership committees in the higher education institutions are filled with syndicate owners, mafias, and extortioners, who, with fake or paid and purchased degrees, make themselves look qualified for posts like chancellors, pro-chancellors, vice-chancellors, deans, program directors, registrars, and other relevant posts. In the name of quality management and intellectual rigor, they develop 'stick and whip' and 'hire and fire' systems and compel the staff and students to conform. Anyone failing to conform is subjected to verbal abuse in front of their colleagues and students, penalized with unethical salary cuts, and threatened with job losses. Due to the political connections of the leadership management, the workers and students feel discouraged from taking legal action against them. In this way, the institutions, from an intellectual and knowledge-making resource, are transforming into an operational ground for mafias, syndicates, and extortioners. They treat the staff and students as private money-vending, profitmaking, and promotion-making machines. Through different personal and collective workplace experiences, this opinion piece unfolds how the mafia culture of 'threat-fire-silence' is normalized and the irreparable damage it is causing to the higher education culture in India.

## Introduction: Universities as mafia syndicates

While working in my previous institution in Bangalore, I learned that a colleague had been fired on short notice. Half an hour before the conclusion of the office hours, a member from the Human Resources Department (HRD) called him to the office, ordered him to surrender the identity card, and showed him the door. When asked why, he was informed that his department and the university were not satisfied with his academic and professional conduct and, therefore, with the order of the higher administration, he was fired. Stunned, he left the campus. He was not allowed to defend himself. Before leaving, when he asked the HRD to show him the termination order, he was threatened that he would not receive his remaining payments if he asked too many questions. This is how a lot of universities in India function as a 'guerilla' university, where threatening, annihilating, and abusive behaviors are normalized as quality management and workplace discipline. This is not only his experience, but several other teaching and nonteaching staff underwent similar experiences. They were fired on short notice without sufficient justifications. A deeper investigation and analysis from the concerned staff by personally conversing with the people who have been fired revealed that their hiring process was a mere gimmick to achieve specific accreditation goals.

According to the National Assessment and Accreditation Council (NAAC), one of the many parameters for measuring a higher education institution's academic and research quality is a balanced student-teacher ratio, which was absent from the previous workplace. Like many other revenue-based private institutions, the number of teachers is much lower than that of students. To hide that, irrespective of a lack of subject-matter expertise, a large number of faculty members with meagre salaries were hired to showcase a balanced teacher-student ratio. Once the process was completed, they were fired. Deeply concerned, I and many staff raised complaints against this 'hire and fire' culture, but they were silenced through threats and rebukes. We were told that we had to conform to the collective vision of the university or else we had to find a different workplace. To further systematize such abusive workplace approaches, the year-end appraisal parameters are fixed based on the extent to which staff has abided by the top-down, dictatorial attitudes of the university management.

Within a few weeks of my joining the university, the Pro-Chancellor's Office organized a university-wide meeting to explain to the teachers how the performance appraisals of the faculty are determined. The Pro-Chancellor started the meeting with a boastful smile about how the university has 'successfully' established uniform operational procedures and how the staff have extended their 'generous support' towards its future vision. During the meeting, many staff raised concerns about excessive teaching hours, poor administrative support, the crisis in research grants, and the compulsion for rapid publications and attending conferences. All these complaints were silenced by blaming the staff for not wanting to work sincerely for the overall development of the institution and warning them that they would be penalized if they did not align with the vision of the university. Such normalizations of arrogance, pretensions, and manipulations are not limited to my previous workplace

but can be observed in other higher educational institutions as well, where the values of mutual respectability, caring, and sharing are obliterated through conformist, dictatorial, abusive, intellectually suffocating, and guerilla norms and conditions (Clark, 2008; Sokhey & Hanson, 2022).

The purpose of writing this opinion piece and sharing these experiences is not to rant bluntly but to provoke collective and systematic anger as a tool of resistance (Fink et al., 2022) to interrogate mafia-like, extortionist leadership structures and bulldoze them. I would also like to clarify that by using anger as a form of resistance, I do not provoke any form of physical violence. On the contrary, my opinion piece invites people with similar experiences and others to generate resistance beyond personal grudges in well-researched, ideologically aggressive, structured, and logical ways so that the unethical profit-oriented guerilla syndicates in higher education institutions can be publicly exposed and staff and students can be efficiently warned against being entrapped. The opinion piece does not intend to outline a list of solutions. However, the 'Postscript,' apart from sharing the painful experience of writing this piece, outlines a few possibilities through which we can "learn and grow" (Brookfield et al., 2024, p. 181) as teachers, workers, and administrators in collective, respectful, and human ways.

## Research methods

The arguments in this research have been shaped through personal interviews with teaching staff from my previous university in Bangalore and other parts of the country, like New Delhi and Hyderabad. The participants who have been chosen are ex-teaching staff of universities who have been victims of the mafia-like leadership system of private universities in India through unethical job terminations and pay losses. Based on my expertise and experiences, the conversations have been limited to participants from private universities in India. The participants were chosen based on their consent, and pseudonyms were used to protect their identities. Four individuals (one from Hyderabad, two from Bangalore, and one from New Delhi), three males and one female, have participated in the conversation, and their ages range between 35 and 45 years. The interviewees were chosen based on their consent and availability and their names have been anonymized. The experiences shared by the participants overlap with many of my colleagues in my previous workplace and other private higher-ed institutions in India. However, out of fear of job losses and legal consequences, they could not consent to the conversations. All four participants were asked open-ended questions, and the conversations started by asking them to share their working experiences with their previous employers and on what basis their jobs were terminated.

The discussions with the participants in Bangalore took place in person, and online interviews were conducted for the rest. The in-person interviews were conducted through walking research methods. Walking interviews focus on life stories and "ethnographic, visual, and participatory approaches" to explore "lived experiences ('lived lives') within the broader social structures, contexts, and processes of our social worlds" (O'Neill & Roberts, 2020, p. 1). While

conversing, we (the participants and I) walked around the university campus and nearby cafeterias, which enabled us to document the perspectives in physically and emotionally relatable ways. Walking conversations helped us understand the experiences within specific institutional and situational contexts.

### Personal and collective experiences

Sawant (name changed), a 38-year-old, was terminated from his job within less than 24 hours. He worked for six years at a private university in New Delhi as a sociology faculty member at the School of Social Sciences. His professional conduct at the university was deemed 'unacceptable', and the "institution leadership felt that it was harmful to the university's future" (personal communication, 2024). The actual reason was that he questioned the management about their violation of job contracts of the faculties in the university by compelling them to work beyond office hours, converting public holidays and weekends into workdays, and not paying salaries on time. Initially, the management ignored his complaints, but as he started receiving support from the faculties, he was threatened with pay and job losses. Eventually, the management started harassing him with unethical pay cuts, cancelling sick leaves, and deliberately delaying his salaries. He shared: "One day, I was called by the registrar's and vice-chancellor's office and was threatened with severe legal and career consequences. The registrar told me that if I do not stop complaining and provoking other staff, then they will not only terminate me but also make sure that I am blacklisted from this profession altogether. They threatened me with the destruction of my career" (personal communication, 2024). After Sawant was terminated, his last working month's salary and his experience certificate were held back. As a result, he cannot seek a new job and has been pushed into a severe financial crunch. Like many others in India, Savant is a victim of the extortion-based, revenue-centric, guerilla university system of India, who, through flagging off genuine concerns, functioned as a barrier to the "banking rationale" of his university, where "knowledge, prestige, and privilege are deemed to be the currency to be accumulated" (Robb et al., 2024). His consistent resistance worried the university because it would publicly spill their money-making syndicates and may impact the volume of student registration.

The experiences of Anshul, a 40-year-old from a private university in Hyderabad, was no different. He worked as an Associate Professor at the School of Business Studies for a year. Like Sawant, he was terminated within a day because the university opined that he could not live up to the university's academic, intellectual, and infrastructural visions and ambitions. According to the guerilla management, his 'mistake' was to highlight aspects like overwhelming working hours, poor pay structures, imbalanced student-teacher ratio, and lack of research incentives. Initially, the management tried to ignore him by saying that his demands did not conform to the terms and conditions of the institution. But when he highlighted that his demands comply with the terms and conditions of the job contract and are categorically outlined in the contract papers which he was made to sign, he was subjected to legal threats.

Anshul said: "I was told that I should be silent and happy with whatever facilities have been provided and not complain too much. And if I am not happy with the workplace, I should simply leave and find a new job" (personal communication, 2024). He continued: "When I loudly protested against their threatening attitude, I was immediately fired, and my salaries and relieving documents have been held back till now". Anshul has been trying to use his legal connections to seek justice. Yet, it has been useless because his former employer has successfully bypassed the charges using political connections and bribery. Also, Anshul has received several threatening calls to drop the case against the institution. Anshul's experiences unpack the "organizational issues of power and control" (Hodgins et al., 2024, p. 2) that many higher education institutions in India face today. Threatening and conformist workplace environments convert educational institutions into real estate business zones, where workload models are "tweaked upwards, forcing even more hours into spreadsheets" (Andrew, 2023b, p. 395). To compel the staff to be a part of the real estate vision, the definitions of full-time work hours are consistently revised to "reduce hours for preparation, marking, research, scholarship, and service" (Andrew, 2023b, p. 395). To work in such intellectually clogged workplaces, one must celebrate and incentivize moneymaking schemes, or they would be subjected to threats, abuse, and terminations. This is how 'hire and fire' systems have normalized within India's corporate higher education institutions.

Revathy (name changed), a 42-year-old woman, and Prasanna (name changed), a 45-year-old man who worked in my previous workplace as Assistant Professors in the School of Engineering, are other victims of the 'hire and fire' system. They worked for five months and were fired without any reason within a 30-minute notice period. As they were preparing to complete their day, an HRD person barged into their staff room, pulled out their identity cards from their collars, and ordered them to leave. When asked why, they were informed that the university management was unsatisfied with their performance. When asked to share further details and show the order of the higher management, they were threatened by the HRD to keep silent; otherwise, they would not be paid their last working month's salary and would not be given the experience letter. Their termination was followed by a spree of terminations across the university in the following weeks, and all were shown the door under the excuse of "upgradation [sic!] of quality teaching faculty" (Revathy & Prasanna, personal communication, 2024). However, many colleagues closely linked to the university management revealed that despite a lack of requirements, individuals under the label of teaching faculties were hired to do the work required to visit the accreditation council. Instead of hiring administrative staff, the university hired teaching staff to do administrative work to kill two birds with one stone. On the one hand, they could showcase to the accreditation examiners that the university has a balanced teacher-student ratio, which, in reality, they do not have. Conversely, they could save on the costs of hiring dedicated administrative staff. To avoid ethical complications, the whole process was executed in a hushed way. Revathy and Prasanna revealed: "We had no idea we were scammed. Initially, we wondered why we were involved less in teaching and research and more in administrative

paperwork. However, our colleagues informed us that this is quite normal in private institutions. Therefore, we regarded it as something normal. Now, we understand that it was not" (Revathy & Prasanna, personal communication, 2024). These corrupted practices are strategically hidden under the vocabularies of 'cutting-edge development,' 'quality management,' 'infrastructural enhancement,' 'intellectual rigor,' and various others documented on display boards, job contracts, and policy books so that any kind of interrogations against the abusive and unethical approaches of the institutions can be systemically silenced (Osipian, 2008).

Although this opinion piece documents the experiences of four diverse participants, the experiences of several staff associated with other private universities are eerily similar. These experiences lead to irreparable damages in the form of mental traumas, withdrawal from academic professions, and intellectual sterilization. Since I started my teaching career at a university in 2018 in India, there have been innumerable times when I felt that the professional spaces in higher education did not belong to me. Due to my vocal attitude, in almost every institution where I have worked in India, I have been marginalized, and my viewpoints, feedback, and critique have been ignored in the name of 'greater welfare.' Also, my sick and emergency leaves were scrapped several times, preventing me from visiting my family during emergencies or taking leave during a health crisis. Being disappointed with the abusive, threatening culture of the university, when I sent my resignation to the university management, I flagged off the concerns that provoked me to take such a step. The letter was ignored entirely. The attitude of the management was that the letter had never been sent. Whenever I reminded the management about my concerns and that I would like to have a conversation with them, they pretended they were unaware of my email and would check and get back to me. Nobody wrote back to me. Moreover, as per the order of the leadership management, my last month's salary was held back without any prior notification, which made my exit process challenging. It was only after warning them of legal consequences that they paid my salary. Unlike the research participants and many others, I was not subjected to termination and threats. Yet, I cannot deny the level of mental harassment and trauma that I had to go through during the entire process, which once again provoked me to question my intellectual value and position in the higher education sector. Today, in India, we live in a time when brutal behaviors and psychological harassment of higher education staff are considered a usual part of the guerilla training processes in workplaces to achieve 'extraordinary' volumes of metrical achievements like rankings, student enrollments, and revenues.

### **Conclusion: Impacts on higher education systems**

The mafia-like, extortionist, guerilla leadership is erasing genuine scholars and their scholarships from the education systems and replacing them with revenue-generators, converting universities into breeding zones of threat, trauma, and destruction. The higher education workplaces in India are getting increasingly neoliberalized by "corporatising and commercialising universities and bringing with it corporate

cost-cutting" (Andrew, 2023a, p. 18). Neoliberal universities are "building real estate empires instead of funding academic positions" (Andrew, 2023a, p. 18), giving birth to a state of inescapable "stuckedness" (Hage, 2009, p. 467). According to Hage, stuckedness is a situation "where a person suffers from both the absence of choices or alternatives to the situation one is in and the inability to grab such alternatives even if they present themselves" (Hage, 2009, p. 467).

Despite being qualified to explore job opportunities in other institutions, the research participants either felt reluctant to explore due to their traumatic experiences or could not explore because of the relieving documents held back in their previous institutes. Their experiences have caused irreparable damage to their careers and the higher education system of India. The neoliberal dictatorial work cultures have gained further impetus with the Bharatiya Janata Party (BJP)-run government in India, which, through the National Education Policy (NEP) 2020, has been incentivizing quantity, rapidity, and revenues over quality, humanity, and intellectual growth. In the name of internationalizing and globalizing its higher education institutions, India's accreditation and education councils have chosen the pathway of quantity and mimicry rather than quality and originality. To elaborate further, to generate a fast-paced transformation process, higher education institutions have been encouraged to blindly mimic the infrastructures, curricula, and pedagogies of the Western higher educational institutions and implant them in India, without taking into consideration the local challenges and contexts (Kulal et al., 2024). To apply these visions, the only way out is to compromise with the quality of intellectual growth and dictate quantity, which has eventually invited mafias, syndicates, and extortioners within the higher-ed leadership management systems.

The frenzied and superficial roadmaps for development have given birth to cultures of trapping, threatening, and erasing opinionated people who do not conform to the extraction, exploitation, and revenue-generation practices the NEP has streamlined. As a result, gradually, academia is replacing academically and intellectually sound people with extortioners, mafiosi, and syndicates who can hire, fire, stick, whip, threaten, terrorize, and exploit workers as they please. My opinion piece intends to sensitize higher education professionals across India and the world against the abusive work culture of neoliberal educational institutions in India and why they should reconsider their decisions before getting affiliated with them. I am not sure what social, cultural, and professional consequences I may face in India for penning this piece, and honestly, I do not care. It is high time to expose the critical workplace conditions of neoliberal higher education institutions in India that are being systemically masqueraded under the sham of professional development, intellectual progress, and metrical extraordinariness as realistically as possible.

### **Postscript**

While writing this opinion piece, I encountered multiple mental breakdowns. The nightmarish experiences of working in my previous institution were continuously hitting back at me. Whenever I heard that a faculty member had



been terminated without notification, I feared the next turn would be mine. Who knew if I was also hired to fulfil some scam marketing and revenue-making project? On the one hand, I wanted to fearlessly flag off genuine infrastructural, cultural, and ethical concerns. On the other hand, I realized that my position in the institution was becoming increasingly vulnerable with every passing day. The anger and frustration in this opinion piece result from these experiences.

However, no matter how much we are intellectually and emotionally beaten, battered, and tortured by toxic teaching-learning environments, we need to take a deep breath, rise on our feet, embrace each other in tears, anger, and laughter, and co-build avenues of radical resistance and pedagogies. To stay engaged and navigate such problematic work ethics, it is crucial to learn “politically, ontologically, somatically, and emotionally” (Brookfield et al., 2024, p. 181) by working within “constraining structures, negotiate institutional barriers, and advocate for change that threatens institutional identity” (Brookfield et al., 2024, p. 181). Personally, every time the institution warned me how ‘professionally threatened’ they felt because of my outspoken approach, I felt more and more assured that my pedagogical and intellectual approaches were on the right track because, in neoliberal institutions, a critical mind is a threat to their blinded development visions.

More and more, our criticality is threatened; more and more, we need to advocate for it and voice it out loud – loud enough to be verbally, visually, and emotionally heard. To put it out straight, the increasing “top-down managerialism and the metrification of the academic work” (Fleming et al., 2021, p. 111; see Dey & Chakraborty, 2024) need to be permanently halted, and I believe that one of the initial initiatives is to identify the correct problems and expose the mortal dangers within the “privatised, corporatised, marketised, financialised neoliberal universities” (Fleming et al., 2021, p. 112).

Some of the ways in which problems like top-down managerialism can be identified and bulldozed are by establishing unofficial inter-faculty grievance cells and performing collective acts of refusals. The inter-faculty grievance cells need to be unofficially established in the forms of WhatsApp and telegram groups and online and physical meets outside the institutional spaces so that the perpetrating bodies within the institutions do not get a scope to interfere in the name of pseudo concerns and care. Every institution has officially established grievance cells that, theoretically, claim to address the concerns and grievances of the staff. However, such spaces are deeply clogged with the politics of exclusions and hierarchies. As a part of such politics, incidents that may publicly put the institution’s reputation, ethics, and prestige at stake are systemically shelved and submerged by either ignoring the complaints or threatening the complainants to remain silent. So, such official spaces are highly reliable. Therefore, to counter such spaces, it is crucial to generate unofficial online and offline locations of solidarities that are disentangled from the surveillance and censorship of the institutions, where individuals can unburden their concerns without the fear of being patrolled. These spaces can prove more effective than officially established bodies and can compel

the institution to surrender its corrupted stances and take action. For instance, in my previous workplace, once a series of emails from the registrar’s office dictating the faculties about abiding by mandates on dresses, working hours, and leisure time caused a massive stir.

At the beginning of one of the semesters, in the name of disciplining the faculties, the registrar’s office fleshed out strict guidelines for what qualifies to be formal wear for staff, designated times for lunch, breakfast, and snacks, and how staff at leisure hours are not allowed to sit in the canteens and cafeterias and relax. The emails also contained information about how staff may get fined and fired if found violating these norms. The language of the emails was profoundly concerning as it consisted of words and phrases that were arrogant, unprofessional, and threatening in nature. Some of the institution’s faculties collectively flagged this issue with the Human Resource Department, which did not pay any heed. Then, a group email led by senior faculty members who have been associated with the institution for over a decade was sent to the highest leadership of the institution, who highlighted how such norms and languages are detrimental to the intellectual and professional health of the institution. This email forced the registrar’s office to change its dictatorial attitudes, relax the norms, and communicate emails more humbly and professionally. This initiative was shaped by generating solidarities in privately and unofficially built discursive spaces.

Another effective way in which the syndication of academic institutions can be challenged is through silent practices of collective refusals. In connection to the abovementioned incidents, besides writing emails, several faculties decided that in their leisure hours, they would continue sitting in the cafeterias and canteens outside the designated time and let the institution act as they wished. Gradually, the act of silent refusal and defiance (Dey, 2023) multiplied with more and more faculties violating the norms, and the institution very soon realized that it could not convert an academic institution into a concentration camp of threats and dictatorial disciplines.

These initiatives are not sufficient; and more intra-institutional and inter-institutional refusals and resistance need to be generated. However, these possibilities at least open up pathways to how we should not fear and strategically navigate through the “heightened surveillance” (Brookfield et al., 2022, p. 132; see Diamantidaki & Kefalaki, 2021) of the peers and instructors. Let us not compromise from being critically reflective beings; let us do whatever needs to be done to ensure that.

## References

- Andrew, M. B. (2023a). Come to the cabaret: Voices from the modern university. *Journal of Applied Learning and Teaching*, 6(2), 17-27. <https://doi.org/10.37074/jalt.2023.6.2.19>
- Andrew, M. B. (2023b). Neo-liberalist capitalism, intensification by stealth and campus real estate in the modern university in Aotearoa/New Zealand. *Journal of Applied Learning and Teaching*, 6(2), 393-401. <https://doi.org/10.37074/jalt.2023.6.2.19>

Brookfield, S. D., Rudolph, J., & Tan, S. (2022). Powerful teaching, the paradox of empowerment and the powers of Foucault. An interview with Professor Stephen Brookfield. *Journal of Applied Learning and Teaching*, 5(1), 131-145. <https://doi.org/10.37074/jalt.2022.5.12>

Brookfield, S. D., Rudolph, J., & Tan, S. (2024). *Teaching well: Understanding key dynamics of learning-centered classrooms*. Routledge.

Clark, G. A. (2008). How academic corporatism can lead to dictatorship. *Nature*, 452, 151. <https://doi.org/10.1038/452151c>

Dey, S. (2023). Pedagogy of 'refusing' – Commentary to Siriwardane-de Zoysa, Sreekanta, Mwambari, Mehta and Majumdar. *Fennia*, 201(2), 273-276. <http://dx.doi.org/10.11143/fennia.126102>

Dey, S., & Chakraborty, A. (2024). Cargo cultism and whiteness syndrome: Fake internationalization of private universities of India. *Journal of Applied Learning and Teaching*, 7(1), 406-412. <https://doi.org/10.37074/jalt.2024.7.1.11>

Diamantidaki, F., & Kefalaki, M. (2021). Interdisciplinary studies in social sciences – Unmasking truths whilst nurturing new possibilities, a preface. *Journal of Education, Innovation, and Communication*, 3(1), 9-12. <https://doi.org/10.34097/jeicom-3-1-june21-0>

Fink, O., Leshem, O. A., & Halperin, E. (2022). Oppression and resistance – uncovering the relations between anger, humiliation and violent collective action in asymmetric intergroup conflict. *Dynamics and Asymmetric Conflict: Pathways towards Terrorism and Genocide*, 15(3), 210-223. <https://doi.org/10.1080/17467586.2022.2112408>

Fleming, P., Rudolph, J., & Tan, S. (2021). 'Never let a good crisis go to waste'. An interview with Professor Peter Fleming on dark academia, the pandemic and neoliberalism. *Journal of Applied Learning and Teaching*, 4(2), 110-120. <https://doi.org/10.37074/jalt.2021.4.2.14>

Hage, G. (2009). Waiting out the crisis: On stuckedness and governmentality. *Anthropological Theory*, 5(1), 463-475.

Hodgins, M., Kane, R., Itzkovich, Y., & Fahie, D. (2024). Workplace bullying and harassment in higher education institutions: A scoping review. *International Journal of Environmental Research and Public Health*, 21(9), 1-19. <https://doi.org/10.3390/ijerph21091173>

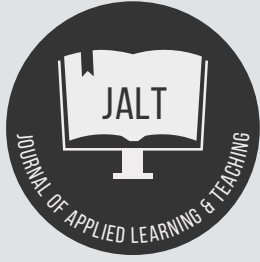
Kulal, A. N. A., Dinesh, S., Bhat, D. C., & Girish, A. (2024). Evaluating the promise and pitfalls of India's national education policy 2020: Insights from the perspectives of students, teachers, and experts. *Sage Open*, 14(4), 1-19. <https://doi.org/10.1177/21582440241279367>

O'Neill, M., & Roberts, B. (2020). *Walking methods: Research on the move*. Routledge.

Osipian, A. L. (2008). Corruption in higher education: Does it differ across the nations and why? *Research in Comparative and International Education*, 3(4), 345-365. <http://dx.doi.org/10.2304/rcie.2008.3.4.345>

Robb, J., Adefila, A., & Cordova, J. P. P. (2024, October 25). Journey without an answer: A postcolonial look at epistemic challenges for (un)learning in higher education. *Convivial Thinking*. <https://convivialthinking.org/index.php/2024/10/25/journey-without-an-answer/>.

Sokhey, S. W., & Hanson, M. (2022, September 20). *How higher education keeps dictators in power*. Jordan Centre for the Advanced Study of Russia. <https://jordandrussiacenter.org/blog/how-higher-education-keeps-dictators-in-power>.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

Book review of Benjamin Luke Moorhouse, Sandy S. C. Li, & Sebastian Pahs (Eds, 2024), *Teaching with technology in the social sciences*. Springer Singapore.

Bhaso Ndzendze<sup>A</sup>

A

Associate Professor, University of Johannesburg

DOI: <https://doi.org/10.37074/jalt.2025.8.1.3>

## Introduction

The onset of COVID-19 affected teaching and learning processes in profound ways. According to UNESCO, at least 80%, and as much as 94%, of enrolled learners had their learning disrupted by the pandemic (UNESCO, 2023). Educators and students the world over had to improvise so as to comply with the lockdown conditions introduced by most governments while still maintaining the learning process. In these efforts, technology proved invaluable. The pandemic has thus enhanced the utilisation of digital tools, but also the subgenre of the scholarship of teaching and learning (SoTL) which has a focus on technology. In the height of the pandemic, many educators were producing volumes of works reflecting, almost in real-time, on the advantages and lessons offered by the infusion of technology into their work. With the pandemic now firmly behind us, works reflecting on the pandemic are still being churned out, and offering invaluable lessons as we engage with technology as an important pillar in the future of education.

It is against this background that Moorhouse, Li and Pahs have produced the edited volume *Teaching with Technology in the Social Sciences*, published by Springer. The book consists of findings and reflections from Hong Kong Baptist University, many of whose educators introduced digital technology components into their classrooms, as well as student exchange and cultural immersion programmes in response to the pandemic. The academic component stems mainly from the social sciences, namely education, history, social work, sociology, as well as geography and energy studies.

The book is excellently introduced, with the editors explicating its overarching research question and rationale. In this regard, the reader is informed that the book seeks to advance a “greater understanding of how teachers in the various social science disciplines use technology for teaching and learning” in order to foster interdisciplinary lessons. The editors provide an overview of the power and limits of strictly disciplinary structures which have so far defined the academic enterprise. On the one hand, these well-defined fields have provided specialist knowledge that is organised. On the other, it has led to different modes



Figure 1: Book cover.

of researching and research dissemination, presenting an opportunity cost for lesson sharing. The book’s introduction also provides a useful overview of the different forms of technologies that have been integrated into classrooms: (1) presentation software, (2) videos to illustrate, and (3) learning management systems (LMSs). Alongside these, newer pedagogical tools have emerged, namely (4) blended

learning, (5) flipped classrooms, (6) gamification, (7) mobile apps, (8) and virtual reality and virtually augmented reality, including the post-2020 concept of the metaverse.

In total, the book is made up of an Introduction and nine substantive chapters. Chapter 2 ('Using Geographic Information Systems in a Spatial History Course to Develop Students' Digital Literacies and Digital Humanities Skills') by Kwong and Moorhouse provides an analysis of the introduction of Geographic Information Systems (GIS) into a Spatial History course. The aim was to develop digital literacy and digital humanities skills among history students. Chapter 3 ('Metaverse Sojourn: Incorporating Virtual Reality and Immersive Interactive Environment to Enhance Students' Sojourn Experiences') by Siu and colleagues describes the use of potential of the metaverse for cultural immersion and the creation of virtual interactive environments in Hong Kong Baptist University's sojourn programme.

Chapter 4 ('Online Delivery of Clinical Social Work Education: The Landscape of Narrative Therapy') by Chan and colleagues reflects on the application of an online private course for students in clinical social work. Chapter 5 ('Promoting Personalized and Blended Learning for Pre-Service Teachers') by Deng et al. points to the pedagogical benefits of personalised and blended learning for teacher educators. Chapter 6 ('Exploring Time and Space: Merging Historic and Contemporary Virtual Reality Technologies in the History Classroom') by Cobb demonstrates the promise held by virtual reality technologies for teaching history by helping students immerse themselves in historical contexts. Chapter 7 ('Building Cross-Cultural Academic Exchange with University Students During COVID-19 Through Online Deliberation: The Case of an Energy Studies Course in Hong Kong') by Cheung et al. describes the results of an online cross-cultural academic exchange that had participation by university geography students drawn from various international contexts during the COVID-19 pandemic. Chapter 8 ('Enhancing Students' Field Experience in Physical Geography Courses Using Virtual Reality Technology') by Li and Wu shows the results of the integration of virtual reality technologies into geography courses in order to provide virtual field trips. In Chapter 9 ('Lessons Learned and Future Directions for Teaching with Technology in the Social Sciences'), the book's editors reflect on their role within the project, and propose lessons learned and possible future directions.

The book is an important intervention in many respects, but three in particular are worth fleshing out. Firstly, it is a multifaceted, rigorous and frank assessment of the utility of technology in teaching and learning. For example, some of the educators ran surveys among their students, which provided a useful overview of the experiences of the students who were at the centre of this experimental period. Their perceptions are predictably mixed, with some agreeing that they found the process of learning through the new technologies to be engaging, but also noting their difficulties using the hardware as well as students' hesitance to move completely towards digital platforms such as the metaverse. Secondly, and despite its very unique and locale-specific origins, the book has lessons to offer beyond Hong Kong. The authors provide rich, practical detail of the steps

they took in migrating to the various digital platforms, or indeed creating some themselves; thereby making the book useful for any other teachers who may wish to replicate or improve upon their initiatives.

Thirdly, the book provides an analysis of the reasons for the still relatively low uptake of technologies. These are five in total, all mediated by context: (1) lack of hardware and other resources; (2) lack of technical capacity and know-how among teachers and students; (3) discipline-specific hesitations towards technology by some teachers; (4) rigidity in course structures within many institutions, which may prevent experimentation with technologies; (5) time constraints, which may mean there is an opportunity cost to the adoption of new technologies. "The digital tools teachers use, the way they use them, and why they use them, is linked to the mode and environment of teaching (modality), approach adopted in the discipline (pedagogies), and the knowledge and skills the teacher is aiming to develop in their learners (discipline-specific knowledge and skills)," they declare (p. 4).

Numerous other studies corroborate this conclusion. From China (Jiang et al., 2022), to India (Muthuprasad et al., 2021), to South Africa (Makananise & Madima, 2023) and Switzerland (Elmer et al., 2020), studies have shown that technologies are no substitute for teaching and learning. From my own experience in using technologies in my courses, students prefer technologies that enhance their experience by increasing and even diversifying, not replacing contact (with their fellow learners and the teacher). Its key strength lies in accommodating different learning styles and preferences among students. For example, some students may benefit from an in-person lecture to consolidate what they first encountered in a video made available to them through an LMS – or the other way around, wherein the lecture may provide first interaction with the lecturer and then use technologies to consolidate.

Context is thus an important facet in technology adoption or lack thereof. It is at the core of the book. Their final chapter is dedicated to overarching reflections from the project. In total, they offer four reflective lessons which are helpful and globally relatable: adopting a bottom-up approach, learning from one another, adapting to unforeseen events, and creating space for pedagogical experimentation.

### Additional references

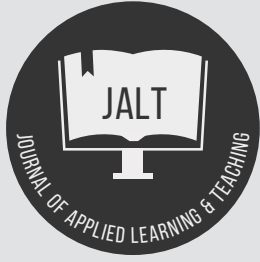
Elmer, T., Mephram, K., & Stadtfeld, C. (2020). Students under lockdown: Comparisons of students' social networks and mental health before and during the COVID-19 crisis in Switzerland. *PLoS ONE*, *15*(7), e0236337. <https://doi.org/10.1371/journal.pone.0236337>

Jiang, B., Li, X., Liu, S., Hao, C., Zhang, G., & Lin, Q. (2022). Experience of online learning from COVID-19: Preparing for the future of digital transformation in education. *International Journal of Environmental Research and Public Health*, *19*(24), 1-18. <https://doi.org/10.3390/ijerph192416708>

Muthuprasad, T., Aiswarya, S., Aditya, K., & Jha, G. K. (2021). Students' perception and preference for online education in India during COVID-19 pandemic. *Social Sciences & Humanities Open*, 3(1), 100101. <https://doi.org/10.1016/j.ssaho.2020.100101>

UNESCO. (2023, April). *1.37 billion students now home as COVID-19 school closures expand, ministers scale up multimedia approaches to ensure learning continuity*. <https://www.unesco.org/en/articles/137-billion-students-now-home-covid-19-school-closures-expand-ministers-scale-multimedia-approaches>

Copyright: © 2025. Bhaso Ndzendze. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.



Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

Book Review of Jürgen Rudolph, Joseph Crawford, Choon-Yin Sam and Shannon Tan. (Eds., 2024). *The Palgrave Handbook of Crisis Leadership in Higher Education*. Palgrave Macmillan.

Jennifer Skipp<sup>A</sup>

A

*Freelance, University of Luxembourg and Trier University, Germany*

DOI: <https://doi.org/10.37074/jalt.2025.8.1.11>

## Introduction and context

This volume is a timely addition to our reflections on and understandings of the 'polycrisis' that has affected Higher Education (HE) from both within and without. As the world grapples with the continuing effects of the three Cs: conflict, climate change, and COVID-19, a fourth C, ChatGPT, or, more accurately, artificial intelligence, has joined the list of challenges. Artificial intelligence presents a significant issue for Higher Education Institutions (HEIs) as they consider both its affordances and threats to teaching and learning in the future. However, even as we move forward, many HEIs are confronting the consequences of past decisions, specifically the 'businessification' of Higher Education. The outcomes of the neoliberal, corporatist principles around which much HE has arranged itself have significantly altered management and organisation practices in HEIs.

This confluence of crises has, perhaps understandably, led many involved in Higher Education to be wistful about times gone by. Many contributors to this volume are hopeful of resetting or reinvigorating the traditional ethos of universities that have become obscured in the neoliberal model or disrupted by COVID-19. Others are more future-oriented. They see the recovery from the pandemic as crisis-as-process, a tipping point which can propel HE forward to fresh ideas about teaching and learning in a modern context facilitated by updated infrastructures and approaches. Regardless of the narrative, what is recognised throughout this volume is the need for strong and adaptable leadership to proactively and wisely steer HE in challenging times. Against this backdrop of polycrisis, each chapter in this volume examines the theme of leadership through accounts of how it has either exacerbated or mitigated the causes and consequences of multifaceted crises.

## Organisation

The volume is organised into two sections. The first, 'Headwinds of Crisis', is divided into nine thematic chapters, with themes ranging from neoliberalism to the pervasive influence of the colonial past on HEIs in the Global South. The first of these chapters, by Newstead and Riggio provides

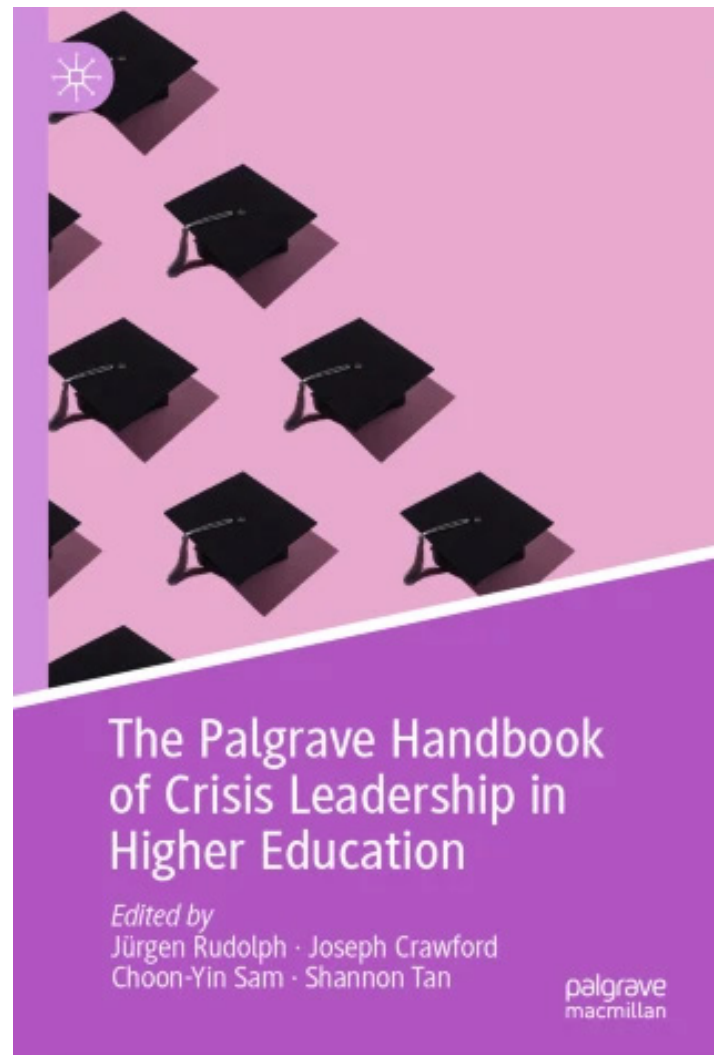


Figure 1: Book cover.

a useful framework of crisis leadership on which many other chapters throughout the volume draw. According to Newstead and Riggio, 'crisis-as-event' can be classified as "unexpected and disruptive events that threaten an organisation's crisis viability and significantly impact an organisation's operations, reputation and/or stakeholder well-being" (p. 20). While COVID-19 was one such event, a

case is also strongly made that it arrived as merely the latest step in a series of negative scenarios, the evolutionary result of deep-rooted and long-practised ignorance, avoidance, inattention or incapacity by those in charge.

The book's second section, "National Cases of Crisis", examines responses to the COVID-19 pandemic from specific national contexts. It covers 23 countries across all continents, ensuring that the reader has a broad perspective of crisis leadership before, during and after the COVID-19 pandemic. While some of the case studies cover contexts that readers might be familiar with, other under-researched countries, including Cambodia, Brazil, Greece, Egypt, Mozambique, and many others, are also represented.

The chapters on national perspectives are similarly organised. Most start by sequencing events during the pandemic, from government declarations of crisis to the initial stages of lockdown and the implementation of emergency measures, normally the transition to remote learning. Space is then given to evaluations of how the pandemic was managed by leaders from government, authorities and institutions. Each contribution reflects on the lessons that may or may not have been learnt and concludes with recommendations for HE leaders in that particular national context and beyond.

In addition to the five Cs of the polycrisis mentioned at the outset of this review, the chapters on national perspectives also contain other important and brave reflections. For example, from Türkiye on its stymieing lack of academic freedom, and from Brazil on the importance of HEIs in national infrastructures and public education. Others, such as Itangata and Kane, Peter Waring and Crawford et al. draw attention to issues directly affecting HE staff. Others still highlight challenges for students that both pre- and post-date the pandemic, such as feelings of fear, anxiety and depression (Altamirano on the USA) and overcrowded classrooms in Egypt (Richter et al.).

The volume's chapters are methodologically diverse. Many draw on ethnographic methods to document experiences of the COVID-19 pandemic and the various crises faced by managers and practitioners in HEIs. This is complemented by other chapters, most notably Teo's analysis of the Uzbekistan context, where the student is placed front and centre. Teo applies a grounded theory to 23 interviews with students to evaluate perceptions of HE leadership during the pandemic. Systematic literature reviews and content analyses are also frequently employed by authors to provide a representative picture of the national context they report on. There is also an array of analytical lenses in the volume. Mike Klein, for example, uses intersectionality to examine inclusion and transformation in HE leadership, while Ismail and Aljunied assess HE in the Global South through a humanistic paradigm.

### **Scope of the volume**

This volume is far more than a multi-focal retelling of the pandemic. Whilst it recounts the crises of the approximately 220 million tertiary students worldwide affected by COVID-19 (UNESCO, 2021), it makes clear that this event was a

disruption to an unfolding set of crises in HE. It exacerbated existent ailments and perhaps helped to hide rather than illuminate deeply rooted problems. These issues are laid bare in this volume. The editors, Jürgen Randolph (editor of this journal), Joseph Crawford (University of Tasmania), Choon-Yin Sam and Shannon Tan (both of Kaplan Higher Education Academy, Singapore) have expertly organised the contributions. As a collection, it moves away from the myopic perspectives that were offered immediately after the pandemic by arranging the chapters to chronicle the similarities between different nations' experiences of crises as well as the features that make each context unique before, during and after COVID-19.

This arrangement means that it is possible to see the nuanced and sometimes dichotomous conclusions drawn about the status and future of HE. For example, while many chapters bemoan the unilateral implementation of the product-based business model with its prioritisation of the economics of student numbers over student interests (Banner & Mara), others see the need for universities to adapt to a business model that establishes or maintains competitiveness in a global market (Kefalaki). Nevertheless, there is also a significant degree of uniformity in the conclusions drawn. Many chapters highlight a neglect of infrastructures, specifically information and communication technologies (ICT), that were required during the pandemic, an unreadiness to address such issues and a need to do so.

Whilst many chapters emphasise the short-sightedness of HE and national leaders and a general lack of preparation before the pandemic, there are more positive accounts. This is particularly true in those contributions which document lessons learnt from previous crises. Rudolph, Sam and Tan report on the lack of interruption to education during the pandemic in Singapore due to the clear leadership and government-coordinated action that was established after SARS. Cambodia reportedly responded to each stage of the pandemic in unique and adaptive ways. Clear channels of communication were established between a host of different players, including leaders from government, HEIs, as well as staff and members of the student body, to involve everyone in the response. Glowatz and O'Brien's report from the Republic of Ireland details the success of a transnational education approach to crisis preparation. The University College Dublin instituted an Emergency Response Framework (ERF) as a reaction to incidents at its global campuses in the years preceding the pandemic. Student protests in Hong Kong and the terrorist attack in Sri Lanka in 2019 led to the ERF, which was rapidly adopted during COVID-19. Both Chan and Lam, in their report on China and Hong Kong, note a shift in paradigm from a reactive state to a proactive quest by leaders for a roadmap for future development. Such stories of resulting dynamic and adaptive leadership are a cause for optimism in others.

### **Evaluation**

The size and scope of this volume are the book's greatest strength. The chapters are at their most powerful when read as they have been arranged. Ideally, the reader would engage with them in the order that they have been

cleverly sequenced to receive the full effect. Merely dipping into chapters here and there, as so often happens with a volume like this, may dilute the overall messages and lead to overlooking the important parallels between diverse contexts or the peculiarities of HE in some countries that a reader may not be familiar with.

What is especially striking about the book is those chapters that distil their findings into easily digestible formats and present their recommendations in helpful frameworks. In doing so, the volume can indeed act as a handbook for crisis leaders. Notable chapters in this regard are Muangasame and Wongkit, Toquero and Ramos, and Omona et al. Muangasame and Wongkit provide an insightful round-up of the fundamental elements of crisis leadership: making decisions amidst crisis, trying new practices in curriculum design, monitoring classroom experiences (including online), evaluating student performance, offering consultation sessions, providing health care for staff and students, and IT support. Toquero and Ramos's content analysis of the case of the Philippines has resulted in a conceptual taxonomy of leadership roles: gatekeeper, cultivator, incubator and networker, with the functions of each explained. Such a table could provide an extremely useful framework for those deciding on the training that needs to happen in HEIs for current and future leaders. Omona et al. diagrammatically represent the seven dimensions required for e-learning success. Again, a useful tool for leaders who understand that the pandemic revealed the need to better leverage digital learning and teaching models. Omona et al.'s diagram is particularly pertinent as the issue of accessibility and equity of online learning is one that pervades many narratives of the pandemic.

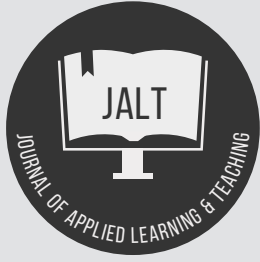
Indeed, the volume frequently raises issues of equity and accessibility in education. From the division between private and public HEIs within a national context, such as in Egypt, to the continued remnants of educational colonialism experienced in countries such as Malaysia and Ghana. Global equity is hard to achieve when some national systems receive significantly more government investment than others. Other chapters highlight the practical issues associated with accessibility. Oko, for example, makes the point that blended learning was and continues to be problematic in Papua New Guinea without paid subscriptions to platforms. Limited bandwidth means that a one-hour Zoom meeting might take almost all of an instructor's daily allowance. Such case studies give one pause for thought.

## Final thoughts

Reading this volume evoked a range of emotions. As a practitioner, it is hard not to empathise with the situations the authors describe, to feel despondent at how core principles of HE are being eroded, or antipathy for managerial hierarchies, or helplessness at a lack of government support and aged infrastructures. Yet, the anxieties and concerns are frequently tempered by the more positive messages from many of the contributors. The editors themselves are keen to emphasise the story of personal and institutional resilience, which this volume presents overall and resonates with my own reflections on COVID-19.

As the editors observe, times of crises and critiques of educational practice often coincide. Yet, a crisis can be a catalyst for re-evaluation, change and regeneration for many, perhaps most significantly for Ukraine, whose infrastructure needs to be newly built. The contributions to this volume demonstrate that it should be possible to use the polycrisis to (re)build a correlative vision of Higher Education amongst staff and leaders, which places the learner at its centre, building a culture that embraces cooperation, coordinated effort and open communication. The volume examines the leadership needed to navigate crises and is thus a valuable resource for leaders, offering both an overview of the challenges, a reflective lens on our responsibilities to students, and useful recommendations for the future of education leadership.





Vol.8 No.1 (2025)

# Journal of Applied Learning & Teaching

ISSN : 2591-801X

Content Available at : <http://journals.sfu.ca/jalt/index.php/jalt/index>

Book review of K. Pulk & R. Koris (Eds., 2025). *Generative AI in higher education. The good, the bad, and the ugly*. Edward Elgar.

Jürgen Rudolph<sup>A</sup>

A

Murdoch University, Singapore

DOI: <https://doi.org/10.37074/jalt.2025.8.1.28>

Generative AI (GAI) has swept through higher education with a force that demands ongoing scrutiny of its promise and its perils. While exploring recent scholarship on AI in academia, I encountered *Generative AI in higher education: The good, the bad, and the ugly*, edited by Estonian professors Kätlin Pulk and Riina Koris. This roughly 200-page volume stands out for its blend of practical insights, critical reflections, and wide-ranging perspectives on how educators, researchers, and students alike are adapting to AI in university settings.

Rather than offering quick fixes, the book challenges readers to reconsider their assumptions about the purpose and value of higher education. It explores student discomfort with AI, the phenomenon of AI 'hallucinations', and the technology's evolving role in academic research. Although I have reservations about some contributors' arguments, the volume's comparative approach—from enthusiastic early adopters to sceptics—proved valuable for clarifying my own views on the pedagogical complexities of GAI. *Generative AI in higher education* does more than catalogue pros and cons: it challenges readers to ask tough questions about the future of teaching, learning, assessment, and scholarship in an AI-driven landscape.

## Overview

The book consists of four parts, divided into 13 chapters, written by 23 international contributors. The first three chapters set the scene. In the introductory chapter, editors Riina Koris and Kätlin Pulk introduce the core question driving the volume: is GAI destined to be the 'best friend' of teachers, learners, and researchers, or does it harbour deeper threats to academic integrity, pedagogical quality, and the overall mission of university education? They emphasise that GAI's rapid expansion calls for careful and thorough consideration across a range of areas: classroom practice, scholarly research, and institutional policy.

One of the key questions that Chapter 1 asks is whether GAI is a student's 'best friend', drawing on ChatGPT's promise of comprehensive academic support. ChatGPT offers clarifications on course content, assistance with homework

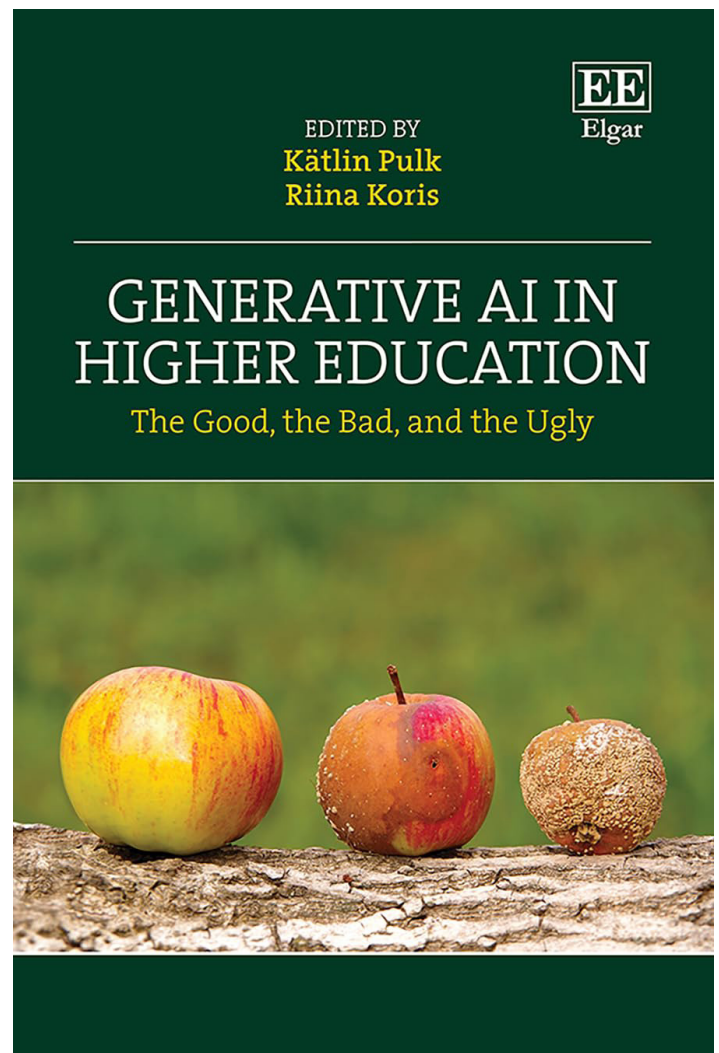


Figure 1: Book cover.

and writing assignments, exam preparation tips, and help with structuring or refining essays. It can also generate ideas for research or creative writing, advise on career development, and even provide emotional support and coping strategies. In other words, GAI, as exemplified by ChatGPT, appears to deliver a broad range of services that could streamline students' academic and personal lives. However, Koris and Pulk's introduction also raises concerns about GAI's

potential to stunt students' cognitive development by curtailing their interpretive range. In a world flooded with information, sensemaking becomes the most difficult task, yet true insight emerges only through a deeper and more sustained engagement with texts. The implication is that while GAI's immediate assistance might prove valuable, it risks cultivating a superficial mode of thinking—both for students and teachers—if not accompanied by rigorous critical inquiry.

The second chapter, authored by Wayne Martin and Deidre Williams, explores Hubert Dreyfus's "Critique of Artificial Reason"—a concept cleverly alluding to Kant's philosophical critiques, including the Critique of Pure Reason. While the lengthy discussion in Chapter 2 may feel tangential for some readers, it updates Dreyfus's philosophical critique of the shortcomings of AI. Martin and Williams also reflect on the intriguing concept of 'extended mind cyborgs', which is applicable to all humans as our cognition relies on external technological enhancements that act as integral parts of our thinking. It illustrates how we are 'natural-born cyborgs' who routinely offload tasks to smartphones, computers, and the internet. Rather than science-fiction implants, 'extended minds' function as extra-corporeal boosts to human intellect, expanding our mental capabilities far beyond the physical boundaries of our skulls.

Closing Part 1, Chapter 3 by Chahna Gonsalves and Oguz Acar examines the varied discourses framing GAI in higher education. The authors highlight opportunities, such as boosting innovation, alongside challenges that risk undermining core educational values. They further propose that AI should supplement students' learning only after foundational skills are established, suggesting an approach more suited to later-stage undergraduates or postgraduates. The rest of the book is divided into the good, the bad, and the ugly, reminding us not only of the title of Sergio Leone's epic 1966 spaghetti western but also of Ifelebuegu et al.'s 2023 article in this journal: "Chatbots and AI in Education (AIED) tools: The good, the bad, and the ugly". Part 2's 'The Good' Chapters 4–7 collectively make the case that, given GAI's inevitability, educators should focus on harnessing its benefits to enrich learning, teaching, and assessment.

In the fourth Chapter, John Pavlik advocates applying constructivist learning theory to integrate AI tools in a way that bolsters student engagement and critical thinking. Chapter 5, by Christian Hendriksen, provides practical strategies for students and educators to use AI ethically and effectively. Hendriksen underscores the value of digital literacy and reflective practice, illustrated by his revisiting of Benjamin Bloom's 'two-sigma problem'—the finding that learners who receive one-on-one or very small group tutoring consistently outperform peers in traditional classroom settings. He further notes early evidence that both teachers and students can deepen their learning experiences with GAI, highlighting that chatbot tools can remain patient, available at any time, and capable of adapting to a wide range of student abilities. The Chapter concludes with an array of practical advice, including techniques for optimising GAI interactions and a collection of annotated chat sessions, provided in a downloadable companion document.

Chapter 6 by Katri Kerem examines the escalating pressures on academics, exacerbated by overwork and precarity driven by neoliberal policies. Against this backdrop, she presents ChatGPT as a 'virtual colleague' with the potential to enhance teaching productivity, particularly for time-poor lecturers juggling endless administrative obligations. Kerem highlights three key areas where ChatGPT could streamline teaching practices: (1) AI-enhanced course design, (2) assistance with assignments, assessments, and marking, and (3) content preparation. Beyond efficiency, she emphasises the platform's capacity to personalise content, aligning with constructivist principles to foster a more interactive, student-centred environment.

Importantly, Kerem tempers her optimism by cautioning that, although GAI might free educators for deeper scholarly pursuits, universities often redirect this extra capacity to further 'measurable' outputs in their relentless metrification of academic work. Rather than alleviating the burdens of overwork, the tool could unwittingly reinforce unrealistic demands on teaching staff. Kerem's Chapter thus highlights the need for institutional cultures that genuinely value reflective practice and sustainable workloads.

The seventh Chapter, by Michael Dowling and Yue Li, shifts the focus to academic research, showing how GAI can aid scholars with tasks ranging from literature reviews to data analysis, albeit with caveats regarding reliability and ethics. They note that GAI could revive the possibility of solo research by eliminating downtime for collaborators, yet caution that treating AI as a 'partner' poses important questions about the future of collaboration, apprenticeship, and authorship. Dowling and Li provide a GAI toolkit to guide researchers, encompassing everything from idea generation to strategies such as embeddings, prompting, and fine-tuning. They cite findings that workers who use GAI outperform those who do not and see no reason to expect otherwise in research. However, they also predict that the success of GAI may diminish the need for human research assistants, raising concerns about how early-career academics will acquire the experience necessary to become senior researchers.

Shifting the focus to the potentially harmful effects of GAI, Part 3, 'The Bad', looks at creativity, assessment, equity, and ethical dilemmas through Chapters 8–11. Chapter 8, by Abdullah Clark and Kathleen Denman, explores whether GAI stifles creativity by supplying ready-made solutions that could diminish experimentation and personal expression. They define creativity as the capacity to produce something genuinely new in relation to oneself and others. By contrast, GAI merely predicts likely sequences of words based on existing data, never truly generating a fresh idea. Although its output can appear novel, Clark and Denman contend that it lacks the inventive depth of human creativity.

Chapter 9, authored by Peter Matheis and Jacob-John Jubin, addresses how AI tools can compromise assessment integrity, calling instead for a more authentic framework that resists automated shortcuts. They recommend linking assignments to current events and up-to-date research to foster genuine engagement with real-world, profession-related problems and advocate multimodal assessments as a strategic way to mitigate the influence of GAI. I was gratified

to be appropriately acknowledged in this Chapter, as an article I co-authored more than two years ago promoted these very approaches (see Rudolph et al., 2023).

The tenth Chapter, by Margriet van Gestel, tackles the concern that AI may deepen existing inequalities in both research communities and society at large by amplifying issues of access, bias, and privacy. She recognises AI's potential to boost writing efficiency, foster creativity, and provide editorial support—particularly for non-native speakers—while also enabling literature summarisation and translation. However, while free versions of GAI exist, the paid alternatives offer superior performance—a cost researchers in the Global North can more readily absorb, potentially widening the gap with those in the Global South. Chapter 11, by Ilija Protopapa and Bochra Idris, exposes the ethical dilemmas of using GAI in academic writing, highlighting risks of unintentional plagiarism, intellectual complacency, and diminished scholarly rigour. They delineate four stages in the traditional literature review—design, conduct, data abstraction and analysis, and writing—and discuss how AI might automate each step. However, Protopapa and Idris conclude that GAI falls short across the board.

Part 4, The Ugly (Chapters 12–13), intends to expose the more disconcerting aspects of GAI's infiltration into higher education. Chapter 12, by Jukka Mäkinen et al., explores how GAI's growing influence in labour relations should push higher education institutions to reconsider their role as producers of rigorous academic knowledge. Drawing on Johnson and Acemoglu (2023), the authors describe how digital technologies in the United States since the 1980s have automated work, undermined labour, and heightened wage inequality—a pattern they link to Milton Friedman's shareholder model, which upholds profit maximisation as a business's chief social responsibility. According to Mäkinen et al., the anti-human tendencies of digital tech and AI reflect the Friedman doctrine's sway. They, therefore, call for a stronger commitment to contextual, socially responsible teaching—one that fosters knowledge and skills extending beyond sheer calculative rationality.

The final chapter, by Michelle Miller, concludes the volume by addressing the challenge of faculty overburdened by constant AI developments. Miller observes that while academics are frequently urged to train students in AI, they often lack practical starting points or illustrative examples. She opposes such 'ugly advice' that merely emphasises the pressing need for professional development that evolves alongside AI tools. Miller warns that deterrence-based approaches run the risk of sparking an endless cat-and-mouse cycle between faculty and students. Complicating matters further, AI-detection tools can unfairly target non-native writers, raising ethical and legal concerns for institutions that rely on them.



Figure 2. Movie poster of the 1966 movie 'The Good, the Bad, and the Ugly'. Fair use.

## Assessment

One aspect I find particularly appealing is that the volume is co-edited by two women from Estonia, a country not typically associated with cutting-edge AI work—especially in such a male-dominated field. Although many contributors are based in Western nations (Denmark, England, Estonia, Finland, Ireland, the Netherlands, and the US), there are also authors from Türkiye and China, making the collective perspective refreshingly international. It is especially encouraging to see participation from European countries like Estonia and Finland, which are often perceived to be at the periphery of the GAI discourse. Another commendable feature is the extensive referencing, which introduced me to new scholarship I had not previously encountered. I was also gratified to see more than a handful of citations from JALT.

Although the volume is newly released, it shows signs of obsolescence—a consequence of the inherent delay between writing and publication in academic settings. The book focuses heavily on OpenAI's ChatGPT up to GPT-4, yet omits mention of more recent iterations (e.g. 4o, 4o with scheduled tasks, 4.5, o1, o3 mini) and offers no insight into newer developments like Deep Research or 'agentic' AI. Nor does it address emerging initiatives such as France's Mistral or Chinese models from Baidu's Ernie to Deepseek. Consequently, certain passages, including the claim that "in contrast to ChatGPT, Copilot has a current knowledge base and a more comprehensive one" (p. 49), are already

outdated in light of the field's hypercompetitive pace. This observation does not undermine the value of the book; rather, it highlights a broader limitation of academic publishing cycles when dealing with rapidly evolving technologies.

In some Chapters, the tendency to anthropomorphise AI seems excessive—for instance, the assertion that “this ability to understand, produce, synthesise, and creatively manipulate language... allows these models to participate in the knowledge-creation process” (p. 90). While such humanising language is widespread in AI literature, it remains misleading; all that GAI does is *mirror* human intelligence (Chomsky et al., 2023; Vallor, 2024).

Other statements that critical readers may take issue with are:

“The rise of decent AI collaborators at a low cost will probably most benefit emerging country researchers, who traditionally haven't had access to strong research guidance and assistance due to cost issues. We should see a greater levelling of expertise across countries as research guidance and assistance all rise to a new higher standardised level... will eventually allow a greater spectrum of ideas to enter the marketplace of research” (p. 100).

Such statements are, for instance, countered in Chapter 10 of the book. AI development is largely concentrated among a handful of tech giants in the United States and China, whose immense wealth highlights the stark inequalities in access to cutting-edge technologies. My view is that without specific investments in infrastructure, digital literacy, and capacity-building, these disparities will likely widen—not only in areas with traditionally limited access to technology but also within wealthy nations (Rudolph et al., 2025).

Overall, the book's 13 chapters—arranged under ‘setting the scene,’ ‘the good,’ ‘the bad,’ and ‘the ugly’—provide a broad range of perspectives on whether GAI can (and should) become a reliable ally for educators, students, and researchers. The collective scholarship offers incisive commentary on the ethical, pedagogical, and institutional dimensions of AI in higher education. Laudably, the book contributes to a much-needed critical AI literacy. Although certain chapters would have benefited from more rigorous critical engagement, the breadth of perspectives assembled in this volume remains intellectually stimulating and worthy of serious attention. I therefore recommend it to anyone seeking a deeper understanding of GAI's expanding presence in contemporary university contexts.

### Additional references

Chomsky, N., Roberts, I., & Watumull, J. (2023, March 8). Noam Chomsky: The false promise of ChatGPT. *The New York Times*. <https://www.nytimes.com/2023/03/08/opinion/noam-chomsky-chatgpt-ai.html>

Ifelebuegu, A. O., Kulume, P., & Cherukut, P. (2023). Chatbots and AI in Education (AIED) tools: The good, the bad, and the ugly. *Journal of Applied Learning and Teaching*, 6(2), 332-345. <https://doi.org/10.37074/jalt.2023.6.2.29>

Johnson, S., & Acemoglu, D. (2023). *Power and progress: Our thousand-year struggle over technology and prosperity*. Hachette UK.

Rudolph, J., Ismail, F., Tan, S., & Seah, P. (2025). Don't believe the hype. AI myths and the need for a critical approach in higher education. *Journal of Applied Learning and Teaching*, 8(1), 6-27. <https://doi.org/10.37074/jalt.2025.8.1.1>

Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education?. *Journal of Applied Learning and Teaching*, 6(1), 342-363. <https://doi.org/10.37074/jalt.2023.6.1.9>

Vallor, S. (2024). *The AI mirror: How to reclaim our humanity in an age of machine thinking*. Oxford University Press.

Copyright: © 2025. Jürgen Rudolph. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.