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Desk review explained: Editorial judgement, fit, and publishing

Fiona Xiaofei Tang[A] [A] *Kaplan Business School, Australia*

Jürgen Rudolph[B] [B] *Murdoch University, Singapore*

Tania Aspland[C] [C] *Kaplan Australia and New Zealand*

Vanessa Stafford[D] [D] *Kaplan Business School, Australia*

Stewart Alford[E] [E] *Kaplan Business School, Australia*

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Introduction

For many authors, the editorial desk seems to be something of a black box. A manuscript is submitted, a period of silence follows, and then a decision arrives. When that decision is a desk rejection, it can feel abrupt, impersonal, or difficult to interpret. For editors, however, the desk review is rarely quick or casual. It is one of the most careful and consequential moments in the publishing process.

This Editorial is an attempt to make that moment more visible.

Over the past six months, a striking proportion of submissions to the *Journal of Applied Learning & Teaching (JALT)*, approximately 96%, have not progressed beyond initial editorial screening. Stated plainly, that figure can sound discouraging. It may invite assumptions about rising barriers or increasingly narrow definitions of quality. Yet neither explanation reflects what is actually happening at the editorial desk. The purpose of this Editorial is to explain why desk rejection occurs so frequently, how those decisions are made, and what they mean and do not mean for prospective authors. We also describe common pitfalls and make a case for stylish academic writing.

Editorial judgement before peer review

In scholarly publishing, desk rejection (also called desk review or editorial rejection) is the decision by a journal editor to decline a submitted manuscript without sending it for external peer review. At this initial screening stage, editors assess whether a manuscript aligns with the journal's aims and scope, meets baseline expectations for academic quality and ethical compliance, and is sufficiently developed to warrant detailed evaluation by reviewers (Goyal et al., 2024). Desk rejection, therefore, represents the first editorial checkpoint in the publication process, filtering out submissions that are unsuitable for review because of issues such as scope misalignment, fundamental methodological limitations, or lack of readiness for peer review (Goyal et al., 2024).

This definition matters as it clarifies what desk rejection is and what it is not. It is not a peer review conducted in ab-

-breviated form, nor is it a definitive judgment on the scholarly worth of a study. Rather, it is an editorial decision about appropriateness and readiness, with a view to ultimately guiding the author(s) to rethink some aspects of their original submission.

At JALT, desk rejection is accordingly practiced in line with this definition above – it is not intended as a substitute for peer review, nor as an early verdict on intellectual value. Editors ask practical but consequential questions. For example, is this manuscript clearly aligned with the journal's remit? Does its structure and argument genuinely reflect the article category it claims to be? Has it reached a level of refinement where external reviewers can engage productively with its ideas, rather than be diverted by issues of framing, scope, or ethical compliance?

Seen this way, desk review is not about deciding whether research is 'good enough' in the abstract. It is about deciding whether this journal is the right home for this manuscript at this stage of its development.

This stance is not new. From its early years, JALT has resisted equating quality with exclusivity. In an Editorial, Rudolph and Yeo (2019) rejected "[measuring] the quality of a peer-reviewed journal by the number of rejections" (2019, p. 5). Less than two years later, in another Editorial reflecting on the journal's development, Rudolph and Tan (2021) observed that while rejection rates had risen as submissions increased, these were not regarded as indicators of prestige or scholarly value. Instead, JALT positioned itself as inclusive and developmental, particularly for authors working at the margins of dominant academic publishing systems, and explicitly cautioned against metric-driven understandings of quality (Rudolph & Tan, 2021). The current Editorial continues that ethos, albeit under very different submission conditions for the present day.

Where desk review fits in the JALT process

The JALT's editorial workflow follows a familiar trajectory in academic publishing, moving from editorial screening to double-blind peer review and, for accepted manuscripts, through copyediting and production.

The desk review is the first point at which a submission is read as a potential contribution to the journal. At this stage, editors consider alignment with the scope, clarity of scholarly purpose, suitability of the article type, and adherence to baseline expectations around research ethics and academic integrity. Only manuscripts that are well-matched to the journal and sufficiently refined to benefit from expert external critique proceed to peer review.

Those that do not are declined early. While this can be disappointing, it is often the most constructive outcome available. A desk-review decision allows authors to receive an initial editorial assessment of suitability and readiness, enabling them to consider next steps whilst their work is still at an early stage of the submission process. It is important to consider this early feedback as a process of continuous improvement from the perspective of the author(s).

Manuscripts that pass desk review enter double-blind peer review, where attention shifts decisively. Questions of fit recede, and reviewers focus instead on contribution, coherence, methodological soundness, and scholarly significance. Normally, this stage of the review engages discipline or content experts in aligned areas of scholarship. These experts, who function as "gatekeepers of scientific knowledge", are essential to maintaining the intellectual rigour and integrity of their research area (Sizo et al., 2025, p. 1). Successful papers then move through copyediting and into JALT's rolling online-first publication stream. Online-first is an online pre-publication pathway that enables the rapid dissemination of research into academic discourse, ahead of the release of the complete issue (Springer Nature, 2024).

From this perspective, desk review is not a procedural hurdle. It is a threshold moment that shapes everything that follows. It is to ensure that peer review is implemented where it can do the most good.

Why desk rejections have become more common

The recent increase in desk rejections at JALT is closely tied to the journal's growth. Submission numbers have surged steadily, the geographic spread of authors has widened, and interest in topics such as generative artificial (GenAI), digital pedagogy, and applied learning has intensified. These developments mirror broader trends in higher

education research publishing in the post-pandemic period (Butler-Henderson et al., 2021; Crawford et al., 2020).

At the same time, they have brought a broader range of interpretations about what JALT publishes. Many submissions treat education or learning as expansive categories, encompassing school contexts, discipline-specific studies, and language-focused research, without a clear engagement with higher-education pedagogy. Others arrive with strong intentions but are framed in ways that do not align with the article classifications or scholarly conversations the journal supports.

JALT is explicitly concerned with teaching and learning in higher education, across disciplines, with an emphasis on applied practice and scholarly insight. When manuscripts fall outside that focus, however strong they may be in other respects, desk rejection becomes the measured editorial response.

What JALT has published, and what that suggests for authors

For authors who are looking for a clearer sense of the kinds of work that align well with JALT's editorial interests, it is useful to look not only at submission guidelines but also at the journal's publication record.

A data-driven study published in JALT analysed all articles appearing between January 2021 and December 2023, using topic-modelling techniques (Bala & Mitchell, 2024). The analysis identified 17 recurring topics clustered into four broad areas: technology and digital learning in higher education; applied and professional learning contexts, including clinical and work-integrated settings; pedagogical strategies and educational outcomes such as feedback, assessment, and learner development; and the social and emotional dimensions of learning shaped by the COVID-19 pandemic and its aftermath (Bala & Mitchell, 2024). These clusters reflect the journal's interdisciplinary orientation and its sustained interest in research that connects educational practice with conceptual insight.

For prospective authors, these patterns provide a helpful reference point. They do not prescribe what must be studied, but they do illuminate the kinds of questions, contexts, and contributions that have resonated with the journal's readership in recent years.

Patterns in desk-review decisions

In an earlier Editorial, Rudolph and co-authors (2023) had referred to Dannelle Stevens's (2019) brilliantly-titled book *Write more*, *Publish more, Stress less!* and her top ten reasons for desk rejections:

> (1) a mismatch with the journal's scope or objectives, (2) inappropriate article format such as being overly journalistic, (3) unsuitable length, (4) non-adherence to journal or academic writing standards, (5) poor language usage including grammatical and punctuation errors, (6) lack of significant content or prolix elaboration of obvious points, (7) inadequate contextualisation for an international readership, (8) weak theoretical framework, (9) shoddy presentation with apparent lack of proofreading, and (10) inclusion of libellous or unethical content" (Rudolph et al., 2023, p. 7; see Stevens, 2019, Table 9.1, p. 156).

Looking across editorial decisions over time and more specifically to JALT, several recurring considerations emerge. These are not newly introduced criteria, nor are they unevenly applied. They reflect long-standing editorial expectations that authors sometimes underestimate.

The most common issue is misalignment with the scope. Manuscripts centred on school-aged learners, narrowly framed TESOL (teaching English to speakers of other languages) or EFL (English as a foreign language) studies, or policy analyses detached from higher education teaching contexts frequently fall into this category.

A second pattern involves genre confusion. Submissions may be labelled as empirical research but read as descriptive accounts, reflective narratives, or loosely structured literature reviews. Each of these forms has value, but only when framed, theorised, and argued in ways consistent with its declared article type.

Editors also encounter manuscripts that are competently executed but merely offer limited advancement of e-

-xisting knowledge. Studies that replicate well-established findings, remain tightly localised, or gesture towards implications without fully developing them may not yet be positioned to contribute meaningfully to the journal's readership.

Questions of methodological maturity and rigour arise regularly. Over-reliance on simple surveys, thin qualitative analysis, or misalignment between research questions and methods often signal that a paper would benefit from further development before peer review.

There are also non-negotiable thresholds. Submissions that raise concerns about originality, attribution, or appropriate ethical practice cannot proceed to further consideration. As part of routine editorial assessment, manuscripts are scrutinised via text-similarity tools, such as Turnitin, to identify substantial overlap with previously published work or inadequate citation practices. Where similarity reports indicate extensive unacknowledged borrowing, patchwriting, or reuse of material without clear attribution, editorial intervention is required. These decisions are not judgments about author intent but reflect the journal's responsibility to uphold established expectations around originality and transparency in academic writing.

Submitting to JALT: A reflective pause

Authors considering submissions to JALT may find it useful to pause over three questions prior to uploading a manuscript:

- Does this paper clearly speak to teaching and learning in higher education, in ways that resonate beyond a single context or discipline?
- Does the article type I have selected genuinely reflect how the paper is structured, argued, and evidenced?
- Has the manuscript reached a level of conceptual, methodological, and ethical readiness where peer review will enhance it rather than rescue it?

When uncertainty remains, authors are encouraged to use the journal's published guidance and latest articles as reference points while evaluating the suitability of their work for JALT. Careful attention at this stage can help reduce avoidable misalignment and support more informed submission decisions.

Stylish and pleasurable academic writing

We encourage more authors to read and heed the advice on academic writing of excellent authors such as Helen Sword (2012, 2017, 2023), Steven Pinker (2014) and Dannelle Stevens (2019). Sword, in particular, has shown that stylish academic writing with pleasure is possible (2012, 2023). Strunk and White's generic *The Elements of Style* is so admirably succinct that it literally fits into a pocket. Sword has also written a small book, *The Writer's Diet* (2007), which comes with a test that authors can take free of charge at https://writersdiet.com/writing-test/. Authors can then discover whether or not they overuse be-verbs, zombie nouns (nominalisations that suck the lifeblood from potentially lively prose), propositions, ad-words (adjectives and adverbs) or "waste words" such as "it, this, that, there" (Sword, 2007).

For many academics, 'stylish academic writing' sounds like an oxymoron. In an interview with JALT, however, Sword reveals that most 'bad' academic writing stems not from deliberate obfuscation, but from insecurity and fear—yet the most successful writers she studied associated their craft with *pleasure* (Sword et al., 2024).

A closing word

This Editorial has not been written to push authors away from JALT. On the contrary, it demonstrates a commitment that has been present since the journal's early years: openness, fairness, and scholarly care (Rudolph & Tan, 2021). JALT continues to welcome submissions from a diverse community of researchers, educators, and practitioner-scholars. What matters is not conformity, but alignment and enlightenment.

Desk rejection, when exercised thoughtfully, is not a blunt instrument. It is a form of editorial responsibility. It respects authors' labour, safeguards reviewers' time, and helps maintain the journal as a coherent intellectual space. By making that responsibility more visible, we hope to make the path to publishing with JALT clearer, more navigable, and more humane.

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The double-edged sword: Open educational resources in the era of Generative Artificial Intelligence

Ahmed Tlili [A] — [A]*Beijing Normal University, Beijing, China*

Robert Farrow[B] — [B]*The Open University (UK), UK*

Aras Bozkurt[C] — [C]*Anadolu University, Türkiye*

Tel Amiel[D] — [D]*School of Education, University of Brasília, Brasília, Brazil*

David Wiley[E] — [E]*Marshall University, Huntington, WV, USA*

Stephen Downes[F] — [F]*National Research Council Canada, Ottawa, Canada*

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Correspondence

ahmed.tlili23@yahoo.com[A]

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Abstract

The integration of Generative Artificial Intelligence (GenAI) into the Open Educational Resources (OER) landscape represents a paradigmatic shift, transforming OER from static content into a dynamic, algorithmic infrastructure. While GenAI promises to democratize content creation and accelerate localization, it simultaneously introduces profound ethical and epistemic risks. This commentary, in this regard, adopts a speculative-critical methodological approach to interrogate the "double-edged" nature of this transition. We analyze several emerging tensions: the ontological crisis of human authorship, which challenges traditional copyright frameworks; the risk of "openwashing" where proprietary models appropriate the language of the open movement; the potential for automated translation to amplify Global North epistemic biases; and the paradox of hallucination where OER serves as both a corrective ground truth and a potential casualty of remix culture. By comparing and contrasting the optimistic imaginaries of AI-enhanced access against critical perspectives on data surveillance and commodification, this paper argues that the binary definition of "openness" is no longer sufficient. We conclude that ensuring equity in the AI era requires a transition from open content creation to the stewardship of "white box" technologies and transparent digital public goods.

Introduction

The term "open educational resources" was first coined in 2002 at the UNESCO Forum on the Impact of Open Courseware for Higher Education in Developing Countries. The notion of Open Educational Resources (OER) then gained global traction through the UNESCO 2012 Paris OER Declaration, which laid the normative foundation for the movement. That 2012 Declaration called on governments to encourage the release of publicly funded educational materials under open licenses, promote ICT-enabled learning environments, support capacity building, and foster multilingual and culturally contextualized resources. The Paris Declaration laid the normative and philosophical foundation of the OER movement, linking open education to human rights, including the right to education, cultural participation, and lifelong learning.

The UNESCO Recommendation on OER (UNESCO, 2019) was adopted at UNESCO's General Conference. For the first time, OER gained status through an international normative instrument. The 2019 Recommendation established five strategic pillars: capacity building, policy, access, sustainability, and international cooperation. Though it explicitly mentions the potential contributions of artificial intelligence, the Recommendation was drafted before the proliferation of Large Language Models (LLMs) and Generative AI (GenAI). As such, this framework largely addresses a landscape of static content and could not anticipate the algorithmic disruption that was to follow.

The rapid development of Artificial Intelligence (AI) has triggered several debates about how AI and OER could work together (Bozkurt, 2023; Tlili & Burgos, 2024). GenAI has been the subject of substantial hype. Particularly, it has the potential to significantly transform how OER are created, distributed, customized, and accessed, reshaping the entire open education workflow. In terms of content creation, GenAI can automate or accelerate the production of draft materials, generate multimodal versions of resources, create examples and assessments, and support educators with rapid prototyping. For distribution, AI-driven tools such as automated tagging, metadata generation, and content summarization can increase the discoverability and interoperability of OER across platforms and repositories. Customization is perhaps the most transformative domain: GenAI can potentially adapt resources to different reading levels, cultural contexts, or disciplinary needs; translate high-quality content across multiple languages; and convert materials into accessible formats such as audio, simplified text, or alternative modalities. Additional applications could include accessibility support and personalization of learning.

Thus, the UNESCO Dubai Declaration (UNESCO, 2024) attempts to respond to how AI and emerging technologies will transform content creation, distribution, customization, and access. The Declaration acknowledges that the landscape of content creation, dissemination, and use has changed rapidly; that GenAI, machine translation, automated indexing, content adaptation, and other digital tools now shape how educational resources are produced and circulated. One of the Declaration's central conceptual moves is to frame OER as digital public goods, resources with a public mission, and part of a global commons governed with principles of equity, inclusion, transparency, and collective stewardship. By pushing for open infrastructures, open-source software, interoperable metadata standards, and transparent, auditable AI tools, the Declaration connects OER policy to the broader terrain of digital sovereignty, data governance, and rights-based digital public infrastructure.

Rather than inventing new categories, the Dubai Declaration (UNESCO, 2024) revisits the five pillars of the 2019 Recommendation for the era of AI and other emerging technologies. Capacity building emphasizes developing the skills and digital confidence of educators, learners, and content creators, including ethical and responsible use of AI in OER. Policy and governance focus on establishing supportive legal, institutional, and licensing frameworks to facilitate open practices. Inclusive access prioritizes the intrinsic qualities of OER for adaptation into culturally and linguistically relevant resources, ensuring that OER reach underserved populations and support diversity. Sustainability highlights the importance of long-term economic models, but also infrastructure and community stewardship to maintain OER quality and availability over time. International cooperation encourages cross-border collaboration and knowledge exchange, leveraging collective expertise to strengthen the global OER commons.

Despite this aspirational vision, the integration of GenAI into open education illuminates profound tensions that policy alone cannot resolve. These frictions arise, most clearly, where the efficiency of automation clashes with t-

-he ethics of openness. This commentary interrogates some of the major tensions (summarized in Table 1) and explores whether the intersection of OER and AI, particularly GenAI, represents a democratization of knowledge or a new form of epistemic enclosure.

Table 1. Key tensions associated with GenAI and OER.

Framing Question	GenAI and OER-In Favor Interpretation	GenAI and OER-Critical Interpretation
Do OER have to be human-created?	AI-generated content can expand access, speed up resource creation, and lower barriers for educators with limited time or resources.	OER should be created by humans to preserve, among others, pedagogical intentionality, contextual sensitivity, and ethical accountability.
Do OER have to be copyrighted?	Open licenses can apply to AI-generated resources, making content available through the public domain; flexible IP models encourage sharing and remixing, including AI-assisted outputs	Copyright and licensing become ambiguous or meaningless with AI outputs, undermining the current foundations of openness and attribution in scholarship and authorship.
Is "open" being misused in relation to AI?	AI can extend openness by supporting creation, translation, adaptation, and accessibility of resources, broadening participation in the OER movement.	Corporate AI systems falsely appropriate the language of openness while relying on closed data, opaque code and models, and restrictive terms with the ultimate aim of commercialization.
Will AI reproduce linguistic, cultural, and epistemic biases?	AI can be fine-tuned or regionally trained to reduce bias and increase representation in OER, especially for under-resourced languages.	AI inevitably amplifies Global North biases and epistemic dominance, embedding them deeper into OER ecosystems at scale.
Will OER reduce AI hallucination or increase it?	Quality OER can be used as a reliable knowledge base so that the educational output provided by AI/GenAI is more accurate and reliable, particularly in specialized areas.	The quality issues associated with overall content available on the internet, including OER, and the reuse of poor AI-generated content might influence the model and make it even worse.

Method

To interrogate the intersection of OER and GenAI, this commentary adopts a speculative–critical mode of inquiry (Bayne & Ross, 2024; Bozkurt et al., 2023). This approach is increasingly vital in educational research during periods of rapid transformation, where the velocity of technological diffusion often renders conventional empirical cycles reactive rather than anticipatory. The speculative–critical tradition combines conceptual analysis with imaginative extrapolation to interrogate how emerging technologies reshape educational values, practices, and relations of power. Our approach forgoes empirical validation in order to engage critically with discourses, i-

-maginaries, and normative assumptions that underpin current debates about open education and artificial intelligence.

This method is particularly suited to the study of GenAI, whose pace of development and social diffusion outstrips conventional modes of empirical inquiry. Many of the most significant questions and controversies are unfolding in real time and demand anticipatory forms of reasoning. Speculative inquiry allows researchers to explore these issues conceptually, mapping possible trajectories and tensions without presupposing stable outcomes. The critical dimension of our framework situates these explorations within the established pedagogy of questioning the ethical, social, and political consequences of educational technology (Freire, 1970; Giroux, 2011; Farrow, 2017).

Procedurally, we structure the commentary as a series of thematic explorations. For each domain, we present two contrasting provocations (summarized in Table 1). These function as heuristic devices, representing the opposite poles of a conceptual spectrum: the techno-optimist imaginary of AI-enhanced openness versus the critical-realist perspective of surveillance and enclosure. By framing GenAI as a “double-edged sword” (Selwyn, 2019), this dialectical approach foregrounds the productive tension between opportunity and risk. It invites plural interpretations, positioning speculation not as mere guesswork, but as a critical practice that expands the horizon of what "openness" might mean in an algorithmic age.

Do OER have to be human-created?

GenAI tools have made creating resources easy and accessible to millions of people, which has raised questions about whether these resources can be copyrighted, attributed an open license, or even considered OER. In January 2025, the U.S. Copyright Office published a part of its Copyright and Artificial Intelligence report (U.S. Copyright Office, 2025), mentioning that AI-generated resources cannot be copyrighted. The report stated that "given current generally available technology, prompts alone do not provide sufficient human control to make users of an AI system the authors of the output" (p.18). The report further argues that “prompts essentially function as instructions that convey unprotectible ideas" and "do not control how the AI system processes them in generating the output" (p.18). It concludes that GenAI outputs created with little or no human creative involvement (including in automatic response to most text prompts) are not copyrightable.

The above legal framework, albeit from one country, is reflected in international approaches. This view highlights that content created by AI cannot be copyrighted, and we typically think of OER as being in the public domain, or copyrighted with an open license. Thus, from the legal perspective, all AI-generated resources are OER, since their being ineligible for copyright protection places them immediately into the public domain. However, from another perspective, either (purely) AI-generated content is not OER, or we need to rethink our common understanding of OER, as current OER definitions do not specify human involvement in the OER creation and do not exclude machines.

Some might argue that the AI era could be more about hybrid intelligence (i.e., the combined artificial intelligence and human intelligence) and hybrid knowledge (i.e., the knowledge is created by both humans and machines). It is therefore important to keep machines within the process of knowledge creation, including OER. On the other hand, others might argue that what counts as human creation is difficult to define. They might question the true meaning of education and our involvement as humans in the knowledge creation and transfer within a society if the educational process, including creating educational resources and teaching, is delegated to machines.

Does OER have to be copyrighted?

The language of “in the public domain” present in many definitions of OER would suggest that OER do not need to be copyrighted. However, it can be argued that copyright is important for OER, as they are a testament to provenance, resulting in the possibility of identifying authorship and as a proxy for quality or accuracy. On the other hand, given that the work of hundreds, or even thousands, of authors forms the basis for each decision or generated sentence by an AI, how can we select from them in order to attribute sources? If we opt for OER with-

-out copyright (i.e., in the public domain), some might argue about how we can then protect intellectual property. This would also support "power to the strongest", where companies, with the financial advantage, would benefit the most by using what is available to train their models and increase their profits. Others, on the other hand, might argue the necessity of copyright, but this also comes with several legal and technological challenges.

For instance, courts have begun to acknowledge that the act of training GenAI models on copyrighted material is a “fair use,” meaning that no permissions are needed from rightsholders before copyrighted material (whether traditionally or openly licensed) can be used for training. For example, the judge in Bartz v. Anthropic wrote, “the purpose and character of using copyrighted works to train LLMs to generate new text was quintessentially transformative” (Bartz v Anthropic, 2025). If this is the case, how can we update the current legal frameworks to protect the intellectual property of OER authors from being abused (as the author may see it) by GenAI tools? Should current open licenses be updated to address such issues? How can we develop machines (including GenAI tools) that can read the open licenses attributed to OER and act within what that open license or other contract mechanisms specify (For example: https://github.com/creativecommons/cc-signals)? And if training is a fair use and happens outside the realm of copyright, would changes to open licenses even matter from a legal perspective?

Is open being misused?

While the term “openness” is constantly evolving and renewing, there is a longstanding tension regarding its authentic use (Weller, 2014). A new front has emerged in relation to the risk of "open-washing" when it comes to GenAI, where something is labelled as open but is actually rooted in proprietorship, private profit, and restricted access to knowledge (Wiley & Hilton, 2018; Tlili et al., 2024). The indeterminacy of defining “open” can be understood as a flexibility which enables new perspectives and behaviors, but this same lack of agreed definition means that those who do not necessarily share the progressive values of the open education movement may freely brand themselves with the term. OpenAI (2025) produces ChatGPT, which is perhaps the AI tool with the highest profile. However, their systems are among the lowest ranked in terms of indicators which could be used to determine the “openness” of AI systems according to factors such as availability of AI models, parameters, model weights, training data, documentation and availability to application programming interfaces (Liesenfeld & Dingemanse, 2024).

The basis of OpenAI’s claim to openness is open-source code, which is commonly used in almost all software (Langenkamp & Yue, 2022). This is arguably too low a standard for authentic “openness”, particularly in GenAI (Widder et al., 2024). Furthermore, the Open Source Initiative (n.d.) has published a definition of open source AI, which requires a much higher standard of transparency that would enable others to reconstruct models in full through having access to all relevant elements (models, code, parameters, weights, and information about data sources). Generally speaking, most AI models exhibit differing degrees of openness in these respects, and, while more “open” models are being released (Lin et al., 2025), they are competing for attention and adoption with increasingly well-established, heavily funded commercial, proprietary or restrictive models.

On one reading, AI offers pragmatic benefits to the OER ecosystem: automation, personalization, and analytics can reduce costs, improve scalability, and enable new forms of partnership that strengthen the long-term viability of OER without eroding open licenses or public values. On a more critical note, the same technologies intensify phantomization, drawing OER into proprietary infrastructures controlled by large technology firms, where value extraction, data capture, and paywalled services undermine openness and reframe digital public goods as commercial assets. The dichotomy is therefore not about AI per se, but about whether its integration reinforces open, commons-based governance or deepens dependency on closed, market-driven systems.

At a minimum, those involved with education must be aware of the difference between systems that are “free of charge” (gratis or “available” online for use, such as Perplexity and ChatGPT in their introductory offerings), and those that are “open” in the wider sense discussed here. By thinking of AI as simple tools to be used, educators ignore how many GenAI tools are part of an ecosystem of big tech platforms with clear business models and commercial interests that can have significant negative consequences for education as a public good (Amiel, 2024).

Will AI reproduce linguistic, cultural, and epistemic biases?

A long-standing concern of the OER movement is that most content produced originates in the Global North. Due to their legal and technical flexibility, OER are more easily adapted - increasing the support for localization and translation (Amiel et al., 2011). But disparities in the sheer capacity to produce quality content (technical resources as well as associated costs), linguistic limitations as well as biases, have led to a one-way road. Content from richer and more spoken languages is usually translated and sometimes localized to lesser spoken languages and the Global South.

Powerful GenAI tools for content creation and adaptation (e.g., videos, images, software) are currently offered in great part by private corporations through paid services. Financial resources needed to engage in the more sophisticated aspects of OER adaptation and localization will likely disfavor those who need it most. Moreover, the capability to easily create content by those with more resources, could potentially decrease the interest in reusing, remixing and adapting existing resources. This could be due to issues in findability or quality OER, or the low time cost in 'prompting' for new resources.

Will OER reduce AI hallucination or increase it?

Hallucination (errors or mistakes) is a major issue in AI systems that affects the output quality. OER has the potential to reduce hallucinations by offering AI systems access to openly licensed educational content that were developed, revised, or remixed by content experts and educators worldwide. When AI models are trained on reliable OER, their responses can be built on accurate knowledge, minimizing the likelihood of fabricating information. Perhaps more powerfully, OER can be added directly to prompts in order to provide models with just-in-time access to additional ground truth context. This approach can be significantly more helpful in improving the accuracy of model responses than fine-tuning (Ovadia et al., 2024). Additionally, the open and transparent nature of OER enables collaborative verification, allowing educators and learners to cross-check AI outputs, fostering correction and continuous learning. On the other hand, OER can also contribute to poor content if low-quality or outdated materials are included without sufficient curation. The diversity in formatting, inconsistent metadata, and varying levels of academic rigor across different OER sources may lead to errors or misinformation. Furthermore, the dynamic and remixable nature of OER means that conflicting or unvetted content could be used to train AI models, increasing the risk of erroneous output. To sum up, the influence of OER on AI hallucination depends not merely on its open access, but on how carefully and systematically it is curated, structured, and integrated into AI development and retrieval systems. The quality of the data curation process has long been a predictor of the effectiveness of the model training process, and this remains true both for traditionally copyrighted training materials as well as openly licensed materials.

Discussion: Should we continue to define things as "open" or "closed"?

The emerging picture is that a binary open/closed dichotomy does not adequately reflect what is happening with GenAI, since there are many dimensions which could be considered open or closed to different degrees. Widder et al. (2024) propose transparency, reusability, and extensibility as the key dimensions of open AI, reflecting wider sociotechnical elements which go beyond the technical system. White et al. (2024) similarly recommend reproducibility, transparency and usability as critical. Further complicating this picture is the difference between openness as a property of a technical or pedagogical system compared with openness as a feature of a combination of contextual factors.

GenAI systems are composed of many individual components, including the content used for training, the software used for training, the weights that result from the training process, and the software used with those weights for inference (responding to user prompts). Each of these kinds of components - content, software, and data - has its own rich history of open definitions, frameworks, and licenses. Rather than trying to characterize the entire complex conglomerate as "open" or "closed," discussants might rely on the lessons learned in each of these domains over the decades and choose instead to talk about whether the training content is open content, whether the training software is open-source software, whether the model weights are open data, etc. We acknowledge that there remains a lively discussion about whether model weights are data, software, or content.

However, that conversation concludes, there are decades of licensing knowledge to draw upon. For example, a user might use the 5Rs framework as a reference and ask, “Am I allowed to retain, revise, remix, reuse, and redistribute these training materials? This training software and inference software? These model weights?”

Additionally, “openness” could be understood not only as an intrinsic property of an educational AI system. It’s also important to draw on the extrinsic relation of educational AI systems to wider matters of social impact and pedagogical equity. Technological developments have the potential to shift the way we produce and share information, but they are not isolated tools to be used, and instead are part of a wider sociotechnical system. Therefore, open educators should renew their sense of what ‘open’ means in their own contexts in response. Furthermore, the rapid GenAI development should be rooted in the open science movement if we want to adopt a clear box technology, where we can see what process and outcome, allowing us to make the needed adjustments or reuse accordingly.

Conclusions

The integration of GenAI into the openness landscape marks a definitive transition from a focus on static content to dynamic, algorithmic infrastructure. As this commentary has argued, this shift functions as a double-edged sword: it offers the potential to democratize content creation and accelerate localization, yet simultaneously threatens to enclose the digital commons within proprietary, opaque, and commercially driven systems.

To navigate this paradox, the OER movement must look beyond the traditional binary of "open" versus "closed" licensing. The critical imperative for the future is the adoption of "clear box" technologies. In an "opaque box" paradigm, educators are passive consumers of outputs generated by opaque models where the provenance of data and the logic of assembly are hidden (Amiel, 2025). Conversely, a "white box" approach—rooted in the principles of Open Science—demands inspectability, replicability, and transparency. Authentic openness in the AI era requires that we can see "what really happened" inside the model, allowing educators to audit biases, verify sources, and understand the pedagogical logic that drove the output. Without this transparency, "open" content generated by "closed" tools remains a form of epistemic dependency.

Only with societal responsibility and innovative and critical pedagogical approaches will we be able to achieve quality education for all, as urgently needed and demanded by SDG4, for our whole society (Mills et al., 2023). It is, therefore, crucial to remain critical about the GenAI tools to be adopted in education. We must rigorously question how such tools can promote pedagogical equity and inclusivity, rather than facilitating extraction and profit-seeking behaviors that reduce educational users to mere numbers for commercial gain. The goal of OER in the age of AI should not merely be the proliferation of free resources in the public domain, but the cultivation of a digital public infrastructure that protects the sovereignty of the knowledge creation ecosystem.

In all, this speculative inquiry suggests that the definition of "Open Educational Resources" must be expanded. It is no longer enough to ask if the content is free and openly licensed; we should also reflect on whether the technical systems used to create OER should also be open as well, or at least a critical understanding of the interplay between content, tools, and practices that emerge in GenAI and OER. We leave the field with the following critical provocations to guide future research and policy:

- If the majority of future OER is synthesized by machines from the existing commons, does the concept of "human authorship" become a relic of the past, or does it transform into a role of ethical curation and stewardship?

- Can we claim to be decolonizing knowledge through AI translation tools if the underlying "truth" of the models is overwhelmingly trained on data from the Global North?

- If "openness" is decoupled from "transparency"—allowing proprietary opaque boxes to generate open content—do we risk building a future where the products of education are free, but the means of production are entirely enclosed?

- Does our conception of OER need to evolve? Are openly licensed prompts, openly licensed model weights, openly licensed inference software, and the interactive learning experiences they facilitate an important part of our future conceptions of OER?

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When AI Joins the Lab: Reflections on ChatGPT in Research and Graduate Education. An Interview with Professor Timothy Mitchison.

Timothy Mitchison[A] [A]*Harvard Medical School, USA*

Yulu Hou[B] [B]*Michigan State University, USA*

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Correspondence

houyulu@msu.edu[B]

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Abstract

This interview with Professor Timothy Mitchison from a leading U.S. medical school explores his evolving use of generative artificial intelligence (AI), particularly ChatGPT, in research and doctoral education. The conversation examines how he incorporates AI into literature searches, hypothesis generation, experimental design, coding support, and laboratory communication, while also noting persistent limitations such as inaccurate references and conceptual errors.

Beyond technical applications, TM reflects on how AI reshapes cognitive effort, writing practices, and the dynamics of graduate supervision. He highlights both the risks of cognitive offloading, where students may bypass deeper engagement with learning, and the potential for AI to support creativity, accelerate routine tasks, and foster collaborative dialogue between supervisors, students, and AI tools. The discussion also addresses broader questions of knowledge creation, mentorship, and the role of AI in shaping higher education. By situating AI adoption within the everyday practices of scientific research and graduate training, this interview offers valuable insights for academics, supervisors, and students navigating the promises and pitfalls of integrating AI into teaching and learning.

About the Conversation

Timothy Mitchison (TM) is a professor of systems biology at a leading U.S. medical school. His laboratory focuses on understanding fundamental mechanisms of cell biology, with a particular emphasis on microtubules, intracellular transport, and mitotic regulation. TM has contributed significantly to the fields of cell biology. Alongside his research, he plays an active role in mentoring PhD students and contributing to curriculum development in biomedical graduate education. In recent years, he has also developed a personal and professional interest in the use of generative AI tools in scientific research and education.

Figure 1. Professor Timothy Mitchison.

Yulu Hou (YH) is a doctoral student in higher and adult education. Her research explores the intersection of technology, identity, and knowledge creation in graduate education, with a particular interest in how scholars and students engage with AI tools. She is also involved in collaborative studies on doctoral education, international student experiences, and researcher development.

Figure 2. Yulu Hou.

In this interview, YH invited TM to reflect on his evolving use of ChatGPT in his scientific and supervisory work. The conversation, held in person in July 2025, explored how TM integrates generative AI into literature searches, experimental design, mentorship, and academic writing, while also raising broader questions about cognition, reasoning, and co-creation. Drawing on TM's disciplinary background in biology and YH's perspective from education research, the conversation also probed the boundaries of AI assistance and human–machine collaboration in graduate training. The transcript has been edited for clarity and flow.

Professional Background

YH: Could you please briefly describe your roles at your university?

TM: Absolutely. I'm a professor at our medical school. Historically, the school was focused on teaching medical students, but over the years, faculty like me have been doing less and less of that. In fact, I'm not involved in medical education at all anymore. That's now handled by dedicated medical education professionals.

My job today primarily revolves around supervising a research program, which is mostly funded by external government grants. I also play a voluntary role in PhD education. The most important part of that is mentoring PhD students who are doing their thesis research in my lab. Beyond that, I've participated in PhD program leadership, helping to organize programs and directing courses in the biomedical area. So overall, I would say my work is about 95% research and 5% teaching.

YH: Could you remind me when you joined this university?

TM: I came here in 1997, so it's been roughly 25 years now. Before that, I was a professor at UCSF.

Meeting ChatGPT for the First Time

YH: When did you first start using generative AI tools like ChatGPT?

TM: It's funny—my first realization of the power of deep learning came from a board game. I'm a fan of Go (called Weiqi in Chinese), and I remember the famous 2016 match where DeepMind's AI beat the top Korean player. That was a turning point for me. Go had always seemed like something the human brain could do but computers couldn't. So seeing an AI win was a signal that everything was about to change.

Figure 3: South Korean Go champion Lee Sedol, right, places the first stone against Google's AI program AlphaGo (VOA, 2016).

But I didn't start using generative AI myself until much later, when it became available to the public. That must have been in 2022, when GPT-3.5 launched and was free to use. Like many people, I went to the website and tried it out with some research-related questions, and I was immediately amazed. It was extraordinary: being able to have a conversation with a computer that felt like it was thinking.

Like most professors, one of the first things I did was ask it to generate literature citations. In research, one of the main ways we use the internet is to find out what's already known about a topic. We're always asking: What drugs have people studied? What do we know about this pathway?

So I asked ChatGPT to provide citations—and it did. But they were fake. They looked real, with plausible-sounding j-

-ournal names and author lists, often with Chinese names, but when I tried to look them up, they didn't exist. That was shocking. It was especially unsettling because the rest of the conversation was actually helpful, so the fake citations were hard to detect.

That experience put me off a little. Some of my colleagues never used generative AI again after that. They felt burned. And I've read that this was a common experience. Even now, GPT-4 still struggles with citations.

But I stayed interested, thanks in part to a junior colleague of mine, a former PhD student who's now in another lab. He's very enthusiastic about generative AI and would regularly update me on ways to work around the citation problem and new use cases people were discovering. That helped keep me engaged.

There was also a memorable faculty meeting where a colleague presented a project he had done in Israel: he asked ChatGPT to write scientific papers using only existing literature (Ifargan et al., 2025). He's a serious scientist, and I was really impressed by how far the AI could go, formulating hypotheses, structuring papers. It made a big impression.

Since then, generative AI has become more integrated into my work. I don't want to sound like an advertisement for a specific tool, but I've mainly used GPT-4, based on my colleague's recommendation. I've been paying for a subscription ever since. I tried a few other tools but didn't find them as satisfying, though that might just be because I've gotten used to how GPT works. Like any tool, it takes time to learn how to use it well.

Now, I use GPT-4 almost every day, mostly for research. Sometimes I use it on its own, and sometimes alongside other search tools. It's like having a colleague who is extremely broadly knowledgeable, but whose knowledge in any specific area is shallow and not always reliable. Still, no human has that breadth. So, it's incredible. And despite its flaws, like occasionally being wrong or resistant to correction, I've had many experiences where it made interesting connections or surfaced valuable insights.

YH: Thanks for sharing your experiences. You mentioned earlier that GPT still struggles with generating accurate references. Have you found any reliable workarounds?

TM: Yes, the fake citations are still a major flaw. One workaround is to use it in combination with a proper literature search engine. I sometimes have it formulate the search query, then summarize the results. That forces the citations to be real, though the synthesis can become less coherent.

Other times, I ask GPT for citations knowing they'll be fake, and I use those fake references as search terms in PubMed to find what it was probably referring to. That's kind of ridiculous, but it still saves time.

YH: Besides literature searches, what other specific tasks do you assign to GPT in your research?

TM: I've had all sorts of experiences using GPT for research, some frustrating, some really illuminating. One of the most compelling examples happened recently. I was studying a very obscure protein. There wasn't much known about it, but we observed it getting phosphorylated in response to one of the drugs we're testing. What struck me was that this protein had two completely different sets of annotations in the literature. One suggested it was involved in a cell death pathway; the other described it as a GDP exchange factor for a particular GEF protein. These two roles seemed totally unconnected.

So, I asked GPT-4: Why might a protein involved in a cell death pathway also act as a GEF? It's a highly advanced question. GPT-4 responded with several mechanistic possibilities. As usual, some of the citations it gave were incorrect, but one of the hypotheses really stood out. It pointed me to a very niche area of the literature I wasn't familiar with—an unexpected corner that, I think, opened up a genuinely interesting line of inquiry. That, to me, is a key strength of generative AI in research: it prompts new ways of thinking. It helps you frame better questions.

I also use it cautiously in tutorials, particularly when we're discussing topics that fall slightly outside my core expertise. In those cases, I really enjoy three-way conversations: me, a student or colleague, and the large language

model. These interactions are often stimulating, thought-provoking, and productive in unexpected ways. There's something very useful about having that kind of triadic dynamic: it pushes the conversation into new territory.

Knowledge or Retrieval?

YH: It sounds like you treat GPT-4 as a knowledgeable colleague, but one that can make mistakes. This aligns with how some in the literature describe generative AI as a "more knowledgeable other (Stojanov, 2023)."You also mentioned earlier that it helped you make novel connections. In that protein example, would you consider that a form of knowledge creation by GPT-4? Or was it just surfacing information that already existed?

TM: It's not that GPT-4 synthesized new knowledge. It was more like it highlighted existing knowledge I hadn't seen. Maybe I could have found that information through traditional searches—PubMed, for example—but it would have taken longer, and I might not have thought to ask that specific question in the first place.

I haven't yet encountered an example where ChatGPT truly creates novel knowledge—something unsupported by any current literature—that I would trust. As you dig deeper into a topic, GPT-4 will start offering more synthetic suggestions, but those are often unreliable. The deeper you go, the more likely it is to suggest something imaginative but false.

There are areas where it's just flat-out wrong. That's especially problematic when it reinforces misconceptions—things that sound intuitive but are actually incorrect. This happens often in chemistry and physics, where the correct answer is counterintuitive. I can give you an example. There's a simple problem in statistical mechanics: imagine particles randomly bouncing around in a solution near a hard wall. How does their concentration change as you approach the wall? I assumed the drop-off would be shallow. My colleague told me it actually drops very steeply, which is the correct answer. When I asked ChatGPT, it gave me the same wrong answer I had. It echoed the same mistaken entropy-based reasoning I was using. And even when I challenged it repeatedly, it couldn't be convinced otherwise. That was disconcerting.

But in other cases, especially when doing rough, back-of-the-envelope calculations in biology, it can be quite helpful. Say I want to estimate how many molecules are in a 1-micron box at 1 molar concentration. I used to do that by hand. Now I ask GPT-4, and it usually does a decent job, though sometimes it makes order-of-magnitude errors.

What's interesting is that if I say, "That doesn't sound right. Can you check it?" It often revises its answer and gets it right the second time. It's capable of self-correction when prompted, which is amazing. Not always, but often enough that I keep using it.

Expanding Use Cases

TM: I tried using it to learn Python from scratch, but I didn't get far because my starting knowledge was zero. Still, I now use it to generate command-line expressions in Excel for tasks that would be too confusing to Google. Excel can do fairly complex operations, and GPT-4 can usually produce a working command that I just paste in. That's incredibly useful.

Professional coders use it in a similar way, for writing and debugging code. But I've noticed that if you know nothing, GPT-4 doesn't help much. It doesn't substitute for foundational knowledge. That applies to literature searching too. I can evaluate its suggestions because I know the field. I can quickly spot which of the five responses are worth pursuing. So right now, it's most helpful for experts: it makes us faster, and sometimes more creative.

I've also started using it for lab protocols. If I need to express a protein, I'll ask for a protocol. It's usually decent—perhaps no less reliable than what you'd find in a published paper. So, for simple tasks, it works quite well.

And here's another unexpected use: in biology, we often work with lists of proteins and want to categorize them. For example, if I have 100 proteins and want to know which ones bind microtubules, GPT-4 can help. If I give it the list and ask which ones likely bind microtubules, it does an okay job—not great. But if I ask it to generate a list of 10-

-0 microtubule-binding proteins, it does a very good job. That task is officially handled by gene ontology databases, but those aren't always reliable or convenient. GPT-4 ends up being faster and sometimes more useful.

YH: It sounds like, as a senior researcher, GPT-4 has helped you with many routine tasks, convenient and time-saving, even if it makes mistakes occasionally. What about more advanced tasks in research?

TM: The protein example I mentioned earlier is probably the most advanced use I've had. In that case, I was looking at two datasets from two different students, published in separate papers. I was trying to synthesize across them—looking for a connection. That kind of synthesis is where GPT-4 has helped me most. I asked GPT-4 to explore potential links between two seemingly unrelated findings. That's not something you'd easily get by asking a human expert or using traditional search tools. It pushed me to think beyond obvious explanations and consider alternative mechanisms.

So yes, generating hypotheses across datasets, helping me find unexpected relationships, that's probably the most intellectually advanced thing I've used it for. And I don't really do anything in my work that's more complex than that kind of conceptual synthesis. GPT-4 is great for those quick, exploratory conversations. I've found that longer sessions don't improve the output much—you hit the limits quickly—but short, focused exchanges can be incredibly helpful.

Writing and Cognitive Effort

YH: What about writing?

TM: I've tried using it for writing, but I really dislike the style. I enjoy writing. It's one of the pleasures of my job, actually. I care about every word, especially in scientific writing. And I believe there is such a thing as style in science writing—but it's subtle. So, when I'm writing a paper, it's an intense process. Every sentence matters. There are no shortcuts. And frankly, the figures are harder than the text anyway.

I also do a lot of communication in bullet points—PowerPoint slides, shared docs within the lab. I've found GPT-4 pretty good at taking a paper and turning it into bullet points. It's less good at turning bullet points into polished paragraphs, in my opinion.

YH: You mentioned that you don't want to delegate writing tasks to GPT-4 because they're integral to your thinking. In EdTech research, we call that cognitive offloading, using a tool to take over part of the mental labor (e.g. Zou & Zhao, 2025). For you, writing isn't something you want to offload.

TM: Right. I don't want to offload that part of the process. There are a few reasons for that. First, writing isn't the bottleneck in my productivity, so I don't gain much from speeding it up. Second, I actually enjoy writing. It's part of what makes my work satisfying. And third, it stimulates my internal thinking. If I delegate that to a machine, I'm not engaging my brain in the same way. Maybe GPT-4 could technically do a better job, but it's my job to think about these things.

That's why I'm concerned about AI use in education. If we let students offload too much cognitive effort, will they ever truly learn? But I also understand the counterpoint. Students today are under immense pressure, with limited time. Maybe AI can help them cover more ground. I don't know the answer yet, but I hope our class experiment will shed some light.

That said, I'm planning to run an experiment next semester in a new master's-level paper reading class. We'll ask half the students to read papers and write notes the traditional way, and the other half to input the paper into GPT-4 first, get a bullet-point summary, and then read it. We'll alternate groups and compare the experiences. I'm genuinely curious whether the AI-assisted reading helps students, especially with papers that are outside their core training. For instance, a biochemist trying to understand a medicinal chemistry paper. It might help bridge that gap.

YH: You're also pointing to a broader question: when does using AI support learning, and when does it short-circuit it?

TM: Exactly. One of my colleagues thinks if students use AI up front, they'll never really understand the paper. Another colleague—much younger—is convinced this is the future. I'm in the middle. That's why I want to try it out and see how students respond.

What you said earlier about cognitive offloading really resonates with me. I don't want to offload writing because it brings me joy, and because it stimulates other kinds of thinking. But that's not true for everyone. Some students might benefit from offloading certain tasks if it frees them to focus on other areas. It might come down to individual preferences and where people want to invest their effort.

Pedagogy and Mentorship

YH: That's a thoughtful approach for the classroom. I'm also curious about your supervisory role. How do you guide PhD and master's students when it comes to using generative AI tools like ChatGPT?

TM: For PhD students, my approach is that they're junior colleagues—not trainees. I don't tell them how to study or how to do their research. They're responsible for discovery and innovation, and how they get there is up to them. Of course, I'm happy to share how I work. And I learn from them too. That's a big part of why I get along well with students—we treat each other as equals.

With master's students, the relationship is a bit different. There's more of an expectation that we're teaching them something. We've had serious debates in our master's program team about how much to embrace AI. Should we tell students to use it for everything because it's the future? Or should we hold back because they still need to build foundational skills? We're not sure yet.

YH: That's fair. A lot of higher education faculty are still figuring this out. And when it comes to doctoral education, the landscape is even murkier.

TM: Exactly. For PhD students, what matters is the result—the discovery. That's the assessment: publication, peer review, contribution to knowledge. We all know AI is having an impact on assessment. Some educators have reacted by banning devices, insisting on in-class exams, leaving cell phones at the door. Others say: I don't care how you get there; I just want to see the answer.

In our program, we've noticed that if we assign quantitative take-home problems, students will almost certainly use AI tools. So, we've moved away from that kind of assignment and toward short-answer questions or in-class assessments. There's no perfect solution.

It's a huge topic, and I'm not the right person to tackle it deeply. But I am aware that assessment shapes how students learn. I just tend to see things more from the research side: how students engage with uncertainty and make new knowledge. That's where my interest lies.

YH: That's understandable. AI and Assessment is a major topic in undergraduate education, but we know far less about how it plays out at the doctoral level. You mentioned earlier that the core goal for PhD students is discovery. Do you think GPT can support that goal?

TM: Yes, I do. Both my doctoral students and I have been using GPT in ways that make us more efficient. Someone uses it to code; I use it to design experimental protocols. That's not cognitive offloading; it's just a faster way to get information we already know how to process.

But when you're using it to connect ideas across datasets, that's a more advanced kind of use. I think GPT-4 can support cognitive enhancement in that space. It's like having a colleague who helps you maximize your mental output.

The kind of student pursuing a PhD has also changed. When I started, people pursued PhDs to push the boundaries of knowledge. That's how I approached it. It's not just about the tools we use—it's about the mindset. But these day-

-s, many students see the PhD as a stepping stone to a good job. They want to do the minimum. They're less interested in being stretched. And they want more formal education: more coursework, more structure.

Maybe they're right to want that. But I've had to adjust my expectations. I'm still very elitist in my scientific thinking. I've always worked at the top places, and I've always believed that if you don't know something, you go figure it out. In that mindset, GPT is just a new tool for inquiry, like the library used to be.

I also found GPT surprisingly useful when mentoring PhD students, especially when they come to me for career advice. I've used GPT-4 as a kind of brainstorming tool for career direction.

AI Co-Creation and Human Thinking

YH: Earlier you described GPT as an efficient assistant, but I wonder, do you ever feel that you're actually co-creating with it? That it's more than just a tool?

TM: It certainly simulates agency very well. But I think we need to be careful about attributing human-like qualities to it. Sometimes I've had this conversation with colleagues: Is GPT thinking? How is it different from us? I tend to take a relatively skeptical—or maybe just humble—view of human reasoning. I actually don't think humans are as impressive as we like to believe. We all have deep blind spots. I can look at a chemical structure and intuitively reason about its behavior. It feels like reasoning, but it probably isn't really. That's training, not innate genius. When a physicist sees the same thing, it's just scribbles to them. So, I'm not convinced that our reasoning is as advanced or as distinct from machine reasoning as we might think. We don't fully understand how humans reason. Large language models generate the next word based on probabilities. But maybe that's not so far from how we operate.

So yes, maybe these machines are reasoning in ways that are different, but not necessarily lesser. I haven't tried this myself, but I've heard of researchers who use multiple AI agents, like two instances of GPT-4, where one plays the role of a creative thinker and the other a critic. They pose questions to each other and iterate (Yang et al., 2025). Apparently, this setup has produced ideas that combine novelty with rigor. That kind of synthetic back-and-forth is interesting.

YH: That's fascinating. In our field, we care a lot about how something was created. It affects how we value the findings. But maybe in science and engineering, it's more about the result?

TM: In science, it usually doesn't matter how you got there, as long as the result is valid, reproducible, and insightful. There's a lot of interest right now in building predictive models of biological systems using machine reasoning. For example, you might ask: If I give this patient two compounds, what will happen to their cancer? That kind of model would rely on probabilistic reasoning rather than causal chains, which are hard to establish in complex biological systems.

Some researchers are also trying to reverse-engineer how AI makes its predictions, with the hope that understanding the model's internal logic might reveal new mechanisms in biology. That's a whole new frontier, where machines might not just help us reason, but actually reason in ways we're not capable of. That's probably not the kind of research I'll personally pursue, but I think others will. And they should. These tools are going to be a big part of the future.

Emotion and Connection

YH: You mentioned that you're skeptical about human reasoning, and I noticed you use the word "feel" in describing chemical structure and its behavior: "it feels like reasoning." Do you think GPT can actually feel? Or perhaps simulate aspects of feeling?

TM: Personally, I don't find its emotional tone very appealing. As a biologist, I have a mechanistic understanding of feelings. We think using electrical signals at synapses, but we feel through chemical signals that diffuse and affect many neurons at once. That's what gives us mood and emotion. So, by that definition, computers can't feel. They d-

-on't work that way.

That said, humans are deeply emotional creatures. Our feelings are a source of both strength and vulnerability. Feelings drive us to tackle hard problems, but they also mislead us. They can cloud judgment, create bias, or lead to self-sabotage. That duality is part of being human—and it's something machines don't have. At least, not yet.

But I know these systems are designed to emulate human language, including emotional tones. And in some cases, that can be helpful. I've asked GPT-4 for recommendations—on finding a plumber, buying clothes—and it's worked out fine. But I can't imagine turning to it for relationship advice. That feels taboo to me, maybe a bit old-fashioned.

YH: Some people said ChatGPT gave them a sense of companionship during the lonely journey of their research. They described it as reassuring to have someone to "talk to" 24/7.

TM: I can see that. I'm privileged: I still have a lab group and wonderful students to talk to. But I'm 67 this year, and I do think about aging in science. I've seen different models. One colleague next door is still going strong in his lab. My father, also a scientist, aged more gradually. When it got too cognitively demanding to be in the lab, he still tried to do research from home. It kept him happy. He might have really benefited from something like ChatGPT—something to engage with intellectually when social interaction became more difficult. As we age, it becomes harder to stay socially and mentally active, but that's exactly why we need it more. It's like exercise: harder as you get older, but more necessary.

There's also fascinating work in robotics. I visited the MIT Museum recently and saw early social robots like Kismet from the 1980s. It had exaggerated facial features, like big eyes, expressive lips, and it was surprisingly effective at connecting with people, especially children with autism.

Figure 4: The First Social Robot Kismet (Kismet, 2025).

That tells us something: our brains are wired for social engagement, and under the right conditions, machines can trigger those same pathways. That opens up possibilities for human–robot interaction, especially in therapeutic or educational settings.

But as with everything in AI, it's still early. We don't really know what the long-term effects are. And we need to be thoughtful about where we draw the line between simulation and real connection.

Conclusion

This interview offers a window into how an experienced scientist is integrating generative AI into the everyday practices of research and graduate education. TM's reflections highlight both the possibilities and limitations of tools like ChatGPT: their capacity to accelerate routine tasks, stimulate conceptual exploration, and support mentoring, alongside persistent issues with accuracy, reasoning, and the risk of cognitive offloading. His experiences suggest that AI can be valuable when used by experts who can evaluate and challenge its outputs, and when it becomes part of a broader conversational process within labs and classrooms. At the same time, the discussion raises important questions about learning, assessment, and what counts as meaningful intellectual labor in an AI-mediated academic environment. Taken together, the conversation underscores the need for thoughtful, discipline-specific approaches to AI adoption that preserve human judgement, creativity, and connection at the core of research and doctoral training.

Practical Notes: Key Insights from the Interview

General Takeaways

- Use generative AI as a companion tool, not a replacement for expertise. GPT works best when paired with strong foundational knowledge that allows users to evaluate and challenge its outputs.
- Expect broad but shallow knowledge. AI can surface unexpected connections and generate helpful starting points, but deeper disciplinary reasoning still requires human judgment.
- Always verify citations and technical details. Because GPT may produce plausible but inaccurate references or conceptual errors, pairing it with reliable search tools remains essential.

Research Practices

- Leverage AI for routine tasks to enhance efficiency. Tasks such as summarizing papers, drafting code, and generating protocols can often be completed faster with GPT assistance.
- Use AI to support conceptual exploration. Quick, focused exchanges with GPT can stimulate hypothesis generation or help frame questions that bridge datasets or disciplinary boundaries.
- Recognize the limits of AI in writing. Writing remains an important part of scientific reasoning. AI-generated text may not capture desired precision or style.

Teaching and Supervision

- Be mindful of cognitive offloading. While AI can accelerate work, excessive reliance may reduce deeper learning, particularly for students still building foundational skills.
- Maintain clear expectations for independent thinking. Assessment should continue to emphasize students' ability to evaluate AI outputs and reason through ideas on their own.
- Experiment with triadic conversations. Three-way discussions among supervisors, students, and AI can generate dynamic, multi-perspective dialogue and push thinking into new directions.
- Consider AI as a tool for career reflection. GPT can help students brainstorm potential career directions, offering structured prompts for discussion and exploration.

Future Research Directions

This interview opens several pathways for empirical inquiry into the role of generative AI in research and graduate education. Future studies could adopt comparative designs across laboratories, departments, or institutions to map disciplinary differences in AI use. Longitudinal research could examine how faculty and students integrate AI tools over time and how their practices change with continued use. Qualitative studies that incorporate interviews, observations, and artifact analysis could also deepen understanding of how AI shapes cognition, mentoring relationships, and scientific workflows. Finally, collaborative studies involving both STEM and education researchers could examine how AI-mediated reasoning and supervision practices intersect across fields and offer a richer account of emerging academic work.

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"Will AI steal my glory?": Power relations perceived by college instructors when grappling with Generative AI

Yanhong Zuo[A] [A]Fashion Institute of Technology, USA

Xiatinghan Xu[B] [B]Millikin University, Decatur, USA

Leigh Ann Dunning[C] [C]Stetson University, Deland, USA

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Correspondence

yanhong_zuo@fitnyc.edu[A]

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Abstract

This instrumental case study explores college instructors' perceptions of Generative AI as a potential tool for students to learn writing and their teaching practices under the influence of different power centers. Through inductive analysis, this study identifies four centers that have shaped the college instructors' perceptions of Generative AI, including the global impact of AI, the university and department, colleagues, and students. In response to these power dynamics, many instructors have updated their teaching practices to make sure that they still retain their authority in class and promote student accountability for their own learning. These changing practices may range from limiting the possibilities of using Generative AI in assignments to actively integrating it into their lesson planning. Findings of this study can inform instructors' professional development and strategies for responding to the trend of Generative AI in teaching practices.

Introduction

Generative AI (GenAI) is becoming increasingly integrated into everyday digital tools. Microsoft CoPilot, for instance, is now embedded in Microsoft 365, a platform many universities rely on for communication and workflow management. Similarly, ChatGPT has been incorporated into several online Learning Management Systems that are widely used in higher education, such as Canva. As such, many of these tools are marketed as time-saving solutions that simplify tasks and offer instructors access to a broader range of resources and support than they may have had in the past, potentially transforming how they approach teaching, research, and administrative responsibilities (Wyk, 2025).

In higher education, GenAI has been used to assist students in their writing processes (Karimi & Qadir, 2025). For example, AI can provide instant, 24/7 feedback regardless of the location of the student and offer personalized guidance and feedback. However, while GenAI can provide benefits for writers, scholars have also raised crucial questions about the use of GenAI and its implications for higher education. Many of these questions circle around ethical uses, such as authorship (Kostopolus, 2025), academic integrity (Vetter et al., 2024), and GenAI's more long-term impacts on critical thinking and rhetorical knowledge development (Wang & Wang, 2025). Additionally, while GenAI can be helpful in assisting students in revising and learning about grammar, format, and style (Alharbi, 2023; Fitria, 2021), it may have limited ability in engaging with diverse or conflicting perspectives, which is common in many disciplines in social sciences and humanities (Escalante et al., 2023).

While many studies have explored the potential of GenAI in improving teaching and learning of writing in higher education by proposing grand models based on students' and instructors' personal experiences (e.g. Escalante et al., 2023; Kohnke et al., 2023), less empirical research has been conducted to examine the social context of its actual application. Further, existing research on GenAI in higher education has primarily focused on undergraduate students, particularly English as an Additional Language (EAL) learners, while much less has analyzed instructors' perceptions and teaching experiences under the influence of GenAI (Crompton & Burke, 2023). However, instructors across disciplines—from natural sciences to social sciences and humanities—may have writing assignments in their courses, and they face challenges with the increasing use of GenAI (Abdelaal & Al Sawi, 2024). More specifically, they need to navigate this new landscape as they determine whether—and how—to integrate GenAI into their course design, pedagogy, and assessment. Furthermore, instructors may feel uncertain about how to integrate GenAI in their teaching practices, even if they acknowledge that it is embedded in the future of education (Villarreal, 2023).

Indeed, because instructors will shape writing instruction at the college level, what they believe about the role of GenAI in writing and how they grapple with it based on such beliefs in their teaching practices deserves more attention. This study explores how college instructors understand GenAI's impact on writing instruction and what factors have shaped the way they teach. By centering faculty voices, this research study deepens understanding of how instructors engage with and reflect on GenAI, offering insights with lasting implications for writing pedagogy, student learning, and the evolving roles of GenAI in higher education. The specific research questions are:

1. What are the instructors' perceptions of using GenAI in college writing?

2. What are the mediating factors of their perceptions and/or use of GenAI in their teaching?

3. How do they respond to the increasing use of GenAI in college writing?

Literature review

Although it is important to understand instructors' perceptions and experiences of teaching under the increasing influence of GenAI, most existing literature focuses on its potential in supporting students' writing and learning (Villarreal, 2023). In addition to providing personalized tutoring and feedback based on students' individual needs, the use of GenAI tends to promote learner agency, interactive dialoguing, and metacognitive skills (Ouyang & Jiao, 2021). Especially in disciplines such as language learning, research has identified potential benefits in using AI-based tools to support EAL students' writing (Ng et al., 2023).

For example, a group of EAL students in a university in China with AI-assisted instruction demonstrated enhanced writing proficiency including organization and coherence compared to the other group under traditional writing instruction (Wang et al., 2024b). These enhancements may have resulted from the instant feedback and personalized guidance on grammar and vocabulary provided by GenAI tools (Marzuki et al., 2023).

However, while existing research has acknowledged the benefits of using GenAI in writing instruction, some faculty have found it challenging to integrate it into their teaching practices (Kutty et al., 2024). There are several factors affecting instructors' attitudes towards GenAI integration in the classroom. Foremost, some believed they did not have the skills needed to use it in teaching. Many of them explicitly stated that they lacked the confidence to integrate GenAI into their teaching or teach students how to use it responsibly (Villarreal, 2023). Another reason is that many universities do not have clear guidelines on what counts as ethical uses of GenAI; thus, faculty were uncertain about instructional rules regarding using it in teaching (Ng et al., 2023). Related to that, faculty may also struggle with ethical concerns regarding GenAI use for both them and their students. For example, in the field of psychology, Hostetter et al. (2024) found that faculty were often unable to distinguish AI-generated writing from a student's personal work. This raises critical questions about transparency, authorship, and academic integrity, which in turn influences whether and how instructors choose to incorporate GenAI into their classrooms. Finally, faculty may have concerns about data privacy and security. In a qualitative study of 12 English instructors, Kohnke et al. (2023) observed that many were hesitant to use GenAI tools because they were not sure how "data will be protected and algorithmic biases minimized" (p. 2). These concerns highlight the uncertainty around incorporating GenAI into classrooms.

While this growing body of research provides valuable insights, most focus on effective methods and challenges of using GenAI in teaching (Wale & Kassahun, 2024), student learning (Wang et al., 2024a), and writing outcomes (Song & Song, 2023). These studies help us understand how GenAI is changing both students' and instructors' approach to writing. However, less attention has been paid to how instructors are making sense of GenAI in teaching despite the challenges they face—particularly across different disciplines and institutional roles (Zhai, 2024). Since teaching is a social practice that can be shaped by the sociocultural context, instructors need to consider the power dynamics involved in their GenAI practices in the specific contexts when making their decisions in teaching. In other words, it is worth exploring and examining their perceptions of GenAI and the social context in which they are working to better understand their GenAI practices and provide support to them. It is important to understand instructors' perceptions and implementation of GenAI tools in the classroom, especially as the field shifts from a technology-centered approach focusing on rapidly evolving tools to a human-centered approach that emphasizes ethical and empowering use (Ouyang & Jiao, 2021).

Theoretical framework: Scale and polycentricity

To understand the macro and micro levels of power dynamics, which may shape instructors' perceptions and teaching practices with the increasing use of GenAI tools, we use the theoretical lens of scale and polycentricity to guide our study (Blommaert, 2021). Scale, also known as levels or distributions, is a metaphor that imagines that things are "hierarchically ranked and stratified" (Blommaert, 2010, p. 33). Scales can be understood both vertically and horizontally. The horizontal dimension refers to how social practices are shared or operated across different spaces, whereas the vertical dimensions examine dynamics at local, national, transnational, and global levels, which provides an understanding of how social events and processes move across different levels through "codes, norms and expectations" (Blommaert, 2010, p. 32) in a global context.

Useful for analyzing practices in both horizontal and vertical dimensions, different scales can reveal the social and cultural images of a society in a specific time and space; such knowledge can help understand the "stratified social meaning system" (Blommaert, 2010, p. 34) and allow us to see sociolinguistic phenomena in relation to a stratified and power-laden social structure in a global context. Guided by the lens of scale, we aim to explore how the power of GenAI can impact a layered, power-driven social structure in both local and global context, especially with the sweeping influence of GenAI on higher education.

In such a stratified social structure, the theory of polycentricity acknowledges that multiple centers of authority, power, or normativity coexist and influence social interactions. In this view, society is not organized around a single, dominant center but involves multiple "centers" or "evaluating authorities" (Blommaert, 2010, p. 39) at dif-

-ferent scales. The centers at upper scales develop "norms and perceived appropriateness" (Blommaert, 2010, p. 40) that those at the lower scales refer to. Polycentricity emphasizes that individuals may adapt their languages, behaviors, or communication practices to meet the expectations of these different centers of power. For example, a person might use different forms of language or adhere to different norms when interacting in a formal work setting compared to an informal social gathering. Power dynamics across scales are displayed in job titles, relationships, systems, and policies (Blommaert, 2021). The concept of polycentricity highlights the power relations and inequalities in how different norms and standards are valued and devalued across contexts. In this study, polycentricity helps understand how instructors' teaching practices are influenced by different power centers and why they adjust to them.

The concepts of scale and polycentricity also help explain why instructors' perceptions of AI are not uniform but rather shaped by their orientation to multiple, and sometimes conflicting, centers of normativity. These concepts offer a concrete framework for identifying the mediating factors of instructors' perceptions and use of GenAI in teaching. Therefore, they provide a powerful lens to understand how instructors grapple with the increasing use of GenAI as it has become an integral part of the educational landscape that has been transforming various aspects of teaching and learning. They experience the tensions of compromising their own beliefs of academic integrity with university guidelines (Zuo & He, 2024; Zuo, 2024), balancing GenAI use with human interactions (Wang et al., 2024b), and adapting their teaching approaches to respond to the challenges brought about by GenAI tools (Kohnke et al., 2023).

Methodology: An instrumental case study

This study is an instrumental case study following the exploratory approach (Creswell, 2013). Without setting a predefined hypothesis, this approach allows us to focus on the actual experiences of college instructors and achieve an in-depth understanding of how participants interpret their experiences through capturing their thoughts and perceptions (Merriam & Tisdell, 2016). Through analyzing data from multiple sources and reporting in detail on the views of participants, this approach provides insights into complex circumstances of how power dynamics of different centers may shape instructors' teaching practices (Marshall & Rossman, 2016).

In this study, we aim to go beyond the case to gain insights into a phenomenon (Stake, 1995; Yin, 2018). An instrumental case study uses one or more cases as an instrument to provide insights into an issue or a larger phenomenon and facilitate the understanding of it. The case being studied is the AI practices of the instructor participants at a U.S. university, which can shed light on instructors' perceptions of how GenAI can influence teaching and learning.

Research site

This study took place in Fall 2024 at Palm Tree University (pseudonym), a four-year liberal arts university in the U.S. This university offers both undergraduate and graduate programs across different disciplines including education, business, music, and legal studies. Since 2023, Palm Tree University has developed a Quality Enhancement Plan that focuses on information literacy and formed a University GenAI Task Force that provides support to faculty regarding the increasing use of GenAI tools. They created a Canvas course with resources of teaching materials, such as samples of AI syllabus statements, discipline-specific examples of GenAI use, and guidance on effective prompt design. They also host a yearly colloquium and a monthly book club to invite faculty to participate in discussions on how GenAI can be used to facilitate teaching and learning.

Participants

Following the exploratory approach, we recruited 33 instructor participants who responded to a survey, and 10 focal participants who accepted the interview invitation. They are from different disciplines across campus and have various teaching experiences. Figure 1 and Figure 2 present information regarding the survey respondents' discipline and years of experience in academia; Table 1 provides the demographics of the focal participants.

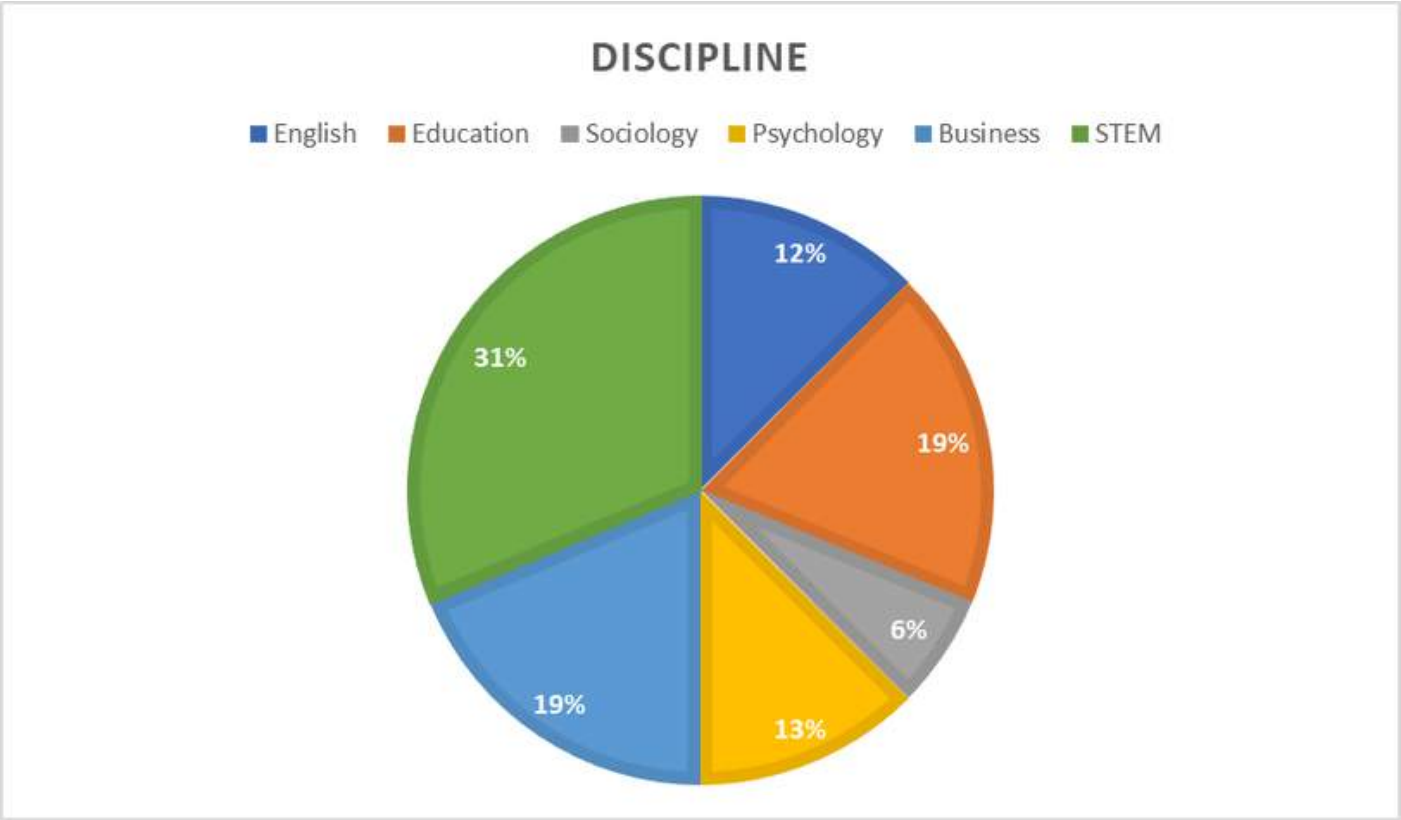

Figure 1. Survey respondents' discipline.

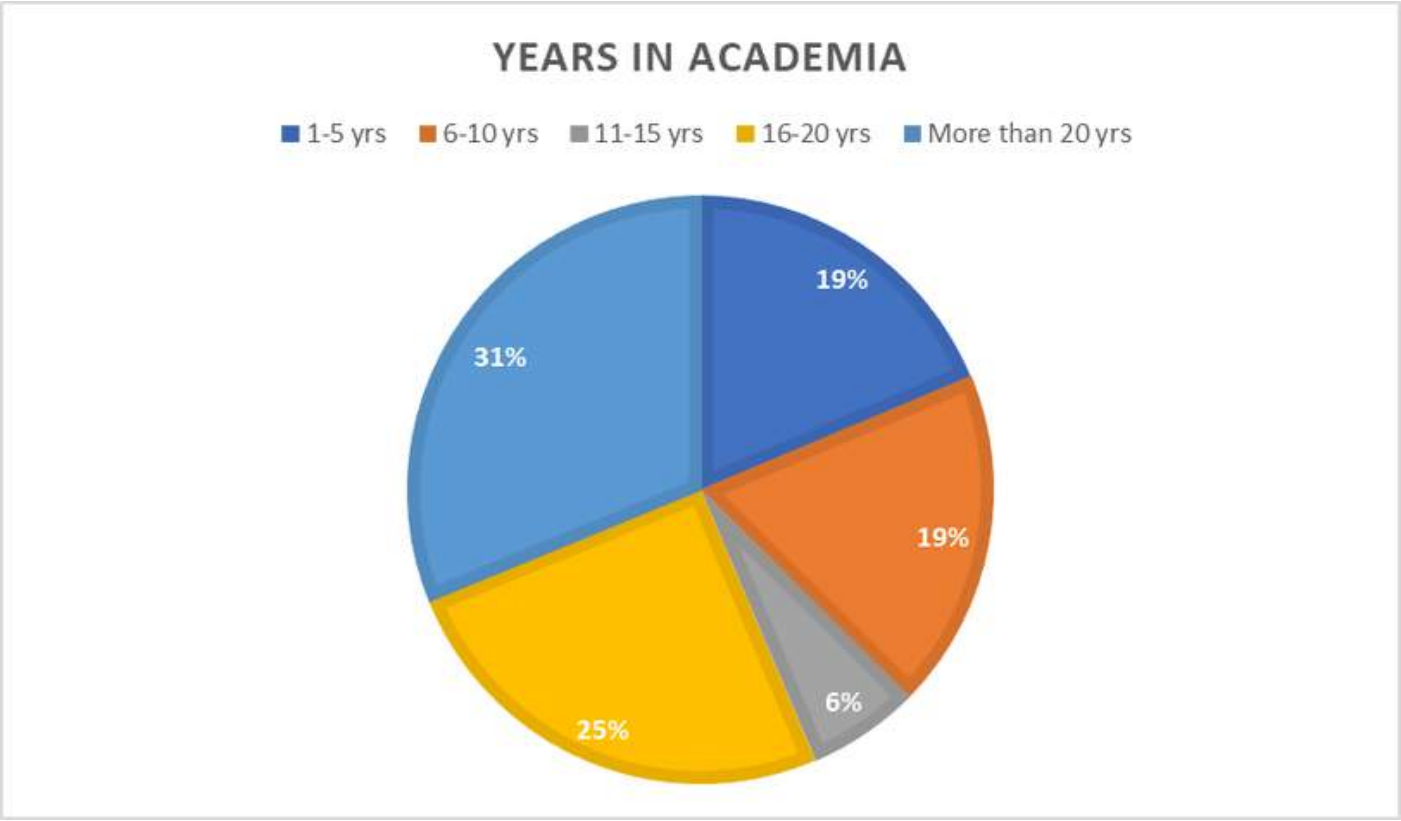

Figure 2. Survey respondents' years of experience in academia.

Table 1. Focal instructor participants' demographics.

Pseudonym	Discipline	Gender	Years of Teaching in Higher Education
Emily	Health Science	F	24 years
Sophia	Education	F	7 years
Alex	Business	M	27 years
Luke	Psychology	M	26 years
Jack	English	M	8 years
Olivia	Education	F	3 years
Grace	Biology	F	5 years
Lucy	English	F	22 years
Henry	Psychology	M	12 years
Ava	Education	F	6 years

Data collection and analysis

Data were collected from multiple sources including a questionnaire, interviews, and course-related documents such as syllabi and assignment descriptions. We sent out a questionnaire reaching out to 265 faculty members across colleges and schools and 33 responded. The questionnaire gathered information about the participants' demographics, perceptions of GenAI tools, and how they have been navigating GenAI in their teaching. Then we interviewed 10 focal participants from different disciplines to better understand the individual experiences of each participant. We asked them about their GenAI policies in their courses, the impact of GenAI on college writing, and challenges or concerns they might face in teaching with GenAI.

We used inductive analysis (Bingham & Witkowsky, 2021; Saldaña, 2021) to examine questionnaires, interviews, and course-related documents. This approach allows research findings to emerge from the significant themes inducted from data (Thomas, 2006). The specific process of data analysis involved three rounds of coding, a process during which we interact with data through reiterative reading, asking questions, making comparisons, and interpreting codes to make sense of data and identify themes or categories (Saldaña, 2021). We started by organizing the qualitative data by individual participant, first making a detailed description of each case and then going through the inductive process to arrive at identifying themes within the case. Next, we conducted a thematic analysis across the cases to tease out the major themes emerging from the data (Charmaz, 2014). Finally, we further categorize and theorize the themes identified, based on which we built the major findings of our research.

In addition, we triangulated the themes with multiple data sources and did member checking with our preliminary findings to enhance validity (Bingham & Witkowsky, 2021; Creswell, 2013). For example, interviews r-

-evealed that participants felt pressure to learn how to use GenAI tools to teach AI literacy, while survey responses reflected concerns about their ability to keep pace with rapidly changing technology. We also conducted member checking with the instructors on the preliminary findings. The data triangulation and member checking enabled us to revise our analyses. After we finished all data analysis, we reported findings again to the participants and invited them to comment on them and revise if necessary (Creswell, 2013).

Results

Just as teachers have various perceptions and understanding of digital teaching tools, such as Padlet, Canvas, and Google Classroom, the participating instructors showed different levels of acceptance and engagement with GenAI in their teaching. Based on an analysis of the survey data, about 62.5% of the respondents indicated that they would allow students to use GenAI in their writing assignments; the top three reasons for such a choice include GenAI's potential in helping students work through writer's block (78.3%) and brainstorm ideas for writing (76.2%) and GenAI's prevalence in students' real-life experiences (61.5%). Meanwhile, 20.4% of the respondents noted that they had not approved the use of GenAI in their course, largely because they felt they were not knowledgeable enough to tell if/how students had used GenAI (40.3%) or they believed "teaching students to write by themselves is the key" (32.5%). In addition, 17.1% of the respondents entered "Maybe" when asked if they would allow use of GenAI in their class, which means they were willing to keep the door open but had not figured out how it could be integrated into the curriculum and assignments to enhance students' learning experience.

An examination of the interview with the 10 focal participants reveals more details regarding these instructors' choices. More specifically, guided by the theory of scale and polycentricity (Blommaert, 2021), instructors' perceptions of and practices with GenAI are shaped by the power of four centers including the global impact of GenAI, university/department, colleagues, and students. They tend to adjust their teaching based on their perceptions and understanding of the rapid spread and development of GenAI, the university/department's attitudes towards GenAI, and how their colleagues and students have been using GenAI in their teaching and learning. In the following, we explore the four centers that exercise power to shape instructors' perceptions of integrating GenAI into their classrooms and the ways these instructors orient themselves to the centers through their teaching practices.

Center one: The global trend of Generative AI

As shown in the existing literature, GenAI has raised heated discussions in terms of its impact on all aspects of teaching and learning in higher education since 2022 (Chan & Colloton, 2024). Influenced by the power of the global trend of GenAI, many instructors have tried to delve into the transformation of teaching and assessment methods by incorporating the tool into their curriculum design (Bok & Cho, 2023; Pokkakillath & Suleri, 2023). The 10 participating instructors noted that "AI is the reality," which "seems inevitable" and is "never going away." For instance, one of them said:

> It's not going to go away. I'm hearing the same arguments and language that were offered when the internet became popular. I don't see it going away. I do see businesses using it instead of hiring writers, and then expecting employees to "spice up" or "fix" the writing. (Lucy)

In other words, this instructor, like the rest of the participants, believes that GenAI is a trend that they cannot avoid or ignore. Therefore, they need to adjust their teaching practices in response.

However, while all instructors have recognized the inescapable reality of generative AI, they have different perceptions of the tool, which can affect their potential responses to this global trend of GenAI based on their own situation. Six of the 10 instructors acknowledge the potential of GenAI in facilitating the writing process as it can provide various support at the different stages of writing. First, they think that it can promote thinking, such as generating and organizing ideas. For instance, all ten instructors noted they had used GenAI to help their students brainstorm in class to come up with topics or reflect on their writing.

In addition, four of the ten instructors believe GenAI can help with the actual writing process, from creating an o-

-utline to polishing a draft. Especially, they believe GenAI can provide timely, contingent support to language learners and students with learning disabilities by summarizing readings and research findings when they are overloaded, offering quick grammar check, and asking clarification questions. Importantly, it can be an alternative to expensive prep schools that benefit students of low socioeconomic status. Also, since it can give quick, standardized feedback to students before they submit their assignments, it can also save instructors plenty of time for grading and evaluation of students (Seo et al., 2021; Usher, 2025).

Therefore, because of the above-noted affordances of GenAI, most instructors believe teachers should take accountability to keep up with this trend by learning about and practicing using it in their teaching. At the same time, however, some instructors tend to take a more conservative attitude as they are concerned about the limitations of GenAI and the ethical issues associated with its use. For example, one instructor was frustrated by GenAI because of "how capable it is." She described an incident in which she at first believed that she came up with a good idea for a major writing assignment for her course, but then realized that ChatGPT could generate a paper that meets all the criteria. Therefore, she felt her teaching and instruction might not be as appealing and useful to her students as she thought, which made her heartbroken, as she said:

> The final project is the one that made me realize how amazing ChatGPT is. It was this project that literally broke my heart. I was like, this is the best assignment…And then I typed it in to ChatGPT, and it brought up the most beautiful [response to the prompt of the assignment], like, if one of my students turned it in, I'd be like…it's amazing. So that one broke my heart, because I thought it was like the most brilliant assignment. And clearly, ChatGPT also thinks it's brilliant, and just wants to steal my glory on this one. (Sophia)

However, although concerned about the increasing role of GenAI in higher education, these instructors agree that such a trend is inevitable. Hence, they still want to learn more about it and how it can be integrated into their courses and classrooms to regain their control and "stay a step ahead of" their students.

To conclude, under the influence of the global trend of GenAI, the highest level of the polycentric power dynamics scale, participating instructors all recognize the fact that the use of GenAI has gradually become a common practice in higher education and consider such a trend unavoidable. Hence, although they tend to hold different opinions due to their various beliefs about its effectiveness in enhancing learning and teaching and concerns about ethical issues related to it, many still see value in learning more about it to keep pace with current expectations for teachers and to maintain greater control over their teaching.

Center two: University and department

The participating instructors' AI teaching practices are also influenced by the power of the university and department, the second center in the polycentric power scales. As the 10 participants are from different departments, including English, Psychology, Education, Management, Biology, and Medicine, they reported varying policies or expectations regarding the use of GenAI in their department. In the following, we first introduce the AI policies reported by the participating instructors and then discuss their mixed attitudes towards having such policies.

First, instructors mentioned they needed to follow the AI policy set by their department and/or the university. Four of the 10 instructors noted that their department had a general AI policy, which aimed to ensure that each professor had a clear AI statement in their syllabus but allowed instructors to design their own specific policies and decide how they would like to use GenAI in their course. According to this requirement, these instructors allowed their students to use GenAI to help them write but not write for them, including brainstorming ideas for writing, reflecting on and improving their argument, and polishing their language. Based on this general requirement, however, they had slightly different opinions about the extent students can use GenAI to facilitate writing. While some thought it was acceptable as long as their students do the actual writing by themselves and honestly report where and how they use GenAI in their writing, a professor from the Department of Psychology wanted his students to use the tool more scrupulously, as he explained:

> There's kind of a general expectation that student papers should be the product of the student. In the default is that students shouldn't use GenAI unless specifically assignment says that they can use GenAI in the field. (Luke)

Meanwhile, some instructors reported that there was no AI policy in their department, which was "kind of an aside conversation" as the faculty tend to "take it for granted." When talking about the varying situations regarding GenAI use in different departments, two of these instructors noted that it may be an issue of disciplinary differences depending on the paradigms and practices of teachers and researchers in their field. For instance, a professor in the English Department said: "I feel like liberal arts university in general are more open to what's going on right now" (Lucy). Meanwhile, the instructors in social sciences reported that according to their observations, people in their department tend to hold mixed attitudes towards GenAI:

> My impression is in the Business School, most people are embracing the technology, not all, or at least they're aware of it enough to think we need to have our students ready for the workforce. (Alex)

In other words, because the Business School seems to be open to students' use of GenAI, instructors are willing to discuss it and prepare their students for using it.

In contrast, another professor in Psychology noted that his department was less interested in exploring GenAI and left the responsibility for creating AI policies to the instructors:

> (Psychology) I don't see much coming up in terms of conversation around it in the department……we haven't really talked that much about it, but professors are free to decide their own policy and class. (Henry)

On the one hand, instructors' views vary in terms of whether an official AI policy is needed in their department and at the university level. Some instructors explicitly noted that they believed at some point the university will have to give "formal guidance to everybody" to ensure consistency in their course development and teaching practices. For instance, as one of them said:

> There's a huge gap or is going to be what the professors are comfortable with, like if we all were on the same page on Canvas. I assume everybody needs to know how to use Canvas, obviously, like we don't all use it exactly the same way. (Olivia)

In other words, Olivia believed that the university should provide instructors with resources that could help them learn about GenAI and open discussions on how it should be used in teaching to keep everyone informed and updated. She believed once instructors had sufficient knowledge about its potentials and limitations, they could make better decisions with more confidence.

However, some instructors tended to hold mixed attitudes towards having a unified policy in their department, which may potentially have restrictive effects on their choices in teaching. For instance, one of them suggested that he wanted to have the freedom whether to use GenAI but was concerned that without an official policy he may not be "on the same page" with other professors. More specifically, he said:

> Currently there's no clear guidelines from the university and department. I want to be flexible but also want to make sure that every professor is on the same page. (Olivia)

Furthermore, two of the instructors reported their concern as contingent faculty who have limited discourse power in their department and autonomy in curriculum development and thus tended to be prudent when considering using GenAI:

> As an adjunct I don't have like free rein over the course. I felt I didn't have as much freedom, and I was just kind of trying to stick to the outline that the professor who has designed the course. (Olivia)

In other words, these instructors felt constrained when considering modifying or adding AI elements to the existing course because of their lack of freedom as adjunct faculty members.

To conclude, at the time of the interviews, the university in this study had not implemented a unified policy on AI practices. Instructors have shown different levels of interest in the use of GenAI in higher education and are at different stages of understanding it. These policies and expectations of the university and departments have potentially shaped how the instructors chose to engage with GenAI in their curriculum development and teaching. Indeed, even scholars working in the same discipline and department may have different perceptions and understanding of the effects of GenAI on the teaching of writing. Hence, in the next section we discuss how the instructors orient themselves to the third center: their colleagues, that is, how their AI practices are affected by the other scholars in their field/department.

Center three: Colleagues

The participating instructors' perceptions of GenAI are also to some extent shaped by their colleagues' AI practices. According to these instructors, there is "absolutely the whole spectrum" in higher education regarding professors' knowledge and practices of GenAI, as one of them noted:

> In my experience, administrators that are older and kind of like old school are scared of it. I even saw an administrator told middle school they could not use it. And then you have the innovative, kind of like the nerdy but groundbreaking ones. They just want to know all the latest programs and they're telling their students use this. (Olivia)

In other words, they noticed that on one hand, some of their colleagues, especially the senior instructors, tend to hold back as they feel they do not have sufficient knowledge of the potentials and limitations of GenAI and do not feel motivated to change their teaching practices after working for more than 10 years in the field.

Further, some instructors were interested in promoting their beliefs in their department. For instance, six participants reported that they had colleagues who were interested in integrating GenAI into their teaching and believed that it was the responsibility of everyone in the department to keep learning and keep themselves updated. For instance, one of these supporters of GenAI said:

> In order for any of us to get comfortable with it, we have to keep using it. There has to be some accountability in the process where professors are saying like, yeah, I use it three times this semester. I had it in my syllabus. My class used it three times, and that could be documentable. You could check to make sure that was happening, like, I'm just thinking about how I am observed as an adjunct that can easily be checked off and part of the observation that's being held being held on me. (Olivia)

As a result, the participating instructors all felt peer pressure, to varying extents, to learn more about what GenAI can do for teachers and students because they saw more and more teachers had started to experiment with it, including some of their colleagues, who wanted to encourage or even push the others to it.

In addition to learning more about GenAI and integrating it into teaching, two of the instructors also talked about how their colleagues adjust the types of assignments they gave and their evaluations methods in response to the increasing use of GenAI identified among their students. One of them noted:

> I have heard some of them talk about how they have changed the types of assignments: they give either like more presentations because that helps you know that the student has actually learned it – you can't just have it spit something out for you, you know, you have to be able to get that information back to someone. (Grace)

In addition to the increasing use of GenAI overall, these instructors also observed that their colleagues have their own preferences for GenAI tools, which may affect how they engage with GenAI in their teaching, as one of them noted:

> I think people are using different ones, like a tutor in the Writing Center, she loved Bard, and now Gemini. Also, I never use ChatGPT. I think people have preferences, depending on what they're used to, and what they like. (Alex)

Hence, in this instructor's case, although she felt peer pressure, her decision about whether and how to use GenAI may still be rooted in her own expectations and evaluations of the quality of writing produced by different GenAI tools. Similarly, the instructors in humanities, such as English and History, suggested that the type of writing in their field is culturally and contextually sensitive and thus requires the writer to pay greater attention towards potential biases and be critical about the existing knowledge. In their opinion, although GenAI tends to advance the dominant views and values online, they may not be able to well address such aspects. Some of the professors in STEM, however, noted that the writing required in their field is relatively more structural and it is the data, instead of the style and quality of writing, that matters more. Hence, they believed that GenAI, if used appropriately, could be useful in increasing the efficiency of their students' writing.

To conclude, the participating instructors noted that they had observed a "whole spectrum" (Olivia) of attitudes to and practices of GenAI among their colleagues. Also, because more teachers have started to engage with GenAI or promote the use of it, they felt pressured, to a varying extent, to engage with it as well.

Center four: Students

All the participating instructors noted that one of the major factors that motivated them to learn about GenAI is the practices of their students, the fourth center in the power scales and the direct stakeholders in their teaching. More specifically, all 10 instructors noticed that their students were using GenAI to help them write. While some instructors identified traces of GenAI in the writing of several students in their class, the others suggested that over 80% to 90% of their students reported use of GenAI. Hence, they all believe that faculty need to "be on top of AI literacy" (Alex) to understand what their students are doing and take control of their course, including teaching and grading, as two of them commented:

> Because it's here, and students will use it, so I am obligated to teach them acceptable and potentially innovative ways to proceed. (Emily)

> We have to do something about it because students are using it. (Alex, emphasis added)

In short, these instructors felt pressured to take action because their students had already brought AI into their course, no matter whether they liked it or not.

In addition, many of the instructors were concerned that their students were more adept at using GenAI than faculty members, which placed them in a passive position in teaching and grading. For instance, four instructors noted that it became more difficult for them to evaluate students' real writing proficiency as they could not tell whether they used GenAI or not in their assignments. More specifically, two of them said:

> I hadn't played enough with it yet to figure out how we can use it and honestly, I would have to ask the students because I don't know what they know. (Lucy)

> I have been quite blunt if they just cut and paste the ideas. I will never know. (Sophia)

However, relying on students' self-report may not be an effective way to get accurate information about their GenAI practices because students were hesitant to acknowledge that they turned to GenAI for help. Also, instructors noticed that some students used GenAI because of "laziness," that is, they overly relied on it to have it finish the writing assignments for them instead of making use of the resources available to them to learn and improve their writing. For instance, one instructor commented:

> But it's laziness. In the rubrics, I have, you know, grammatical correctness, so they'll lose points for that. Because it's there on the rubric. It's black and white. I refer them to the writing center or the student support. Yeah, that's an offer because we offer so many great things for them. They just aren't making the time for it. (Olivia)

In other words, some students chose to use GenAI to correct their grammar instead of taking advantage of the resources provided by the university. They use GenAI as a shortcut instead of investing the time and efforts required to learn and grow.

In addition to unethical use of GenAI, some instructors noted that GenAI might also affect the way that they address educational equity. For instance, two of them were concerned that GenAI might enhance the existing digital divide because of students' unequal access to digital devices, as two of them explained:

> I think around equity, there's obviously all the issues like, who has access to the internet and, these programs - many of them are free, which is great, but there's also better ones that are not free, which is an equity issue in and of itself. (Sophia)

> ChatGPT is free, but there are some generators that are more accurate in terms of balancing off controversial topics, avoiding things like the false citations, you know, and all that sort of stuff. (Luke)

In short, they suggested that students with more economic capital could better use and benefit from GenAI as they have access to the advanced tools or versions. Such an enlarging digital divide, as they perceived, may limit the extent to which they can integrate it into their own courses to help all their students meet the learning goals.

Furthermore, some instructors worried that if GenAI was permitted to complete assignments, then what skills were actually being evaluated – writing or digital literacy. Considering that students may be prepared to varying degrees in terms of using GenAI in their learning and writing, they suggested that some students might need extra support to catch up with their peers. As one of them noted:

> If all our students could have equal opportunity to all levels of training, so maybe if there is a tool that the students take as a freshman that determines where they're at, like a proficiency level on GenAI, that would be helpful. And we then added GenAI to that, saying Okay, this student needs foundational level knowledge on what GenAI is, and then if the student was already using it, say they come from a private school that gave them instruction on that and had them using it some even for middle school, then they wouldn't need as much of foundational, but they could be more project specific. (Olivia)

In short, the participating instructors have several concerns about students' use of GenAI in their writing: First, many of them felt pressured to learn about it as their students were using it, and some of them noted that it was difficult for them to catch up with the practices of their students, who seemed to be more tech-savvy. In addition, the instructors had mixed feelings about the effects of GenAI on educational equity. On one hand, like many other instructors reported in the literature, they believed it could help English learners correct their grammar and polish their language; on the other hand, they were worried that if students ignored available resources suggested by instructors, it might lead to unethical use of GenAI. Additionally, students' various readiness for using GenAI might enhance the existing digital divide, which could further disadvantage students from low socioeconomic backgrounds.

Therefore, to address these concerns, many of these instructors exercised agency to update their teaching practices by using various strategies to ensure that they still have control of their courses as the authority in the class and the learning goals are still met, including shifting from author-based to editor-based pedagogy, adjusting the assignments, changing their grading criteria, creating AI policies, and having conversations about GenAI with students (see Table 2).

These instructors changed, to varying degrees, the types of assignments given to their students as well as the way they teach and grade them. First, they take actions to prevent students from overly relying on GenAI or using it as a shortcut, such as designing assignments that focus on the processes of thinking and writing instead of the final product and adjust their grading criteria to reflect these aspects. Additionally, realizing that this trend of GenAI is inevitable and many of their students are using it, the instructors decided to show them how to use it ethically and effectively to promote learning. More specifically, one of the instructors believed that it is important for students to see both the affordances and limitations of GenAI and how they can make use of the affordances based on their needs and make up for the limitations. Hence, he switched from an author-based approach of teaching to an editor-based approach, through which students can critically engage with GenAI in their writing process. Moreover, to have a better knowledge of how their students have been using GenAI, some instructors choose to have open conversations about GenAI with their students, based on which they can create an AI policy for their own class to regulate students' GenAI practices, including when and how they can use GenAI tools.

Table 1. Instructors' strategies.

Shifting from author-based to editor-based pedagogy	Having students edit AI-generated writing to help them understand the limitations of GenAI; increasing the number of revisions required	
Adjusting the assignments	Reducing the number of traditional writing assignments	Designing more hands-on activities
		Doing conferences instead
		Asking clarification questions
	Assigning reflections on one's thinking and writing process and/or the instructor's teaching	
Changing the grading criteria	Giving less emphasis on language, especially grammar, and more on clarity of students' narration of the process	
	Increasing the weight of class participation	
	Checking words that signal students' own work such as first-person point of view and personal voice	
	Using AI checker; having students redo the work once caught	
	Allowing students to turn in their variation of the assignment to ease their pressure to get everything right at their first attempt	
Creating AI policies	Having different AI policies in different classes, depending on the content and goals of learning	
	Having a general policy and then also specific, different ones for each assignment	
	Discussing AI with students to gain more knowledge of their AI practices	
Having conversations about AI with students	Showing students how to use it in a sensible and academically acceptable way	
	Bringing in an AI specialist or consultant	
	Having students practice writing questions: diversify and integrate the different methods at some point, knowing different uses for AI in different contexts	

Discussion

The study has identified four centers that shaped the college instructors' perceptions of GenAI, including the global impact of GenAI, the university and department, colleagues, and students. As "evaluating authorities" (Blommaert, 2010, p. 39) at different scales, these centers hold different "norms and perceived appropriateness" (Blommaert, 2010, p. 40) regarding the use of GenAI in college writing, which represent their own understanding of the affordances and limitations of the tool. Coexisting in a stratified structure (Blommaert, 2021), the centers have cumulative effects on the instructors' teaching practices: The ten participants, who came from a range of disciplines and had various levels of experience in higher education, adapted their practices to varying degrees to address the expectations of the four centers of power.

First, similar with their counterparts in many global contexts who have been trying to actively respond to heated discussions of GenAI's impact on higher education, especially classroom teaching and curriculum design (Bok & Cho, 2023; Chan & Colloton, 2024; Pokkakillath & Suleri, 2023), the participating instructors, regardless of their personal attitudes towards GenAI, have all noticed the increasing popularity of GenAI in their discipline, saying that "AI is the reality." Feeling that they were faced with an inescapable situation of using GenAI, most instructors wanted to learn more about how it could help promote the learning of writing and how they could prepare their students for using it in their academic journey and future career. Meanwhile, some instructors tended to take a more conservative attitude than their colleagues, as they were concerned about the limitations of GenAI, such as the lack of authorial voice and critical thinking in AI-generated texts (Ala et al., 2025; Amirjalili et al., 2024), and were less confident about whether and to what extent they could keep up with the change.

Second, the university and department's policies and expectations also have effects on the teaching practices of the ten instructors from seven disciplines. Depending on the conventions of their discipline, the instructors might have different perceptions of whether or to what extent an AI policy is helpful. In this study, instructors in STEM and liberal arts tend to hold a more open attitude to conversations about GenAI, while those in social sciences report that instructors in their fields seem to have mixed attitudes. Since most of the previous research mainly focuses on a single discipline such as English language education (Kohnke et al., 2023; Liao et al., 2023), mathematics instruction (Lee & Yeo, 2022), engineering (Simelane & Kittur, 2025), this study extends the previous research and acknowledges disciplinary differences of how instructors grapple with GenAI tools in classrooms. However, regardless of their disciplines and experiences with GenAI, the instructors all recognize the need to encourage conversations about GenAI in their department to make people aware of how it has been and can be used by both faculty and students.

In addition to the influence of the global trend of GenAI and university and department policies, this study has established two other centers that can potentially shape instructors' perceptions and practices, which have not been well researched in the existing literature. The first one is their colleagues. Feeling pressured to keep up with their colleagues, some of the instructors show interest in learning more about GenAI to update their own teaching practices or are enthusiastic about promoting the use of GenAI in their department, while others tend to hold back as they feel less motivated to change the practices that they had established for over 10 years in their classroom. Another center is students, whose GenAI practices serve as a major factor that motivates these instructors to learn about GenAI.

Indeed, the rapid development and increasing popularity of GenAI in higher education seem to have (re)shaped the power relations within the existing hierarchy. First, GenAI has further complicated power relations in teacher-student relationships. On one hand, it supports students' exploration of new learning experiences and engagement with writing activities that they believe are effective. For some students, using GenAI can be beneficial as the tool can help "remove barriers" (Brookfield et al., 2022, p. 134) in writing for them, such as writers' blocks and language issues. Additionally, using GenAI may demonstrate their pursuit of freedom in taking control of their own learning by writing in the way that they are interested in, which may potentially revert the rules or expectations set by the instructor. Hence, "will AI steal my glory," a question raised by one of the participating instructors, can be a valid concern.

On the other hand, because of the increasing number of identified GenAI usage in their students' writing, some instructors seem to have levelled up their surveillance to ensure students are following their policies and meetin-

-g the learning goals, often through the use of AI checkers and modifying or replacing the writing assignments they used to give. Such practices may intensify the "self-censorship and self-surveillance" of students when using GenAI in their writing (Brookfield, 2005, p. 37). As a result, the students' AI practices and instructors' responses may lead to an elevated power battle.

However, the ultimate, genuine concern of these participating instructors, including the instructor who wondered if GenAI could steal their glory, is whether their students can still learn how to write when using GenAI as they do. As some of them pointed out, the development of GenAI is an unavoidable trend, and it is likely that students may need to master AI skills to thrive academically or professionally in their future journey. Also, it is of equal importance to support instructors to make them feel confident and comfortable in their class to ensure the quality and effectiveness of teaching. Hence, instead of dodging the topic or completely banning the use of GenAI in their courses, it may be better for instructors to learn to "exercise their power in a supportive, ethical and responsible way" to encourage active participation on the side of students and promote meaningful learning (Brookfield et al., 2022, p. 134). For example, instructors should consider the interests and needs of their students to integrate GenAI in their writing when (re)designing their course or writing assignments. In other words, they should stay open to possibilities, including various types of tools and different forms of teaching. Just as learning, teaching is a social practice in nature, which means the instructor's decisions are made based on considerations of multiple social factors, such as the context of teaching, the needs, interests, and learning profile of the students, and the objectives of teaching. As a result, teaching can never be set in stone but involves life-long learning and evolving practice.

In addition to instructor-student power relations, GenAI may have also shaped the power dynamics between some senior instructors and junior instructors. For instance, while some senior scholars participating in this study expressed concerns about the lack of knowledge of GenAI or difficulties in keeping up with their students' GenAI practices, their junior counterparts seemed to feel more comfortable with integrating GenAI into their class and are more adept at it. In such a situation, it is important for the university to support both senior and junior instructors' self-development and experimental teaching practices, providing a safe and encouraging environment for them to try something new that they believe could be important and helpful.

In short, instructors' perceptions and practices of GenAI, including whether and how to use it, are shaped by their understanding of the polycentric power exerted by the four centers noted above and to what extent they want and can negotiate their internal interests and the external demands under such power relations. Depending on their perceived importance of each center and "appropriateness" of the rules related to each center, the instructors make decisions about their teaching based on their own interests and needs in their context.

Conclusion and future directions

This study explores college instructors' perceptions and teaching practices under the influence of GenAI. Although it yields robust findings, there are several limitations. First, since this study was conducted in a private liberal arts university, the findings may not be generalizable to broader contexts, such as public institutions or universities with different student populations and technological resources. Future research should extend this inquiry by examining GenAI teaching practices across a wider range of institutional contexts, including public universities and community colleges, to capture greater diversity in instructor experiences and institutional resources. Comparative studies across disciplines could also provide valuable insights into how subject-specific pedagogical needs shape the integration of GenAI in teaching.

In addition, the study captures a snapshot in time and given the rapid pace of GenAI development in education, instructors' practices and attitudes may evolve quickly, limiting the study's long-term relevance. Finally, the relatively small sample size restricts the breadth of perspectives included, which may leave out important variations in how GenAI is integrated into teaching. Longitudinal research would be beneficial for tracking how instructors' practices and attitudes evolve as GenAI technologies continue to develop and as institutional policies and student expectations shift.

The findings of this study suggest directions for professional development needed by college instructors in the era of AI. As noted, lack of knowledge in GenAI, especially how it can be used effectively in teaching and evaluation of writing, is a major concern among the participating instructors who felt hesitant, to varying extent, to allow students to use GenAI in their writing. Hence, professional development provided by the institution or other organizations on GenAI can be helpful. In addition, open discussions on the potentials and risks of GenAI as well as its application in the department or field can also help instructors themselves updated and develop a more comprehensive and critical understanding of GenAI, which allows them to make better decisions in teaching.

In addition, this study offers pedagogical implications for college instructors. The participating instructors' changing teaching practices in response to the development and prevalence of GenAI in higher education can inspire teachers in similar contexts. For instance, seeing GenAI as an inevitable and irreversible trend, some of the instructors chose to have open conversations about GenAI with students and guide them to experiment with it to learn about its limitations in writing. Regardless of whether the institution or department has an AI policy, it is important for instructors to clarify how GenAI can be used in their class, so that students understand both the learning expectations and how their work will be evaluated. Also, several instructors adjusted the form or nature of the writing assignments to encourage students to be more accountable for their own learning. Emphasizing the writing process instead of the final product, such as assigning students reflections on their own thinking, writing, and learning, increasing the number of instructor-student conferences, and requiring multiple revisions, is one of the most common strategies adopted by these instructors.

Finally, this study has theoretical implications. The notions of scale and polycentricity, which have rarely been used in GenAI research, provide a powerful lens to explore how the power relations display in instructors' teaching experiences under the influence of GenAI. These concepts have been used in the studies of academic literacy to analyze power relations in writing practice. For example, in academic writing and publishing, multilayered norms at different scales are involved and authors' textual trajectory is often intervened by coauthors, local colleagues, professional reviewers, and editors as polycentric powers that authors need to refer to (Hynninen, 2021). However, to our knowledge, these two notions have rarely been used to analyze the contesting power relations involved in the instructors' AI pedagogical approach. As instructors' perceptions and teaching practices regarding the use of GenAI are woven into complicated power relations, the two notions can guide the understanding of how these power relations can come into play in the instructors' teaching practice regarding the use of GenAI.

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Appendix: Interview Protocol

1.What course(s) are you teaching this semester? Can you describe them such as primary goals, course assignments, etc.?

2.Have you considered using GenAI tools or actually used them in your own writing? If you have used it, could you talk about your experience briefly? If you haven't, could you explain why?

3.Do you have AI policy in your course? Could you please share your course policy related to GenAI such as ChatGPT? If you don’t have a policy related to GenAI, do you plan to have one?

4.Does your GenAI course policy apply to all course assignments? If not, could you please share these assignment-specific AI policies/guidelines?

5.In what ways may GenAI affect teaching of college writing? Have you ever changed your assignments due to concerns about GenAI? If so, how and why?

6.What challenges do you think students have in writing? How do you think GenAI may or may not help with the challenges?

7.Do you think GenAI can play a role in educational equity? What impact it may have on students with different socioeconomic/cultural/linguistic background? In what ways may GenAI affect student writers?

8.In what ways do you think GenAI tools can be incorporated into college writing courses and instructors’ teaching?

9.What challenges and difficulties, if any, have you encountered when using GenAI in writing and teaching?

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Leading a curriculum design of care through courage in knowledge and action

Kathie Ardzejewska[A] [A]*University of Notre Dame, Australia*

Lauren Stephenson[B] [B]*University of Notre Dame, Australia*

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Correspondence

kathie.ardzejewska@nd.edu.au[A]

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Abstract

This paper explores what happens when you set out to lead a caring curriculum program design in a range of international contexts over several years with the premise of a shared vision. Through a single composite case approach, we have captured the essence of our learnings by combining our individual accounts of eleven programs across a range of contexts to form a single composite case which sought to capture the macro-, meso-, and micro- factors at play. Employing collaborative autoethnography (CAE) and a metaphorical, three-dimensional personal narrative inquiry framework, the data (as moments and reflections recounted) emerged through close analyses of the experiences of two senior education leaders. We identified in our data the three themes as described in the literature: curriculum, leadership and care. A further sub-theme revealed that we, as leaders, care for others. However, while we enacted transrelational leadership, we were thwarted in our goal at all levels of the system. The study tells the story of how, where and why we failed. Rather than experiencing failure as a source of shame and avoiding it, we grew from the lessons learned. Key to our findings is the creation of the term "curriculum of care in higher education". This idea is new to curriculum design discourse in higher education. It is defined as advocating for an environment where we are all included, supported, belong and feel safe, brave and care for each other. There is a commitment to asking 'what happened to you?' What is integral is the nature of academics' and students' agency in their work.

Introduction

Learning leaders in higher education (HE) recognise the super complexities of current times (Barnett, 2020) and they know that learning is enacted through the relationships that happen through the interactions of members within HE communities "[T]hese processes are authentically human in nature and cannot be reduced to mechanical, technical or clinical intentions" (Branson & Mara, 2019, p. 92). Pinar (1975), in his seminal work, recognised the importance of relations noting that curriculum design often requires learning leaders to facilitate complicated conversations, whilst navigating a myriad of "structural-agentic processes" (Annala et al., 2021). In this complex space, one expectation that is gaining ground in academic peer-reviewed and grey literature is the need for academics to have their wellbeing recognised by their leaders (McClure, 2025). Research has shown that contemporary leaders need to engage in the emotional wellbeing of their followers, referred to as the "affective turn" (see Munro & Thanem, 2018; Renault & Tarakci, 2023). A model of leadership in higher education that clearly aligns with these critical concerns is transrelational leadership. At "its essence is a relationship that seeks to create a culture based upon … shared values of trust, openness, transparency, honesty, integrity, collegiality and ethicalness" (Branson & Mara, 2019, p. 94).

It is also of critical importance that educational leaders understand and are agile in navigating the influence of neoliberal corporatism (Wooltorton et al., 2025) and the forces of geopolitics shaping our individual and collective futures. The core business of universities is to ensure that students successfully grow and meet the requirements of their chosen program in order to flourish, not only for their personal and professional benefit and welfare but also for a country to reach its social and economic goals. Given the volatile state of the world, we thought as educational leaders, it timely to consider our context as foci of "troubling", allowing us as reflective practitioners to access "the understandings which have been implicit in his [sic] action, understandings which he [sic] surfaces, criticizes, restructures, and embodies in further action" (Schön, 1983, p. 50). Agile leaders are those who are creative, rather than reactive (Hensellek, 2020). Grant (2021), whilst not discussing HE leaders specifically, posits that agile leaders need to adopt an evidenced-based approach, an approach which is a celebrated practice in the Scholarship of Teaching and Learning (SoTL).

Program review and curriculum design is an expectation for contemporary academics, especially program coordinators and those in positional leadership (Krause, 2023). The theoretical underpinnings driving program review are "curriculum inquiry" (Burt & Hubball, 2014, p. 203) and the need for "professional learning conversations" (Earl & Timperley, 2009). This naturally lends itself to an SOTL approach where exchanges and reflections around composite program review are shared by those in the review process. We thus set out to explore:

1) What happens when you set out to lead a caring curriculum program design with the premise of a shared vision?

2) What are the macro-, meso-, and micro-organisational factors at play?

Literature review

Curriculum conceptualisation and reconceptualisation are influenced by multiple factors (Krause, 2023) especially the outcome of a neoliberal corporate frame (Wooltorton et al., 2025). Individual academics working in universities across different parts of the world, have embraced these paradigms while simultaneously holding other ones that their own practice identifies. We as academics in HE have the opportunity to lean in with our own personal theoretical and philosophical frameworks (Krause, 2023). Krause (2023), in her thoughtful and "practical guide" to "learner-centred leadership in higher education," lists some important fundamentals that underpin successful curriculum leadership. Key amongst these is "intentionality and an informed understanding of the power and purpose of curriculum in your context" (p. 119).

Curriculum in context

Drawing on organisational behaviour theory (Ashkanasy & Dorris, 2017), social research units of analysis (Serpa & Ferreira, 2019; Smith et al., 2006) and Bronfenbrenner's (1976) ecological systems theory, we illuminate the complexity of current organisations, including HE organisations, by proposing a three-level framework for understanding the organisation - micro, meso and macro. At the micro level is the individual level of activity and the relationships within it. The meso refers to the school (faculty) and the curriculum, and the macro refers to the university – the executive, the institution. We chose this framework because it can represent the complexity in which leadership is now recognised to operate within.

Power and purpose of care

This paper aims to bring the issue of care for curriculum to academic consciousness. In doing so, we draw specifically on the seminal literature of critical pedagogy (Freire, 1997; 1998); feminist ethics of care (Noddings, 2002), and political ethics of care (Collins, 2025; Tronto, 1993, 2013), acknowledging that these principal references have evoked ongoing conversation that brings them to contemporary attention. We also draw on Australian indigenous care ethics through kaartdijin bidi, an [I]ntergenerational learning of Noongar kaartdijin, pedagogies involv[ing] responsibilities for care of people, place and knowledge in temporal and spatial worlds, enabling the continuity of deep relationships (Wooltorton et al., 2025, p. 14). In an "ethics of care" approach to HE, we also draw on an African ethic of ubuntu caring; emancipatory, humanising and politico-pedagogical act (Ewuoso & Hall, 2019).

A critical pedagogical approach aims to empower learners and educators to become active and engaged citizens who can challenge social inequality and injustice (Freire, 1998). The key question is "How shall we live well together?" (Strike, 2007, p. 19). Like Noddings (2015) and others, we argue that education is grounded in relationships between the carer and the cared for, with its focus on how teachers and leaders can create caring relationships through "modelling, dialogue, practice, and confirmation" (p. 237). Noddings (2012) asserts that a caring connection is ethically important to humanity, and thus the relationship in which people engage in a caring manner is key. Zeivots and colleagues (2024) identified that co-design of curriculum in HE can be relational and transformative. Acknowledging that Indigenous and feminist care ethics probe into deep connections and moral commitments between humans and nonhumans is also important in curriculum design that is caring. Indigenous ethics highlight attentive caring for the intertwined needs of humans and "nonhumans within interdependent communities. Feminist environmental care ethics emphasise the importance of empowering communities to care for themselves and the social and ecological communities in which their lives and interests are interwoven" (Whyte & Cuomo, 2017, p.234).

As Australian academics, we are committed to Noongar kaartdijin bidi which means knowledge path and is a metaphor for connecting people, place and time (Wooltorton et al., 2022). Through such connection, "we celebrate values and ethics of care, creativity, narrative, lived experience, the collective, justice, ways of responding to sentient, animate places … [and] attend to notions of non-linear time" (Poelina et al., 2022, p. 2). In this process of an international community of learning leaders, we looked for an ethical theory that marries with the above. Ubuntu caring also celebrates interconnectedness (Ewuoso & Hall, 2019). Ubuntu is an African philosophical idea of shared humanity where human beings are interdependent on one another. Ubuntu caring permeates all aspects of life, extending beyond human relationships to embrace our connection with nature and the spiritual world. It manifests in relationality, community, respect, fellowship and compassion (Ewuoso & Hall, 2019) and as a result, we obtain a sense of belonging in the world (Hallen, 2016). In the same way, Collins (2025) proposes a care-ethical approach where responsibility derives from the inevitable fact of human interdependency. This responsibility calls upon each of us to perform contextually embedded and open-ended actions of care. Care is enacted in the networks of social relations that each of us inhabits, rather than in the individual alone. Care is decidedly not concerned with individual aims, desires, or ambitions; and it is not possible as an "I "but only as a "we" (Jacobs, 2005). For Tronto (1993), an ethic of care is an approach to personal, social, moral, and political life that starts from the reality that all human beings need and receive care and give care to others. The care relationships among humans are part of what makes us human and as such, we are interdependent beings. Tronto (1993) purports that care is political and that it extends to the more-than-human existence.

It is a democratic process where all stakeholders make decisions about the allocation of the labour of care.

There is a discourse on using the terminology curriculum of care. Although the concept of care is not new to the literature of pedagogy, the term "curriculum of care" only appears to have been first used in 2004 by Watson in a webpage article describing a Year Two classroom involved in a child development improvement project. The "mission is to help teachers create caring classrooms [through] comprehensive educational programs that focus on ways to help schools foster students' social, emotional, and moral, as well as intellectual, development (no page)". A further search failed to find any other references, although "care curriculum" is used by Maddock et al. (2019) from Monash University, for example when they describe the syllabus for medicine, nursing and health science students, which is person-centred care. The kindness curriculum has also started to gain interest post-COVID, influenced by the Kindness Factory (Koschel, 2023). Kaplan Business School, for example, has embedded graduate attributes pertaining to kindness (Vojinovij et al., 2024).

Leadership in higher education

To enact such a curriculum of care, now more than ever, we need caring and compassionate learning leaders in HE (McClure, 2025) because when academics are well, they are better at supporting their students and their communities (Brewster et al., 2022). Learning leaders in HE do not rely on positional leadership roles, but rather, they lead by recognising and acting on opportunities to exert influence, often independent of formal managerial positions or roles. Branson et al. (2018) drew on the basic leadership practices of Haslam et al. (2011) and applied these to HE. It describes leadership as essentially a transrelational phenomenon: a leadership style focused on attending to relationships across the different structures within the institution, leading to work not just being done, but so that the group grows and improves its practices. They describe such a leader as someone who is an "authentic member of the group they are leading; championing the group; changing the groups' identity; and bringing the external relevant influences to the attention of the group." (Branson et al., 2018, p. 19-21). In turn, the group adopts the leader who then decides to use all available theories, strategies and resources best suited to their needs (Branson & Mara, 2019). As such, a relational leader is competent, confident and empathetic and has the "capacity to generate knowledge and truth in a cooperative, relational manner" (p. 97). Such a leader seeks to create a culture that is inclusive, where diversity is celebrated and where a wide skill set is employed and heard, creating an environment where people can not only be well, but thrive and flourish physically, socially and emotionally. One could posit that such leadership by its very nature is more likely to be generative and inspire the agility to enable adaptive responses. Brown (2018) concurs, defining a leader as anyone who is courageous enough to take responsibility for identifying and mentoring the people who mentor. They need the essential attributes: "the ability to be courageous, wholehearted, vulnerable, and joyful." (Della-Latta & Burkett, 2021, p. 163).

Returning to the literature that reviews the key concept of agility, it identifies the required shift in leadership characteristics to operate primarily in the creative space rather than the reactive one. An agile approach to leadership that is lean and dynamic. Having reduced the hegemonic tendencies of the bureaucracies, it facilitates faster decision-making and innovation leading to improved efficiencies and effectiveness, but it is still reflective. For Prasongko and Adianto (2019), agile leadership involves four components: interconnection, information transparency, technical assistance and decentralised decisions. As such, a leader leading with agility guides the team, continuously influences team behaviour by defining, disseminating and sustaining a guiding vision. Further, as previously identified, Wooltorton et al. (2025) draw our attention to the argument that students of HE are not only faced with a polycrisis, but that HE is actually part of the cause of the problem. The authors suggest that learning leaders are those who can focus on agile leadership and who can exercise self-awareness and build their own and others' leadership capacity. According to Edmondson (2021), the changes emanating from the post-COVID era have created a new paradigm shift for universities where the ensuing "chaos" will "separate the agile from the fragile" (p. 2). Underlying this approach is the capacity to be responsive in uncertain situations and to be able to respond appropriately when opportunities are birthed from these circumstances (Scott, 2023). Karakose et al. (2022) note that agile leaders are most effective when serving as partners, that is, as servant leaders (Greenleaf, 2002) to teams, rather than when teams serve them. Although the concept of servant leadership is not new among both academics and practitioners, it continues to receive considerable focus due to the fact that it can positively impact individual and collective outcomes (Canavesi & Mi-nelli, 2022).

Unlike the more recent work of Zeivots et al. (2024) who focused on a codesign team of course coordinators, educational developers and learning designers, we are interested in how the leaders acted and learned in curriculum design experiences. This is an unexplored area, but essential given that all curriculum design needs a leader to initiate and see a project to its end (Krause, 2023).

Method

This study employs collaborative autoethnography (CAE) (Chang et al., 2016) to analyse our experiences of program design closely using a composite case approach (see Duffy, 2010; Willis, 2019). Autoethnography (AE) is a research approach in which the researcher calls upon their own experiences and undertakes "an ethnographic analysis of the cultural context and implications of that experience" (Lapadat, 2017, p. 589). It does not ask the researchers to step-back from their position and look in, instead the researcher is clearly invested in the sense making process: (auto), with depth, a critical reflexivity and mindfulness of the nature and risk of introspection; ethno (critically addressing wider cultures and social groups), and graphy (sophisticated analysis, representational sense) (Grant, 2024). Collaborative autoethnography (CAE) is a social version of AE. It involves "researchers pooling their stories to find some commonalities and differences and then wrestling with these stories to discover the meanings of the stories in relation to their socio-cultural contexts" (Chang et al., 2016, p. 17). CAE then is about being self- and collectively reflexive, being critically reflective about assumptions and employing new concepts if the current ones have failed (Grant, 2024, p. 6). Two or more authors focus on a phenomenon of inquiry from the perspective of self through a concurrent or sequential systemic research approach that typically combines the perspectives, findings, and conclusions in order to understand cultural experience (Ellis et al., 2011). "Researchers use the tenets of autobiography and ethnography to do and write autoethnography … [and] retrospectively and selectively write about epiphanies that stem from, or are made possible by, being part of a culture and/or by possessing a particular cultural identity" (Ellis et al., 2011, p. 1-2). Using CAE processes, the researcher participants move back and forward between experience and examining a vulnerable self while also observing and revealing the broader context of that experience. Making sense of the experience for self and others recognises the relational ties to cultural members.

As a reflexive genre of writing, CAE situates the self within the context of a culture, sub-culture or group, and studies one's experience along with that of other members of the group. It is therefore a personal style of research characterised by "confessional tales" (Ellis & Bochner, 2000, p. 740) that do not usually figure in more conventional styles of academic writing. CAE therefore has no pretence of objectivity. The researchers' lived experiences become the object of investigation, as they are "fully committed to and immersed" in the groups they study. (Ellis & Bochner, 2000, p. 741).

This methodology emphasises the importance of reflection as a basis for continued learning, and one that makes perfect sense for the scholarship of teaching and learning because:

> [R]eflection is the meaning-making process that moves a learner from one experience into the next with deeper understandings of its relationships with and connections to other experiences and ideas. It is the thread that makes continuity of learning possible (Rodgers, 2002, p. 845).

Adapting Willis's (2019) composite narratives, this study uses a composite case approach where data from several individual projects, with over ten years of our lived experience, is used to tell a single story. The data were collected from state, national, and international projects over a ten-year period (2013 – 2023). Lauren's programs included: Master Education, Early Childhood Education B-12, Master Education (Inclusive Education), Master Education (TESOL), and Master Education (Global Leadership). Kathie's included Bachelor Personal Development Health Physical Education, Bachelor Health Science (Fitness), Bachelor Sports Business, and Graduate Certificate Learning and Teaching in Higher Education.

We have utilised a metaphorical three-dimensional personal narrative inquiry framework (Clandinin, 2006) framed by a Deweyan theory of experience, and thus we draw upon Dewey's criteria of continuity, interaction and situation. The framework's three dimensions are the personal and social (interaction) along one dimension; past, present and future (continuity) along a second dimension; place (situation) along a third dimension Clandin-

-in & Connelly, 2000). The initial stories were written separately and saved in a shared document, and these stories were then combined into one story. We also met bi-monthly or monthly for 1.5 hours over Teams for eighteen months to discuss our findings and subsequent learnings. Initially, by colour coding our stories, we identified text (data) that we broadly grouped into categories. The categories were subsequently grouped into a smaller number of themes in line with what the literature identified as pertinent to contemporary HE leadership: curriculum, leadership, and care. Any questions whether a text had a better fit with another theme were resolved through discussion.

This process of analysing the data led to our initial ideas and thoughts about the impact of care, vulnerability and compassion on curriculum design and pedagogies, leadership practices and drove the desire to investigate further. The initial analysis also served as a reflective space, helping us to think about what kinds of prompts would elicit deeper and more specific reflections about the impact of macro, meso, and micro influences and organisational factors on program design processes and outcomes.

During the thematic analysis, we were also open to the possibility of the generation of other additional themes. The theme of care was further developed into care for self and care for others. As a result of this process, our final themes evolved into curriculum, transrelational and agile leadership and care of others. The themes were then analysed according to the ecosystem: macro (the university), meso (the school), micro (individual). It was here that we saw additional themes arise.

We come to this work as privileged, white women and mothers in somewhat different professional roles: Kathie as a senior academic developer, pedagogist and researcher. Kathie is a woman from a Second World War migrant family and an Anglo-Celtic convict ancestry who grew up in Dharug Country. She now lives in Whadjuk Boodjar which is my “Heart Land”. She is the first in her family to go to university and believes “You must be the change you wish to see in the world” - Mahatma Gandhi. Like Whitlam (1974) and Freire (1997), she believes that education is a social good with the potential to be transformative. Kathie is embarking on a life-long journey, learning about Indigenous knowledges and indigenising the curriculum. Lauren is an Australian woman of Anglo-Celtic ancestry who was born in Broken Hill, NSW and who grew up on Gadigal Country. For much of her adult life, she has lived and worked across the globe and has come to call the Middle East home for over 25 years.She returned to Australia as a mid-career academic, believing a great intellectual community should look and be like the world, advocating for placing social justice at the heart of living community, culture, and affirmative regeneration.

Results

Data collection from our CAE and subsequent thematic clustering were carried out to explore these key dimensions. These are unpacked and analysed below. Despite starting out with the good intentions of introducing a care curriculum, we found that this was much harder to achieve. We found that across all layers of the ecosystem (macro, meso, micro), the capacity to design a curriculum of care was consistently being thwarted. This is unpacked below.

Curriculum

Lauren and Kathie unpack the definition of the curriculum of care as the parameters for dialogue within and across stakeholders, i.e. the macro and meso levels.

> Care is belonging; compassion; empathy, pastoral and really we're looking at it from the whole person. (L)

> Curriculum of care is ultimately about care for the students and what that looks like, and to me it's always been about neighbouring learners, be its students or us designing it, implementing it, teaching it, assessing it, that we're all learning in it together. (L)

> We owe it to them ... we need to make sure that the [any] curriculum we offer is cared for, i.e. well designed, reviewed, and revised. (K)

The next two quotes, however, detail how difficult it is to develop curricula in a vacuum of executive leadership. The second of the quotes below, while connected, is more nuanced. It is the difference between what leaders of the institutions espouse at the macro level, and perhaps even believe is happening, and the experience of the staff and the micro.

> the disconnect, when the culture is supposed to be one of care and belonging and we as leaders try to enact that in our relationship and our care for the curriculum. But then it wasn't there? Wasn't sustained by the [executive] leaders. We're trying to work in that space. It just kind of crashed or it just crashed around us. (K)

> I don't think the care extends beyond themselves. Maybe that's cause there isn't an understanding of curriculum. If I follow what design entails, you need your leaders to sit down together and then be talking to their junior colleagues. I wanted to facilitate this so that junior colleagues could know what course design looks like, know what backwards mapping looks like … they all work together. (K)

This quote at the meso level demonstrates the (lack of) commitment to the development of the curriculum of care by some stakeholders. There is also a shouldering of tremendous responsibility by leaders to produce curriculum and the resulting student success. Perhaps a blind spot in retrospect?

> if we weren't going to take people with us – we had to build the curriculum because we couldn't have students graduating without being capable of teaching all of the curriculum. (K)

Transrelational and agile leadership

The data identifying the theme of leadership identifies a mix of leadership practices; some of them positive, some mistakes, and some of them under siege. The data leading to these learnings is unpacked below.

The following quotes from Lauren and Kathie at the macro level show that while they had planned for team growth and curriculum improvement, on reflection, the assumption that education academics should be skilled curriculum developers was flawed.

> I tried to lift the bar … a more umbrella view of the program … I made assumptions. (K)

> staff in the school … (exhibited) no self-awareness and (nor the) capacity to see what they didn't know and what they could not do without further expertise and support. (L)

Instead of moving forward with their goals, Lauren and Kathie were thwarted, realising that:

> staff did not trust … did not want to change, liked their ways. (L)

> The old saying, "attack is the best form of defence applied here" … many practitioners who have come to higher ed who have not been mentored appropriately … (who have) not studied learning and teaching in higher education have said to me: things like 'I didn't know it was useful to collect data on student outcomes, on evidence of improvement; evidence of what I am doing … why don't they send out an email telling us to collect this? (K)

This appears to be the result of a need to "save face".

> they argue we are practitioners and you can't tell us what to do as we get good TPEs' [student evaluations]. (K)

Relationships were a concern on the micro and meso levels and acted as a barrier to curriculum design. This was evidenced in the unwillingness to collaborate - an expectation of good practice:

> No one had an interest in collaboration. Trying to get people to talk to each other … All of that was just so unfamiliar (L).

It was also seen in the way people conducted their relationships:

> Gossip … privately undermined me and Kathie, he complained about the process and purpose when he had originally agreed to it, he pretended…

The next set of quotes, while also about resistance, were experienced at the meso level, where being thwarted happened at three levels. The first is clear – these detractors are out in the open. The second is evidence of someone undermining the process and the third speaks of something much more insidious.

> there was a resistance … most of our time in this review, was arguing about doing it, not … doing. (L)

> playing this role [of learning leader] was impossible … he [one member] did not act as advocate of curriculum change, he stopped attending meetings … He [another member] wanted a very different kind of mapping and made it very confusing … things stagnated. (L)

> One woman sought me out after the meeting saying 'oh my goodness it was one of the best team meetings ever … it really allowed us to think about why we weren't able to improve our curriculum and how we weren't working together … there are so many problems with cliques that no one will really say out loud so it was good to tackle it head on … everything isn't fine. (K)

Care of others

There was substantive data about care for colleagues and students. On careful analysis, it was clear that there was a duality in caring for the curriculum and others.

At the macro level, Kathie's care for the curriculum was demonstrated through her passion for ensuring the design is right but also in the care for academics and the profession.

> I no longer get frustrated that academics don't know how to undertake curriculum design. I realise it's a very difficult thing to do.

> the reflexivity of vulnerability of the profession … I was concerned that I was entering into the public discourse of discrediting the profession …The important thing is… tell a story about growth.

The collaborative autoethnography records the surprise when they recognise the expected care for the student is missing:

> There is no mention in our reflection of the students being mentioned, except for that "they love us". (K)

Care for others was seen through her own growth as a leader in accepting responsibility for failing to deliver and her ability to see this as an opportunity for growth. This was an act of self-compassion and compassion for her colleagues:

> It was like, standing in the embers … Inert; thinking about all of this; kept chugging along, but was sort of breaking. And just knew that I wasn't going to run away. I was just going to tread water … paddle and hang on to the goodness that I could … And do the best that I could in this context. (L)

> But what we do if we had our time over? What we did acknowledge is this way isn't working and we stepped out. (L)

It also reflects the underpinning values of Katjinin Bidi and Ubuntu.

> I don't care where students graduate from. I want them to have the same experience, the same outcomes. We owe it to them – i.e. education is a social good - yet schooling in Australia is so inequitable. Given this, we need to make sure that the curriculum we offer is cared for, i.e. well designed, reviewed, and revised (K)

Kathie is particularly concerned that students can teach relationally and for a regenerative future.

> we couldn't have students graduating without being capable of teaching all of the curriculum for the future. (K)

Discussion

It is not merely for the sake of regulatory procedures or contributing to the international conversation that program and data analysis are important. It is also essential to evidence, provoke and promote professional learning conversations so that program review and curriculum design are effectively implemented and embedded across HE. Employing collaborative autoethnography (CAE) of educational leaders, and a metaphorical, three-dimensional personal narrative inquiry framework is the key unique differentiator for this study. It is also novel to publicly share the failings of leaders in this space. On the flip side, there is also a need to disseminate good practice and share achievements.

Through a CAE approach, we have established that we, as leaders, care deeply about the curriculum. A curriculum of care for higher education was defined through our research where all stakeholders participate in and contribute to designing, implementing and evaluating an environment of teaching, learning and assessment. All individuals are included, supported, belong and feel safe and are encouraged to care for each other. There is a commitment to compassion and to asking 'what happened to you?'

While a discourse on using the terminology "curriculum of care" exists (Koschel, 2023; Maddock et al., 2019; Vojinovij et al., 2024; Watson, 2004) we have coined the term in the context of curriculum design in higher education. It draws attention to how all curricula can be developed. The commitment concept draws on neuroscience, acknowledging that trauma, as well as good experiences, influence our behaviour (Perry & Winfrey, 2021). While we shared the aspirations of transrelational and agile leaders, we were not successful at bringing about curriculum change. We were consistently hindered at all three levels: macro, meso and micro:

> "...the disconnect, when the culture is supposed to be one of care and belonging and we as leaders try to enact that in our relationship and our care for the curriculum. But then it wasn't there? Wasn't sustained by the [executive] leaders" (K) - macro

> "No one had an interest in collaboration. Trying to get people to talk to each other ... All of that was just so unfamiliar" (L) - meso

> "No one had an interest in collaboration. Trying to get people to talk to each other ... All of that was just so unfamiliar" (L) - micro

Some of these barriers at the macro and meso levels were beyond our powers, however, some appear to be hard lessons learned about managing relationships. Zeviots et al. (2024) offer codesign as a method to work through the cultural - discursive, material-economic, and socio-political environments of universities, but there is no mention of leadership.

As leaders, through it all, there remained a firm commitment to caring for others, a positive characteristic for a leader in contemporary higher education (Branson & Mara, 2019). It aligns with the recent return to affective leadership (See Munro & Thanem, 2018; Renault & Tarakci, 2023).

We believed we were ready as leaders with a "strong back, soft front, (and) wild heart" (Brown, 2015; 2018) "to be able to listen to the not so comfortable truth" (K). However, no matter how much we cared about the curriculum, it was clear that we were thwarted in our goal to deliver a curriculum review that was caring. The biggest barrier was that while we had thought we had understood the ecology of the environment and thought that we had the right people at the table from the outset (Krause, 2023, p. 124), we had failed to accommodate the ecosystem that did not support us or the process of collaborative curriculum decision making.

Just as Zamora and Bali (2025, p. 3) argued, we found that our ecosystem did not address our teachers who cared and served their students. In fact, in the context of HE, we were operating at odds with the environment (Branson & Mara, 2024). Further, we found that one cannot expect the HE executive leaders to demonstrate genuine engagement in enacting a socially just and caring space because it is at odds with the managerial practices of a neoliberal world as identified by Branson and Mara (2024).

The politics of care ethics helps to explore what happened to us as the project unfolded. Tronto (2013) identified five phases of care that, when unpacked, ask us to be: attentive, responsible, competent, responsive and trusting. This means that everyone needed to be willing to take action in a way where they were vulnerable and with an expectation that they would be continually cared for. We acknowledge that such a suite of expectations is problematic in contemporary HE; one that does not encourage such vulnerability (Branson & Mara, 2024). Further, we acknowledge that even building such a culture means that we are addressing the symptom(s) and not the cause.

This is evidenced at the meso level, where staff with less experience in curriculum design and the subsequent behaviours as a result, have also played a role in us not meeting our goal. On face value, adopting Brown's "rumble"' (2018) should have worked. We also used Grant's data/evidence-based thinking, but we did not remove emotion/application from the equation. This need to "save face" is an important lesson learned. There is substantial literature supporting academics' ingrained sense of being an impostor, fear of failure and public failings (Jaremka et al., 2020). In common with Dowie-Chin and Schroeder (2022), we found that academics with low knowledge and skills in curriculum design were especially resistant. If we return to Brown's seminal work (2015), the foundation for the silencing behaviours is most likely shame.

Our findings speak of the need to consider all curriculum reviews as opportunities for professional development for all staff. This is particularly relevant given the current heightened focus on programmatic assessment because of generative AI. Linked to capacity, the findings also suggest that some of the academics perceive care as transactional and performative: "they love us". An explanation may be found in the work of Dowie-Chin and Schroder (2022) who found in their case study, a highly regarded college educator used "care to win over her students" (p. 866). This behaviour had stemmed from her entry into the faculty where she was positioned as less expert and as ill-equipped, and so she decided to take on the gendered role of care, or "at least giving the impression that she cared for students".

The findings showed we cared for the curriculum, and we cared for others. Given that the data are autobiographical narratives, we expected to see mentions of caring for oneself. That we did not was surprising. Instead, we were left feeling rather bruised and in need of self care: "It was like, standing in the embers … Inert; thinking about all of this; kept chugging along, but was sort of breaking" (L). This feeling is not unusual (Bosetti & Heffernan, 2021). "We need to cultivate ecosystems and cultures that recognise, value, support, and reward care and equity work for all, and consider 'socially just care' everyone's responsibility" (Zamora & Bali, 2025, p. 3). Calls such as this, are gaining momentum with publications such as the 'Caring University' (McClure, 2025) and 'The Gentle Academic' (Butler-Henderson & Ashok, 2024).

To engage in complicated curriculum conversations, we need to return to our strengths, compassion and our creativity and reflect on our own assumptions. Moreover, it is essential that university leaders create an environment conducive to a curriculum of care. We need to give priority to enable staff to develop their teaching and curriculum development capabilities. We recognise the need to provide support for new leaders, early career and staff who are new to HE on how to develop/review and write curriculum to boost their confidence, ability, capacity and agency. The solution can be found in Branson and Mara (2019)'s fundamental principles of relational leadership in HE, which include but are not limited to: know your team members individually; maximise the potential of every individual; and create an environment where people can not only be well but thrive and flourish physically, socially and emotionally. "This necessitates that the higher education leader has the courage to lead such a dramatic cultural change, the authenticity to personally promote and model the change with sincerity and conviction, and the wisdom to create, support, and sustain the change." (Branson & Mara, 2024, p. 87).

Relational connections are authentically human in nature and are so much more than technical solutions. Acade-

-mic work in HE, such as the curriculum design and renewal processes discussed in this paper, requires us to change mindsets by engaging in challenging and nuanced conversations to enable a shared vision, purpose and culture grounded in trust, openness, transparency, honesty, integrity, collegiality and ethical principles (Branson & Mara, 2019). We argue that care theory, with its focus primarily on the value of relationships (Noddings, 2002) between the carer and the cared for, should be understood by learning leaders, as it is in an African ethic of ubuntu caring, as an emancipatory, humanising and politico-pedagogical act. We should be explicit with our followers and acknowledge, as Tronto (1993) suggests, that care is a democratic process where all stakeholders make decisions about the allocation of the labour of care. Embracing the Noongar concept of kaartdijin bidi allows us to also acknowledge that it is a learning journey where we connect with one another in place and time (Wooltorton et al., 2022).

Moving forward, for the purposes of our own leading learning through curriculum review, we draw on the following leading learning dimensions (Krause, 2023) that together challenge perceptions and open up new ways to think about and enact leading learning in HE: understanding learner-centred leadership principles; co-designing strategy; connecting with colleagues; and leading with integrity. The last two align well with Branson and Mara's (2019; 2024) concern for taking the time to know the members of your team. Importantly, while our style of leadership focused on the micro, these latter strategies call upon us to consider opportunities that enhance leadership at the meso and macro levels.

Conclusion

In this paper, we have advocated for the ongoing need to value the agency of academics and students in their work and learning, recognising this as integral to, rather than peripheral to, institutional decision-making (Marques et al., 2024). We have defined the curriculum of care. Through the telling of two learning leaders' stories, it is clear that learning is enacted through the interactions and relationships of members within HE communities. Our focus has been on agile leadership, exercising self-awareness and critical reflection and building on our own leadership capacities. We acknowledge that we are most effective when serving as partners, that is as servant leaders, to teams rather than when teams serve them; when we are courageous and when we listen, when we are curious and encourage mistakes to create and sustain a culture of change that supports new ideas and practices (Branson & Marra, 2019; 2024; Canavesi & Minelli, 2022; Eva et al., 2019; Karakose et al., 2022). Table 1 summarises the strategies that inspire and support a curriculum of care mapped against the HE context.

In these super complex times of hierarchical university structures and performance driven, competitive and metrified environments (Barnett, 2020), there is a growing recognition that cultivating relational leadership skills and curriculum matters. There is also a need for integrity and courage (Branson & Mara; 2024; Krause, 2023). In enacting the courage of care, we have tried to cast shame aside to share with others some of our learnings. We have realised that we need to be strategic, create a plan and communicate this clearly and frequently and have a few good people around us whom we can trust. To understand individual lives, we need to understand the times in which we live and the circumstances of other people. If we are going to achieve the kind of future we envisage through education, we need to connect more with the university community and draw on their skills in investing in a culture of learning together and embracing an ethics of care based on shared values. When we reconsider ourselves in relation to others and care again, we are far better enabled to disrupt uncaring and unjust practices.

From a curriculum of care perspective, HE is contextualised; it is embedded in its provenance, its local histories, cultures and communities. In this way, learning is not merely a neuro-psychological behaviour, but rather, where ideas of humanity are deeply ingrained, where ethical and political responsibilities and questions of equity and social justice are foregrounded.

We have challenged traditional pedagogical hierarchies in curricula and academic relationships and instead we argue for "caring with others" and engaging in reciprocal processes in pedagogical encounters, instead of a pedagogical one-way exercise where roles and responsibilities (of who is meant to care and who is meant to be taken care of) are fixed. A curriculum of care for higher education ensures that the people at the table are diverse and that they feel they can lean into their courage and speak authentically.

Table 1. Strategies that inspire and support a curriculum of care.

Cultivate relational leadership skills	Meso, micro
Consider your learning as a journey, constantly iterating by reaching backwards and forwards	Macro, meso and micro
Cultivate courage to have brave conversations that include scrutinising why and how your leadership of a project failed	Macro, meso and micro
Ensure the planning stage is not skipped and once the plan has been created, communicate this clearly, and frequently, and have a few good people around you who you can trust	Macro, meso and micro
Prioritise staff professional learning in curriculum design – see curriculum design as an opportunity for professional learning but be mindful that academics with gaps in their knowledge may feel shame	Macro, meso and micro
Care for humans and non-humans to regenerate for the future	Macro, meso and micro
Prioritise time to know your team and create the environment in which everyone can thrive	Meso, micro

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#LearnEnglish: Social media, language learning, and the need for critical digital literacy

Pourya Javahery[A] [A]School of Languages, Ibn Haldun University, Istanbul, Turkey

Muhammet Furkan Alpat[B] [B]School of Education, Ibn Haldun University, Istanbul, Turkey

Jaber Kamali[C] [C]School of Languages, Ibn Haldun University, Istanbul, Turkey

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Correspondence

jaber.kamali@ihu.edu.tr[C]

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Abstract

This research aims to explore how English as a Foreign Language learners interact with English-language educational material on Instagram, using the framework of Critical Digital Literacy (CDL). Utilizing a qualitative approach, the study included 13 university students from diverse educational backgrounds, self-identified as English learners following multiple English-teaching Instagram accounts. Data were collected through semi-structured interviews and digital diaries, which were gathered in a one-month period. The interviews and digital diaries were analyzed by thematic and content analysis based on key CDL constructs, including authorship awareness, ideological critique, and digital agency. Three prominent themes surfaced: (1) trust, credibility, and the problem of invisible authorship; (2) platform pressures and the influence of performative content; and (3) passive consumption and the limits of motivation. While the participants demonstrated some level of critical awareness, their evaluation and reflection practices were lacking and underdeveloped. The study indicates that it is crucial to explicitly integrate CDL principles into EFL teaching practices. This integration would provide learners with the ability to critically evaluate the credibility and educational value of informal digital learning resources. The research adds to the expanding literature on informal digital language learning and emphasizes the need for further empirical studies into teaching methods that promote reflective and engaged use of social media-based educational platforms.

Introduction

In an age where language input is just a scroll away, millions of English language learners are turning to social media platforms for bite-sized lessons, such as vocabulary hacks or grammar reels (Gomes Junior, 2020). But behind the eye-catching visuals and elegant performances exists a pressing concern about what learners are absorbing and the potential costs involved. On the one hand, digital tools have opened new doors for informal language learning (Dressman & Sadler, 2020). On the other hand, they have also blurred the lines between entertainment, marketing, and education. Instagram used to be a purely visual playground. However, it has evolved into an unexpected classroom for language learners across the globe (Aslan, 2024). It contains quick reels and visually appealing language tips and has paved the way to unprecedented access to English-learning content outside traditional learning contexts (Gonulal, 2019). However, this new learning frontier has its own hidden complexities. These complexities include questions about who is granted the authority to teach, what norms are being reinforced through the content, and whether learners are developing the critical skills required to evaluate the overwhelming amount of material they encounter.

As the lines between entertainment, education, and advertising increasingly blur (Gui et al., 2024), it is crucial to examine how learners interact with and evaluate English content on Instagram. In the Iranian EFL context, formal learning remains largely classroom-based and examination-oriented, which limits learners' opportunities for sustained exposure to English beyond instructional settings (Sadeghi & Richards, 2015). Against this backdrop, Instagram has become one of the most widely used platforms in Iran and serves as a space where many learners encounter English-related content, such as short-form instructional videos, vocabulary posts, and materials shared by English-teaching influencers (Baleghizadeh & Saeedi, 2025). This research examines the ways Iranian EFL learners engage with English-learning material on Instagram through the perspective of Critical Digital Literacy. It aims to move beyond surface-level and investigate deeper than mere behaviors. In other words, this study focuses on learners' views regarding credibility, their understanding of authorship and ideological biases, and their capability to reflect on the performative pressures inherent in digital platforms. By contextualizing these insights within the CDL framework, the research highlights the skills and literacies that learners require, not only to access language input but also to navigate, critique, and excel in informal digital learning contexts influenced by visibility, virality, and platform dynamics.

Review of literature

Language learning in informal digital spaces

The advancement of technology has revolutionized the way individuals find information and acquire new knowledge. Language learning has been highly influenced by these developments which allow the learning process to occur outside traditional classrooms in informal contexts. The global use of social media as a digital tool has encouraged researchers in the field of language pedagogy to explore the potential of informal language learning in digital spaces (Lee, 2019a). Informal Digital Learning of English (IDLE), a subfield of Computer-Assisted Language Learning (CALL), investigates the potential of language learning outside the classroom and within digital spaces (Benson, 2011). Lee (2019b) defines IDLE as the informal learning of a language in a self-directed and unstructured way through the use of various digital tools, such as smartphones and computers, as well as different resources like websites, applications, and social media. Literature shows that out-of-classroom learning through exposure to technology can allow learners to improve their pragmatic competence and listening comprehension, as well as expand their vocabulary range (Lai & Gu, 2011; Lee & Dressman, 2018). In another study, Fauziah and Diana (2023) found that IDLE can create and enhance learner autonomy, which enables language learners to set their own learning goals and objectives.

As Guo and Lee (2023) reviewed, IDLE is rapidly spreading worldwide due to the ease of use and availability of technology and digital spaces. YouTube, Instagram, and TikTok are among the popular digital platforms where IDLE significantly occurs. Due to their features, these platforms offer language learners a boundless amount of English content through livestreams, videos, images, captions, memes, and more. The visual and interactive nature of these applications promotes Mobile-Assisted Language Learning (MALL), which provides mobile phone and smartphone users with easy access to content without time or location limitations (Kukulska-Hulme, 2020).

The features of IDLE and MALL align with microlearning, which includes the easy delivery and accessibility of content in an interactive format that encourages informal and self-directed learning (Cronin & Durham, 2024).

Instagram and English language learning

In recent years, social media platforms have become extremely popular, with Instagram being one of the most widely used. Not only is Instagram a social networking platform, but it is also a tool for learning a variety of subjects, including the English language. Although students initially showed some hesitancy toward using Instagram as a language learning tool, it can be utilized as a microlearning tool to generate and receive English content which is supported by Mobile-Assisted Language Learning (MALL) (Al-Ali, 2014). Lee (2023b) also finds Instagram an appropriate tool for offering language learning opportunities due to its multimodal, mobile, instantaneous, and interactive features. The learning process can be facilitated by learners' everyday use of Instagram, which can serve as a supplementary tool to formal language learning and positively impact students' achievement (Erarslan, 2019).

Different studies have investigated the educational potential of Instagram in the field of language education. Instagram's feed-based tasks can be quite beneficial for grammar learning through enrichment activities, and university professors also show a positive attitude toward this use (Teng et al., 2022). In another study, Gonulal (2019) found that learners consider Instagram an enjoyable platform for vocabulary development because it visualizes context effectively. Additionally, learners' communication skills are enhanced due to the opportunities for socialization with other learners. Through vocabulary development on Instagram, learners can also increase their cultural awareness by witnessing the use of specific vocabulary in appropriate contexts (Berti, 2020). Furthermore, Abdyrakhimova (2025) highlights that using Instagram as an informal English learning tool can encourage more student engagement and unintentional skills development; additionally, its visually interactive environment can enhance creativity in language learning.

However, there are some limitations regarding the use of Instagram as a language learning tool. Instagram can easily distract learners' attention due to its variety of content, and there is no effective way to assess learners' comprehension (Baleghizadeh & Saeedi, 2025). In addition, the highly interactive feature of Instagram can cause users to lose track of time and even lead to addiction; data consumption should also be mentioned as another challenge related to its use (Fitrianingsih et al., 2024). Furthermore, anyone can develop language learning content on this platform, and since there seem to be no restrictions for these developers, learners can easily be fed by incorrect input (Rezaie & Chalak, 2021). These concerns highlight the significance of learners' critical evaluation of the existing content in digital spaces.

Ideology and representation in language learning media

Learning English on social media platforms such as Instagram does not occur in an ideologically neutral way. As Gao and Liu (2023) investigated, English language teaching materials on Instagram strongly reproduce and represent the concept of native-speakerism. Native-speakerism is defined as unequal power relations between native and non-native English teachers, in which non-native teachers are marginalized and Western English language varieties and teaching methodologies are favored (Halliday, 2006; Kubota, 2011; Kamali, 2026). In the same vein, the importance of native-speakerism on social media is highlighted by South Koreans, particularly in relation to "correct" pronunciation (Ahn et al., 2020). The algorithmic biases of social media platforms such as Instagram seek to promote English teachers who follow native-speaker norms, granting them more visibility, and as a result, it reproduces the ideology that English competence is connected to resembling a native speaker (Ruecker & Ives, 2015).

In this digital space, English is not only considered a means of communication but also a product that can be marketed, and visible English teachers can make this happen for themselves. Therefore, many Instagram teachers try to market themselves by presenting their pedagogical skills, individual characteristics, and personal experiences (Curran & Jenks, 2023). As social media platforms are gradually becoming suitable environments for advertisement (Wang & Curran, 2024), teachers have started to use them as tools for self-branding (Aslan, 2024; Nejadghanbar et al., 2024). Properly utilizing self-branding techniques can assist teachers to outperform their more qualified and skilled peers in attracting attention and advertising themselves (Curran & Jenks, 2023). The p-

-romotion and self-branding of teachers who take advantage of algorithmic biases – such as following native-speaker norms – or use different advertising techniques raise concerns for language education. Learners may be exposed to unnecessary norms, and teachers may sense that in order to remain visible, they need to use techniques that may not be pedagogically acceptable.

These dynamics emerge within a digital ecosystem increasingly shaped by algorithmic and AI-driven mediation. Recent studies show that many media literacy frameworks have not adapted to these conditions (Van Wyk, 2025). Saliu (2024) argues that influential texts overlook key features of contemporary online life, from platform-level control to the growing communicative role of AI. Similar concerns arise in education. Sullivan et al. (2024) demonstrate that AI systems are not neutral tools; they are products of extractive data practices that can reinforce inequality and weaken pedagogical integrity. Together, these critiques highlight the need for stronger critical digital and AI literacy so that teachers and learners can better interrogate the ideologies embedded in social media spaces such as Instagram.

Critical Digital Literacy: Theory and application

The constant development of digital tools results in their application in education and language learning. Therefore, critical literacy for navigating these tools has become essential. CDL, as an evolving concept, stresses the development of digital content, and its evaluation in a reflective and critical way (Pandya et al., 2021). CDL goes beyond basic digital competence by assisting users to examine the structural aspects of technology and to analyze the potential commodification and exploitation existing in digital capitalism (Pötzsch, 2019). CDL is referred to as an individual's capacity to evaluate digitally developed content and to engage critically in digital spaces (Pangrazio & Selwyn, 2018). Promoting CDL among learners raises their awareness of the existing ideologies in digital environments and how the representation of meaning in these environments can maintain or reproduce current power dynamics (Darvin, 2017).

Although there are many conceptualizations of CDL, its key dimensions include reflective practice, ethical awareness, evaluation of digital content, and critical thinking. Reflective practice and ethical awareness are defined by Mihailidis (2019). The former refers to an individual's ability to reflect on how they use digital tools and how this usage affects their understanding of the world. The latter is associated with ethical issues related to the application of digital tools, encompassing topics such as privacy, copyright, ideology, representation of meaning, and the digital divide. Leu et al. (2014) explain the other dimensions. Evaluation of digital content suggests an individual's ability to assess the reliability, validity, and quality of content that is developed in a digital space. Critical thinking is described as analyzing the content for misinformation, bias, and hidden agendas. Drawing from Hinrichsen and Coombs (2013), Mihailidis (2019), Pangrazio and Selwyn (2018), and Darvin (2017), this study operationalizes CDL through four key dimensions:

1. Authorship Awareness – the ability to question who produces content, under what authority, and with what intentions.

2. Ideological Critique – identifying values, norms, or commercial interests embedded in digital texts;

3. Reflective Practice – monitoring one's own engagement patterns and motivations in digital spaces;

4. Digital Agency – the ability to critically select, reject, or repurpose content as an empowered user.

These dimensions guide the coding, interpretation, and thematic construction in this study. CDL can be utilized to evaluate and investigate the perceptions of learners on the digital English learning content on Instagram. CDL enables learners to question why certain content and teachers, such as native speakers, are idealized, while non-native speakers are marginalized which aligns with the ideas of Ruecker and Ives (2015), who emphasize the reproduction of native-speakerism in digital spaces. Learners can also raise their awareness of algorithmic bias, ethics, and digital representations, as stressed by Pötzsch (2019). Through the lens of CDL, content on Instagram can be critically evaluated to examine the persona of the content developer, the ideology that underlies the content, and the structural framework that supports it. In this way, CDL generates a framework that encourages ,

critical, ethical, and reflective engagement with digital language learning environments. Prior research has explored the affordances of Instagram for language learning (e.g., Gonulal, 2019; Lee, 2023a). It has also acknowledged the benefits and challenges of informal digital spaces (e.g., Benson, 2011; Kukulska-Hulme, 2020) but few studies have critically examined how learners themselves evaluate, interpret, and reflect on such content through the lens of Critical Digital Literacy.

This study investigates how EFL learners evaluate and make sense of Instagram-based English learning content through the lens of CDL. Applying CDL as a conceptual framework, the study critically examines learners' awareness of authorship, values and norms, and their own agency when consuming pedagogical content on Instagram. This research is significant because it highlights the urgent need to equip learners with the tools to interrogate what they see, rather than merely consume it in a context where native-speakerism, performative aesthetics, and commercial motives often dominate language-related content. The findings contribute to the current literature on language education by showing that native-speakerism, performative aesthetics, and surface-level fluency do not suffice when it comes to informal learning on social media.

The current study aims to address the following research questions:

1. How do learners perceive and respond to the visual, algorithmic, and performative features of Instagram that shape content visibility and appeal? (Ideological critique)

2. In what ways do learners evaluate content credibility and authorship on Instagram English-learning pages? (Authorship awareness)

3. How do learners reflect on their use of Instagram for language learning and demonstrate digital agency in navigating educational content? (Reflective practice & agency)

Method

Context and participants

This qualitative research involved 13 participants, all of whom were university students situated in Iran. The ages of the participants varied from 20 to 26 years, and they represented a range of academic fields, including English Literature, Translation Studies, Engineering, Psychology, Graphic Design, and Computer Science. All participants regarded themselves as English language learners with differing levels of experience, having studied English for durations between two to nine years. Their self-assessed English proficiency levels ranged from A2 to C1 according to the CEFR scale (See Table 1).

The sample size of 13 participants was selected based on the concept of thematic saturation in qualitative research (Guest et al., 2006). In this research, recurring themes started to appear after the 10th interview. The last three interviews confirmed thematic saturation. Since the emphasis was on depth rather than breadth, this sample size was adequate for gaining detailed insights into learners' engagement with language learning via Instagram through the framework of Critical Digital Literacy.

A purposive sampling strategy was used to recruit participants who (1) identified as English language learners, and (2) followed at least two Instagram accounts focused on English language learning. These requirements helped us ensure that the participants had consistent and personal engagement with informal language learning content on Instagram. This information was gathered prior to the interviews through informal chats and telephone conversations during the recruitment process. These initial interactions helped confirm participants' eligibility and willingness to reflect on their Instagram-based learning experiences. Moreover, all participants stated during the interviews that they used Instagram daily, often as part of their wider digital media usage. Although their engagement with the platform was not always explicitly for educational purposes, every participant noted that they commonly encountered, interacted with, or intentionally searched for English language content on Instagram. As a result, they were appropriate candidates to investigate how Iranian EFL learners actively or passively engage with English learning content in everyday digital environments.

Although the platform was officially banned for a period and subject to intermittent restrictions, it has continued to be accessed extensively through VPNs and alternative means. Instagram is considered one of the leading platforms for both socializing and informal education (Shahid Zadeh et al., 2024). Given the relative lack of oversight regarding educational material on Instagram, the Iranian digital environment offered a rich context for exploring the links between social media, language learning, and critical digital literacy.

This study adhered to ethical guidelines aligned with the Declaration of Helsinki (General Assembly of the World Medical Association, 2014) to ensure the rights and privacy of the participants. The participants were fully briefed on the purpose of the study, the use of their data, and their right to withdraw at any stage. Furthermore, informed consents were obtained before the process of data collection and to maintain confidentiality and anonymity, the participants' identities were replaced with pseudonyms. Finally, all the data were securely stored with restricted access.

Table 1. Participant overview table.

Participant ID	Age	Years of English Study	CEFR Level (Self-reported)	Instagram Use	Follows ≥2 English Learning Pages
P1	21	2	B1	Daily	Yes (5 pages)
P2	25	6	B1	Daily	Yes (4 pages)
P3	21	6	C1	Daily	Yes (2 pages)
P4	21	3	B1	Daily	Yes (6 pages)
P5	20	3	B1	Daily	Yes (2 pages)
P6	20	7	C1	Daily	Yes (4 pages)
P7	24	8	C1	Daily	Yes (3 pages)
P8	22	8	B2	Daily	Yes (2 pages)
P9	22	2	B2	Daily	Yes (3 pages)
P10	20	3	A2	Daily	Yes (5 pages)
P11	26	9	C1	Daily	Yes (4 pages)
P12	21	2	A2	Daily	Yes (2 pages)
P13	20	5	B2	Daily	Yes (3 pages)

Data collection

The study employed two sets of data collection tools, namely semi-structured interviews and digital diaries. Semi-structured interviews were conducted with 13 participants, with each interview lasting between 20 and 35 minutes. The interviews were conducted individually and audio-recorded with the participants' permission to guarantee the accuracy and completeness of the data. They were conducted in Persian (the mother tongue of the participants) to make sure that the participants could express their thoughts and reflections with ease and clarity. This also helped us minimize potential misunderstandings related to language. This decision also allowed participants to reflect on their experiences more deeply and comfortably.

In addition to the interviews, the participants were asked to write a digital diary based on their English-learning experiences on Instagram over the past month. They were encouraged to describe specific posts that stood out to them, reflect on their learning behaviors, and share their thoughts critically. Each participant was also requested to provide one or two screenshots of the Instagram posts they engaged with, which served as contextual anchors for their reflections. These digital diaries and visual samples complemented the interview data and enriched the study through methodological triangulation.

After collecting the data, the audio recordings were fully transcribed. The transcripts were subsequently translated into English to facilitate thematic coding and analysis in the study's reporting language. To facilitate initial English translations of the Persian transcripts, the researchers used ChatGPT as a first-pass translation tool to improve efficiency. However, all outputs were meticulously reviewed, edited, and verified by the researchers and a professional bilingual translator. The translator conducted back-translations on key segments to ensure semantic equivalence. While AI tools provided linguistic scaffolding, final translation integrity was ensured by human oversight to maintain academic and ethical standards.

We developed the interview questions based on the theoretical framework of CDL to investigate participants' engagement with English-learning content on Instagram, their critical assessment of this content, and their views on content creators and the platform's influence. The complete interview questions are included in Appendix A.

The interview questions were designed to elicit insights across six key thematic areas grounded in CDL:

- Digital Language Learning Habits (e.g., frequency and purpose of Instagram use for learning)
- Engagement with Educational Content (e.g., preferences and interaction with posts)
- Evaluation of Content Accuracy and Credibility
- Authorship and Intentions Behind Content Creation
- Ideological and Representational Influences (e.g., appearance, accent, native-speakerism)
- Critical Reflection and Recommendations for learners and content creators

The themes were shaped by the four fundamental dimensions of CDL, which are highlighted in the literature: critical reflection, ethical awareness, creative agency, and evaluation of digital content (Hinrichsen & Coombs, 2013; Mihailidis, 2019). These frameworks acted as interpretive lenses during the thematic synthesis.

The researchers share linguistic and cultural backgrounds with the participants. As a result, reflexivity was essential throughout the study. Steps were taken to mitigate potential bias, including peer debriefing during coding, audit trailing of analytical decisions, and participant validation of interpretations.

Data analysis

The qualitative data were analyzed using thematic analysis as outlined by Braun and Clarke (2019). MAXQDA software was used to analyze the data collected from semi-structured interviews. This software helped us facilit-

-ate the coding process and organization of data.

To provide a theoretical foundation for the analysis, the process was further shaped by concepts of CDL, especially concerning learners' understanding of authorship, content reliability, ideology, representation, and digital engagement. Consequently, the study employed a hybrid coding strategy: codes were initially derived inductively from the participants' own expressions and experiences, then systematically organized deductively into conceptual categories consistent with the CDL framework.

All 13 transcripts were transcribed, translated, and read multiple times to ensure thorough familiarization. During the initial coding phase, significant phrases and ideas were emphasized, such as expressions of confidence in content creators, annoyance at misleading information, insights on visual design and fluency, and comments on motivation or its absence. These codes were maintained closely to the data at this stage to ensure the preservation of participants' voices.

In addition to interview data, content analysis was conducted on the participants' digital diaries and accompanying screenshots. These diaries provided reflective accounts of specific Instagram-based learning encounters, offering valuable triangulation to validate and deepen the themes that emerged from the interviews. Entries were treated as contextual reflections and coded using the same inductive-deductive procedure, enriching the analysis with further nuance and authenticity.

The second coding stage was informed by the CDL framework. Emergent codes from thematic and content analysis were clustered under four deductive categories: authorship awareness, ideological critique, reflective practice, and digital agency. This hybrid inductive-deductive approach ensured that the themes reflected both participants' lived experiences and key constructs from CDL theory. While the initial coding was conducted using MAXQDA to assist with data organization and code generation, the second (deductive) stage was carried out manually. At this stage, we reviewed and reorganized the codes by closely referencing the CDL framework to group them into conceptually meaningful categories. These categories functioned as a framework for identifying thematic trends across the dataset. Through ongoing comparison and constant reference to both the data and CDL theory, the coded segments were subsequently refined into a collection of key themes that reflected both the participants' shared experiences.

Findings

Thematic analysis of the interview and digital diary data revealed three overarching themes that illustrate how EFL students interact with English-learning material on Instagram. These themes investigate the mere behavioral observations to reveal learners' developing understanding of authorship, ideology, motivation, and platform influence, which are essential elements of CDL. This section outlines the findings in accordance with the CDL framework as defined by Cope and Kalantzis (2015), Janks (2009), and Buckingham (2008), while employing Braun and Clarke's (2019) six-phase thematic analysis approach to pinpoint and organize significant trends in the data (See Table 2).

Theme 1: Trust, credibility, and the problem of invisible authorship

This theme reflects the dimension of *authorship awareness* in CDL, as it explores how learners interpret credibility and expertise in online content. A key trend identified is the learners' inclination to trust content based on surface characteristics – such as fluency, confidence, accent, or visual attractiveness – rather than on transparent qualifications or teaching credentials. This theme corresponds to the authorship element of CDL, which highlights the necessity of questioning who generates knowledge, and under what authority (Cope & Kalantzis, 2015). In digital spaces where anyone can publish, learners must cultivate a critical perspective to evaluate not just the content but also its creator, the method of delivery, and the intended purpose.

The participants consistently relied on perceived expertise rather than verified teaching background. For instance, P1 stated, "If the post looks professional and the speaker sounds natural, I tend to trust it," while P2 added, "I don't know who they are, but if they speak well, I assume they're right." Such statements illustrate a reli-

Table 2 Summary of findings: Themes and participant insights.

Theme	Summary of Findings	Example Quote
Trust, Credibility, and the Problem of Invisible Authorship	Learners often judge Instagram content credibility based on accent, fluency, or appearance rather than pedagogical accuracy or qualifications.	"If the post looks professional and the speaker sounds natural, I tend to trust it." – P1
Platform Pressures and the Influence of Performative Content	Instagram's algorithm and visual aesthetics encourage repetitive, oversimplified, and influencer-driven content, often at the expense of pedagogical depth.	"Most pages feel like they're focused more on growing followers than on teaching." – P7
Passive Consumption and the Limits of Motivation	Despite high engagement with Instagram, learners seldom return to saved content or critically reflect on it. Motivation is momentary and not sustained.	"I save a lot of posts, but I almost never go back to review them." – P5

-ance on performative markers of credibility. This reliance is a trend that Buckingham (2008) critiques as characteristic of media-saturated environments where learners must learn to question not only the message but the messenger.

Although some of the participants developed skepticism after negative experiences, such as P4's dissatisfaction with a paid course, this reflection was typically reactive. Learners like P3 and P10 showed an emerging awareness of the difference between fluency and pedagogical expertise. P3 explained, "If they're just someone with good English skills and no teaching background, I'll be more critical." This indicates an intuitive but underdeveloped recognition that not all content creators are educators, and that instructional credibility is not guaranteed by language proficiency alone.

Moreover, eight of the participants reported learning to be more discerning over time, particularly when exposed to conflicting information. P5 noted, "I've seen a lot of grammar explanations that contradict each other. Sometimes I search them on Google or check a grammar book, but it takes time." This behavior aligns with the early stages of what Cope and Kalantzis (2015) describe as epistemic agency, which is the ability to navigate, verify, and evaluate sources rather than absorb content passively.

Participant 1 noted in their diary:

> What struck me wasn't just the pronunciation but how confidently he claimed the 'correctness.' … Maybe because the tone was confident, the visuals clean, and he sounded like a teacher. But isn't that part of the algorithmic trick too — polished delivery builds authority? I enjoyed it, but I'm also trying to look behind the content these days.

The learners tended to rely on fluency and appearance as markers of credibility. Their behaviors reflect on awareness of authorship, which is a critical component of CDL. Learners were often confused between performative formative fluency and pedagogical expertise to decide which content is reliable. This confusion points to a broader issue of how digital spaces distort the lines between authenticity and authority. The reliance

on performative aspects of learning content, such as accent or appearance, is in line with Buckingham's (2008) critique of media saturation. According to this critique, individuals are often unable to distinguish between content presentation and content quality.

Participant 2 wrote in a diary:

> Thinking critically, I wonder how these influencers decide what content to make. Maybe the algorithm pushes 'travel English' because it looks nice visually? It's funny that I didn't search for this kind of post—it just came up. Maybe Instagram knows I'm planning a trip this summer. Creepy, but useful?

This theme underscores a limited development of authorship awareness. Although the participants occasionally questioned the source, this was not a consistent practice. To ensure that EFL learners can engage with digital content critically, there is a clear demand to embed source evaluation, credibility assessment, and questioning strategies into EFL pedagogy. Without such support, learners may continue to conflate fluency with authority, which may leave them vulnerable to misinformation or shallow pedagogy disguised as educational innovation.

Theme 2: Platform pressures and the influence of performative content

This theme illustrates *ideological critique*, which focuses on learners' perceptions of algorithmic bias, performative pressures, and commercial influences in content. This theme centers on the students' awareness of how Instagram's layout and commercial framework affect the nature of educational material. The participants exhibited a growing comprehension of the algorithmic and visual factors that favor brevity, entertainment, and virality over pedagogical depth. This aligns with Janks (2009), who highlights the ideological role of literacy – how power and representation are embedded in the production and circulation of digital content.

Most of the participants criticized the repetitive and oversimplified formats used in English-learning posts. P9 stated, "They post '5 ways to sound fluent' over and over, with no depth or context," while P7 noted, "Most pages feel like they're focused more on growing followers than on teaching". These statements point to an understanding of platform logic. This understanding is what Cope and Kalantzis (2015) refer to as the hidden curriculum of digital media that shapes user expectations. The participants also highlighted the role of appearance and performance in determining a creator's popularity. P12 commented, "A lot of creators are young, attractive, and confident. Sometimes they look more like influencers than teachers". The visual dominance of influencer-style educators illustrates what Buckingham (2008) refers to as the conflation of media spectacle and educational credibility.

Participant 6 stated in the digital diary:

> It reminded me how much passive scrolling can become active learning if we choose the right pages to follow. I trust Cambridge more than other pages, maybe because I know it's an institution, not just a person. That gives me some kind of security, like 'this is correct English.' But at the same time, the post was very simplified. It made me realize that some pages use 'educational aesthetics', clean design, and minimal language, just to get likes.

Additionally, several participants expressed concern that the platform's emphasis on aesthetic appeal leads to a homogenization of content. This is where originality and depth are sacrificed for algorithmic visibility. P11 reflected, "They post the same idioms or expressions, just with different backgrounds and trendy music. It's like seeing the same lesson in ten different costumes." Such comments indicate a potential awareness of how content creation is often shaped more by metrics than by learning outcomes. Moreover, the ideological dominance of American English also emerged as a point of tension. While some learners were happy with the familiarity of American norms, others expressed discomfort with the lack of representation of other English varieties. P13 remarked, "You rarely see pages teaching British English or global varieties. It's always American TV accents." This supports Janks's (2009) assertion that literacy is inherently political. In other words, choices about language, accent, and representation are not neutral but ideologically loaded.

Participant 5 reflected in the digital diary that:

> I think that's why Instagram feels more real sometimes. Teachers like her fill in the blanks left by formal education. But it also made me think — who decides what gets left out? Why are some phrases 'invisible' in mainstream English teaching?

Participant 9 commented:

> "An Instagram page had a reel explaining how adding 'the' can change a sentence's meaning completely. For example: 'There's a fly on the picture' instead of 'There's a fly on a picture.' It honestly blew my mind. … Instagram gives these mini-lessons that stick, often more than long textbook units."

This theme highlights that learners are not simply passive consumers of content. They are starting to become aware of the structural elements, such as commercialization, visual bias, and algorithmic selection, that influence what educational content becomes visible and valued. However, this recognition does not always lead to alternative engagement strategies. The results indicate a need to enhance learners' platform literacy. This literacy helps them to comprehend, maneuver through, and question the performative demands of Instagram. Teachers and course developers could integrate reflective conversations about media consumption, representation, and the commercial aspects of social media into language learning programs to foster this critical understanding.

Theme 3: Passive consumption and the limits of motivation

This theme pertains to *reflective practice* and *digital agency*, examining how learners engage with and act upon Instagram content in their language learning journeys. Although the participants acknowledge Instagram for its accessibility and appeal, they stated that their engagement with English-learning content was mostly habitual and non-reflective. The learners frequently used Instagram as a background tool, a tool which is convenient, stimulating, and omnipresent. However, they hardly ever saw English-learning content as a transformative tool. This theme is about the learner agency dimension of CDL, which emphasizes the importance of intentional, reflective, and strategic use of digital tools (Cope & Kalantzis, 2015; Luke, 2014).

The participants said that they saved posts with good intentions, but they rarely followed through. P5 admitted, "I save a lot of posts, but I almost never go back to review them," and P8 added, "I use the save feature a lot – although I admit I don't go back and review as much as I should." These confessions point to a pattern of low-engagement behaviors. Therefore, according to the data gathered from the interviews, language-learning content is mostly consumed passively rather than acted upon critically.

Participant 2 stated in the digital diary that "I saved the video and tried repeating the sentence a few times. What I liked most was how natural it felt, like someone talking to a friend, not teaching a lesson. It didn't feel like a textbook at all." Moreover, we discovered that short bursts of motivation were common among the participants, although they were often fleeting. P1 shared, "Sometimes I watch a reel and get super motivated for five minutes, and then it disappears," while P2 remarked, "They push me to act, but I don't always follow through." These comments reflect a tension between emotional engagement and sustained learning behaviors. Learners were aware of the gap between their momentary inspiration and their actual learning habits, but few of them had strategies in place to bridge that gap. Participant 5 also expressed in the digital diary that "I saved the reel and I actually repeated the sentences while fixing things in my apartment! It felt so relevant."

Despite these limitations, learners expressed appreciation for Instagram as a supplementary learning tool. P13 described it as "background input which is always around, but not central," while P6 mentioned, "It's a nice way to get exposed to idioms I wouldn't hear in class." This suggests that Instagram plays a peripheral but persistent role in shaping learners' exposure to informal and culturally embedded language-learning content. However, according to Buckingham (2008) and Lankshear and Knobel (2011), having access alone does not associate with learning. In other words, exposure to digital pedagogical content on Instagram may reinforce superficial understanding rather than deep acquisition without critical engagement. Furthermore, some learners acknowledged that the convenience of social media also leads to complacency. P10 reflected, "It feels like I'm lea-

-rning, but when I actually try to use the expressions, I forget them. Maybe I need something more structured." This comment reflects the need for instructional design that connects social media interaction with structured and intentional learning activities.

In the realm of passive consumption, students stated that they save posts with positive intentions but seldom come back to them. This pattern reveals a deficiency in their ability to actively integrate what they find on Instagram into their language learning activities. While learners tend to experience brief moments of motivation, these feelings rarely lead to prolonged efforts. From a CDL standpoint, this underscores the necessity for learners to cultivate more strategic, self-directed learning habits that extend beyond simple content exposure and engage in the thoughtful use of digital tools (Leu et al., 2014). Implementing self-monitoring strategies like digital journaling or goal-setting exercises may assist learners in transforming passive content engagement into active learning practices.

This theme calls attention to the need for educational interventions that promote critical digital self-regulation. Language learners need to move from passive recipients of pedagogical content to active and strategic users. Without such support, learners risk remaining stuck in a cycle of inspiration without transformation. To bridge this gap between exposure and application, it is important to integrate micro-tasks, reflective journals, and self-monitoring checklists into mobile learning practices. To conclude, from the lens of CDL, it became clear that having access to digital language content on Instagram does not suffice. This means that language learners need explicit pedagogical support to be able to interrogate the following aspects of language content on Instagram:

- What is being presented?
- Who is presenting it?
- Why is it being disseminated?
- How does such content align with or distort broader educational goals?

Therefore, the themes underscore the urgent need to include digital engagement not only as a technical skillset but as a practice that develops critical and epistemic awareness. Although there were instances where the participants exhibited moments of critical reflection by questioning the value and validity of a post and the credibility of the creators, these insights were not sufficient to support transformative learning. To be more accurate, the participants were partially aware of issues, such as source credibility, platform bias, and their own motivational gaps, but they did not have the tools and skills to act upon these insights strategically. This highlights the importance of integrating CDL principles into EFL instruction. This integration is not considered an ancillary topic anymore; it must be a core component of digital-age language education. Language learners need to develop authorship awareness, platform critique, and content evaluation to succeed in a complex and algorithm-driven environment of Instagram.

Discussion

This study applied the framework of CDL to investigate how Iranian EFL students utilize Instagram as a casual digital space for language acquisition. The results revealed that while learners actively consume English content on Instagram, their engagement is primarily characterized by surface-level assessments, adherence to performative norms of the platform, and limited strategic involvement. These results correspond with and build upon existing research within four related spheres: informal digital language acquisition, Instagram as a learning tool, ideological impacts in online environments, and the broader theoretical context of CDL. Moreover, this study extends existing literature by not only describing learners' behaviors but also analyzing them through a structured CDL framework, an approach rarely applied to social media-based English learning. Whereas prior work has highlighted learner enjoyment or motivational gains from platforms like Instagram, this study problematizes these platforms as ideologically embedded environments and reveals learners' emerging but often underdeveloped critical capacities. In doing so, it bridges the gap between IDLE studies and critical pedagogical concerns in digital education.

The tendency observed in participants to save posts while seldom revisiting them, or to rely on visually appealing content without verifying its authenticity, mirrors patterns previously noted in the literature concerning Informal Digital Learning of English (IDLE) (Lee, 2019a; Benson, 2011). Despite the wide recognition of digital environments for fostering self-directed learning (Kukulska-Hulme, 2020), this study highlights a notable gap between learners' access to these resources and their critical engagement with them. The participants frequently demonstrated passive or routine interactions with educational materials. These behaviors confirm Cronin and Durham's (2024) concern that microlearning tools, despite their promise, may become superficial if not paired with reflective practices. Moreover, the findings of this study challenge the optimistic view of IDLE. Lai and Gu (2011) found that out-of-class exposure could improve pragmatic competence and vocabulary. However, our study revealed that this exposure was rarely translated into strategic and meaningful learning behavior. Rather, language learners often use pedagogical content impulsively and emotionally. This confirms Fauziah and Diana's (2023) warning that autonomy in digital environments needs scaffolding to be truly effective.

The second theme revealed the extent to which the participants were aware of Instagram's algorithmic and commercial structure. Having such awareness, they could recognize how Instagram prioritizes content that is visually engaging and performative. These insights validate and verify the critiques of Instagram that claim that Instagram is an ideologically loaded platform. This means that Instagram is a site where learning is shaped mostly by platform dynamics instead of pedagogical intent (Gao & Liu, 2023). The overrepresentation of American English, which is considered the dominance of confident and attractive influencers, and the repetitive structure of content align with what Ruecker and Ives (2015) describe as the digital reproduction of native-speakerism.

The fact that the participants were able to recognize these trends, though often intuitive rather than analytical, supports Halliday's (2006), Kubota's (2011), and Kamali's (2026) claims about the marginalization of non-native speaker identities in digital ELT materials. The current study adds new depth to these findings by showing how learners' perceptions might be influenced by algorithmic visibility and self-branding practices on a platform like Instagram. Several learners expressed that influencers tend to prioritize "looking the part" over actual teaching effectiveness. This point is supported by Curran and Jenks (2023), who argue that Instagram's commercial ecosystem encourages teachers to market themselves more than to educate. The mentioned points were particularly evident in the ways learners interpreted credibility through performativity, such as accent, camera quality, and charisma, rather than expertise or training. This echoes Mihailidis's (2019) concept of ethical awareness and representation in CDL and affirms the need for learners to be equipped to analyze who gets seen and why in digital environments.

Perhaps the most critical finding in this study was learners' limited attention to authorship and credibility. Many of the participants based their trust on the content due to its superficial indicators like fluency or production quality. This issue mirrors Pötzsch's (2019) concerns about how digital capitalism commodifies expertise. Only after their negative experiences (e.g., purchasing low-quality courses) did some of the participants begin questioning content quality and author background. This finding powerfully illustrates the underdevelopment of reflective and evaluative practices, which are key dimensions of CDL as conceptualized by Bacalja et al. (2021) and Leu et al. (2014).

While prior research has emphasized the pedagogical opportunities of Instagram (Lee, 2023b; Gonulal, 2019), our findings draw attention to its pedagogical vulnerabilities. Without CDL training, learners are unlikely to distinguish between charismatic presentation and qualified instruction. Rezaie and Chalak (2021) warned us about this issue. They stated that unchecked access to unregulated educational content is considered a major risk that has been confirmed through the current study. Nevertheless, it was interesting that a few participants did express growing skepticism and the beginnings of a critical digital habitus. These habits were mostly shaped by repeated exposure to unreliable content.

Not only does the contribution of this study lie in describing learner behavior, but it also attempts to contextualize it within the wider framework of CDL in EFL settings. This means that, although much of the existing CDL research has focused on school-age learners in general digital environments (Darvin, 2017; Mihailidis, 2019), our study applies these principles specifically to informal language learning on social media, w-

-here pedagogical oversight is minimal, and learner responsibility is paramount.

Ultimately, the findings from this research indicate that various aspects of CDL, including the assessment of authorship, understanding of digital ideology, and self-reflective regulation, are inconsistently exhibited among language learners using Instagram. However, these aspects often appear in disjointed or instinctive manners. As a result, there is ample opportunity to create pedagogically sound interventions that assist learners in comprehending Instagram not just as a source of content, but also as a platform deeply intertwined with social and ideological contexts.

Conclusion and implications

Interpreted through the framework of CDL, this study investigated how EFL learners engage with English-language content on Instagram. Three major themes were revealed through thematic analysis of the interviews with 13 university students: superficial trust and lack of authorship awareness, the influence of Instagram's algorithmic and performative culture on educational content, and the passive nature of learner interaction with this content. Instagram has been valued for its accessibility and exposure to informal language input. However,learners often lacked the necessary critical awareness to evaluate content credibility, ideological bias, and pedagogical value. Through linking these findings to existing literature, this study emphasizes the urgent need to promote critical digital awareness in informal learning spaces.

One limitation of this study is its relatively small and localized sample. Our sample includes 13 university students, which may limit the generalizability of the findings to other sociocultural contexts. Additionally, since we employed in-depth qualitative methods, the study relied on self-reported perceptions instead of observational or performance-based measures of learner behavior. Future research could expand to include comparative studies across countries. Additionally, it could integrate quantitative approaches or investigate the perspectives of content creators to offer a more holistic understanding of digital language learning ecosystems. Finally, the CDL behaviors observed in this study may have been influenced by participants' English proficiency levels, as learners with lower CEFR profiles may rely more heavily on perceived "experts" on social media and engage less critically with digital content.

The findings carry important implications for learners, teachers, and curriculum designers. Engagement of language learners with digital content requires structured opportunities to develop CDL skills because learners need to be able to question authorship, evaluate accuracy, and recognize ideological influences on social media. Teachers and teacher trainers should integrate critical digital literacy practices into formal curricula to bridge the gap between informal and academic learning. Moreover, content creators and platforms should consider adopting ethical guidelines to improve the pedagogical integrity and transparency of online educational content. Furthermore, policy makers also play a key role. They should consider national or institutional frameworks that recognize CDL as a core 21st-century literacy and provide schools with resources and teacher training opportunities. Policies that promote safe and ethical digital participation can help standardize expectations across educational systems. Finally, parents, who are increasingly involved in learners' digital lives, need awareness of CDL principles as well. Supporting parents through workshops, informational materials, or school-community initiatives can help them guide young people toward more responsible and reflective online behavior.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work, the authors used ChatGPT3.5 in order to edit some parts for clarity and accuracy. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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Appendix A: Interview Questions

Section A: Digital Habits and Language Learning Background

1. Can you tell me a little about your English learning journey?
2. How often do you use Instagram, and what do you usually use it for?
3. Do you follow any Instagram pages for English learning? Which ones?

Section B: Engagement with Instagram Learning Content

4. What kind of posts do you usually engage with? (e.g., grammar tips, vocabulary lists, pronunciation videos, memes, reels)
5. Can you describe a post that you found especially helpful or memorable? Why did it stand out to you?
6. How do you usually interact with this kind of content? Do you save, like, comment, or share posts? Why or why not?

Section C: Evaluation and Content Validity

7. Do you usually check if the information in a post is accurate or reliable? Why or why not?
8. How do you decide whether a post is correct or worth using in your own learning?
9. Have you ever seen a post that you thought was wrong, misleading, or confusing? Can you give an example?
10. Do you follow any pages run by teachers or professionals? How does that affect your trust in the content?

Section D: Awareness of Authorship and Purpose

11. Do you ever think about who creates this content and why they are doing it?
12. Do you feel that some pages are trying to sell something, promote themselves, or get followers more than teach?
13. How important is it to know who the author is when you're learning something from a post?

Section E: Ideology, Representation, and Power

14. How is English usually presented in these posts? For example, do they focus on one kind of English (e.g., American, British)?
15. Do you notice anything about the accents, appearance, or backgrounds of the people featured in these posts?
16. Do these pages ever make you feel more or less confident about your own English?

Section F: Critical Reflections and Suggestions

17. How do these Instagram pages influence your motivation or learning habits?
18. Do you think English-learning content on Instagram should be more critically reviewed or designed? Why?
19. What advice would you give to learners using Instagram to study English?
20. What would you say to content creators who want to teach English on Instagram?

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Affordances and constraints of synchronous and asynchronous computer-mediated collaborative writing formats in doctoral writing groups: A comparative literature review

Elham (Ellie) Manzari[A] [A]Faculty of Education, Monash University, Melbourne, Australia

Michael J. Henderson[B] [B]Faculty of Education, Monash University, Melbourne, Australia

Lynette Pretorius[C] [C]Faculty of Education, Monash University, Melbourne, Australia

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Correspondence

ellie.manzari@monash.edu[A]

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Abstract

This conceptually informed narrative literature review, guided by affordance theory and the Community of Inquiry framework, examines the affordances and constraints of synchronous and asynchronous formats within doctoral writing groups, comparing how each format supports or challenges collaborative writing. The review finds that synchronous interactions can enhance collaboration by providing immediate feedback and fostering a strong sense of community, while also noting the potential scheduling difficulties associated with real-time engagement. Conversely, asynchronous interactions enable more thoughtful reflection and allow for greater reflexivity, though they may lack the immediacy and interpersonal connection of synchronous sessions. By analysing these dimensions, the review illuminates how each format shapes the dynamics of collaborative learning, reflective practice, and knowledge construction within doctoral writing groups. Drawing on a model of instructional design, this paper extends existing discussion on how digital technologies shape collaboration, knowledge construction, and academic writing development in doctoral education. Furthermore, it highlights how these writing groups function as knowledge-building communities where doctoral students do not merely exchange drafts but actively co-construct ideas through iterative discussion and feedback. Ultimately, it suggests that a hybrid approach that combines the immediacy and social connection of synchronous interactions with the flexibility and reflective depth of asynchronous methods may provide the most balanced and effective support for doctoral students' writing development.

Introduction

In recent years, digital technologies have become deeply embedded in academic and professional contexts, reshaping how individuals interact, collaborate, and share information. In higher education, the integration of digital tools has significantly enhanced accessibility and enabled more flexible collaboration across diverse group sizes and geographical locations (Bond et al., 2020). Within this transformation, computer-mediated communication (CMC) has emerged as a crucial mechanism for enabling collaborative engagement, particularly in terms of academic writing. Initially defined by Herring (1996) as "communication that takes place between humans via the instrumentality of computers" (p. 1), CMC encompasses both synchronous and asynchronous communication modes (Wang & Devitt, 2022). Building on the functionalities of CMC, computer-mediated collaborative writing (CMCW) is defined as the process of co-authoring written content through digital platforms such as shared documents, forums, or specialised collaborative writing software (Li, 2018). The ongoing evolution of digital technologies has deeply influenced higher education, redefining academic writing and collaboration through the growing use of computer-mediated communication tools.

Synchronous communication tools, such as Zoom, Microsoft Teams, and Google Meet, foster immediate interaction, promoting dynamic exchanges. In contrast, asynchronous tools, including email, discussion boards, messaging services such as WhatsApp, and collaborative platforms such as Google Docs, enable participants to engage in writing at their own pace, facilitating deeper reflection on shared content. However, the effectiveness of these tools depends on how users perceive and utilise these potential affordances. Adopting an affordance theory perspective (Gibson, 1977; Norman, 2013), affordance here is used to refer to the possibilities for action enabled by a system's design (Hoang & Pretorius, 2019). Importantly, affordances only become meaningful when recognised and utilised by users, so Norman (2013) refined this concept by distinguishing between perceived affordances (i.e., what users believe they can do) and actual affordances (i.e., the system's true capabilities). Misalignment between these affordances may lead to inefficiencies, particularly in the exchange of feedback and collaborative decision-making. Affordance theory also intersects with instructional design models, which highlight how digital tools shape cognitive engagement, social interaction, and teaching presence in collaborative learning environments (Garrison et al., 1999).

Beyond its functional role, CMC aligns with key instructional design principles, particularly those outlined in the Community of Inquiry (CoI) framework (see Garrison & Anderson, 2003; Garrison et al., 1999; Zhu et al., 2019). CoI emphasises the importance of cognitive, social, and teaching presence in shaping educational experiences in online learning environments (Garrison & Anderson, 2003; Garrison et al., 1999; Wertz, 2022; Wilson & Berge, 2023). Cognitive presence refers to the extent to which learners can develop and validate understanding through ongoing dialogue and reflective thinking (Garrison et al., 2001; Moore & Miller, 2022). Social presence is the capacity of individuals to connect with their learning community, engage in purposeful communication within a supportive environment, and build interpersonal relationships (Garrison, 2007). Finally, teaching presence refers to how instructors design, guide, and facilitate both cognitive and social interactions to achieve meaningful learning outcomes (Anderson et al., 2001; Martin et al, 2018). Previous research has demonstrated that doctoral writing groups play a crucial role in fostering safe and supportive learning environments where students engage in reflective practice (see, e.g., Cahusac de Caux & Pretorius, 2024; Cahusac de Caux et al., 2017; Hradsky et al., 2022). As such, we believe the CoI framework provides a compelling lens through which to analyse how synchronous and asynchronous tools either support or constrain the emergence of scholarly communication, the articulation of academic voice, and the collaborative construction of knowledge within these groups.

Doctoral writing groups provide a supportive environment for collaboration, feedback, and knowledge construction, reinforcing writing as a socially mediated practice rather than an isolated endeavour (Bergen et al., 2020; Cahusac de Caux & Pretorius, 2024; Chakraborty et al., 2021; Dusdal & Powell, 2021). These groups generally take one of two formats: some groups focus on providing space for dedicated individual writing (see, e.g., Wilson & Cutri, 2019, 2021) while others focus on collaborative writing and providing feedback on written work (see, e.g., Cahusac de Caux & Pretorius, 2024; Lam et al., 2019). Doctoral writing groups have been extensively studied in recent years, demonstrating their significant benefit in terms of academic writing quality, quantity, confidence, and reflective practice (see, e.g., Aitchison, 2009; Aitchison & Guerin, 2014; Cahusac de Caux et al., 2017; Cahusac de Caux & Pretorius, 2024; Chakraborty et al., 2021; Faulconer et al., 2010; Ferguson,

2009; Lam et al., 2019; Lee & Boud, 2003; Li & Vandermensbrugghe, 2011; Murray & Newton, 2008; Stracke & Kumar, 2014; Wegener et al., 2016). Importantly, research has also highlighted that these groups foster academic development, helping participants develop a sense of belonging within the traditionally isolated space of academia (see, e.g., Hradsky et al., 2022). Pretorius et al. (2022) explain that "academic identity, as a part of our identity, is shaped in the context we find ourselves and therefore refers to the stories we tell ourselves about who we are, who we are not, and who we would like to or should be in academia" (p. 7). As such, the design and facilitation of online doctoral writing groups are likely to significantly affect how students position themselves within academic discourse communities.

Doctoral writing groups are increasingly incorporating CMCW tools. Within these groups, synchronous tools enhance peer interaction and real-time discussion, whereas asynchronous tools allow for extended reflection and revision cycles. While previous studies have examined the pedagogical benefits of doctoral writing groups, fewer have critically investigated how digital affordances shape collaborative writing outcomes in doctoral education. Existing research tends to focus either on the instructional benefits of writing groups or the functionalities of digital tools, without systematically comparing how synchronous and asynchronous affordances and constraints interact in these settings. This review critically examines the affordances and constraints of synchronous and asynchronous digital environments in doctoral writing groups, highlighting their respective contributions to collaborative writing, reflective practice, and knowledge construction. By synthesising insights from existing research, this study evaluates how digital tools facilitate collaboration within writing groups while also identifying challenges such as accessibility, digital literacy, feedback quality, time management, and academic identity formation. Given the complementary strengths of synchronous and asynchronous tools, this review proposes a hybrid model which provides a more effective framework for supporting doctoral students' writing development. To achieve these objectives, this study is guided by two key research questions:

1. How do synchronous and asynchronous digital tools afford or constrain collaborative writing in doctoral writing groups?

2. In what ways can a hybrid approach integrate the strengths of synchronous and asynchronous formats to enhance doctoral students' writing development?

Method

Review design

This study reports a conceptually informed narrative literature review with a comparative focus. A conceptual narrative review was selected for its emphasis on interpretive synthesis and theory development, enabling cross-disciplinary integration, rather than simply mapping the breadth of existing evidence as in a scoping review (Kalenjuk et al., 2025). Conceptually, the review is informed by affordance theory, which guided our attention to the action possibilities and constraints created by different digital tools and configurations, and by the CoI framework, which directed our analysis towards the quality of social relationships, depth of engagement with ideas and writing, and the forms of design and facilitation that shape doctoral writers' experiences. Rather than aiming to exhaustively map all research on doctoral education and digital tools, the review synthesises and compares how synchronous, asynchronous and hybrid computer-mediated formats afford and constrain collaborative writing in doctoral writing groups, and how these formats support or hinder these forms of presence for doctoral writers.

Conceptual lenses

Affordance theory sensitised our analysis to the action possibilities and constraints created by different digital formats for doctoral writers, for example, opportunities for immediacy, flexibility, visibility of writing, and access to peers and supervisors, as well as barriers related to time zones, infrastructure, or self-regulation. The CoI framework drew attention to how synchronous, asynchronous and hybrid environments supported or hindered social presence (relationships and sense of community), cognitive presence (deep engagement with ideas and writing), and teaching presence (design, facilitation and guidance).

Application of the conceptual lenses

The conceptual lenses, affordance theory and the CoI framework, guided all stages of the review. They first informed the design of the data-extraction matrix (spreadsheet), which captured (a) the digital affordances and constraints reported in each study and (b) indicators of social, cognitive, and teaching presence. During analysis, the lenses shaped the guiding questions used to code each article, such as what synchronous, asynchronous, or hybrid formats enabled or made more difficult for doctoral writers, and how interaction, feedback, and identity-related experiences were supported or constrained. In the comparative synthesis, themes were interpreted through this shared frame to explain how different modes of interaction influenced engagement, feedback practices, and doctoral identity work. Importantly, the lenses were used as sensitising concepts rather than a fixed codebook: we also coded inductively for themes not captured by the frameworks and incorporated these into the final thematic structure and model.

Search strategy

We followed a structured, iterative search process. Initial searches were conducted in the Scopus and ERIC databases. These searches were supplemented by targeted searches in Google Scholar and by handsearching the reference lists of influential articles and edited collections on doctoral writing groups and academic writing support. Backward and forward citation searching was also used to identify additional relevant studies.

Search strings combined terms relating to doctoral writing groups, online or digital environments, and modes of interaction. For example, we used combinations of terms such as:

- "doctoral writing group*", "PhD writing group*", "doctoral writing retreat*", "doctoral writing support"
- "online", "virtual", "computer-mediated", "digital", "technology-mediated"
- "synchronous", "asynchronous", "hybrid", "blended"
- "collaborative writing", "peer feedback", "writing community"

Search terms were refined iteratively as our familiarity with the field increased. The search was limited to publications between 2000 and 2025, reflecting the period in which online and hybrid doctoral writing groups have become more established, and to peer-reviewed journal articles and scholarly book chapters published in English.

Eligibility criteria

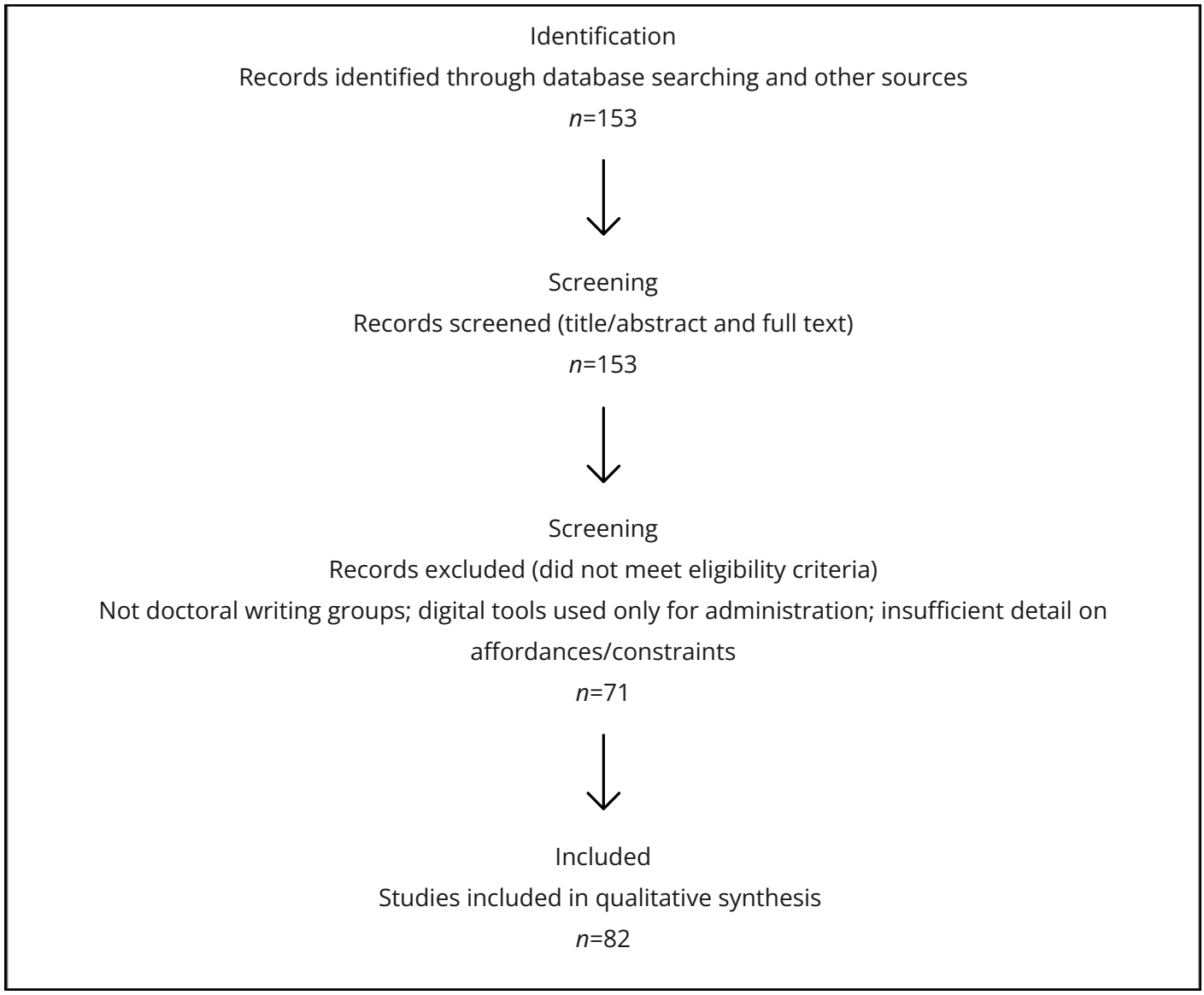
As this was a conceptually informed narrative review, we did not conduct a formal quality appraisal; however, we limited inclusion to peer-reviewed sources and extracted key methodological details. Studies were included if they (a) focused on doctoral writing groups, writing retreats, or structured doctoral writing support that involved peer interaction around writing; (b) examined synchronous, asynchronous, or hybrid online/digital formats (including computer-mediated tools used for interaction, feedback, or collaborative writing); and (c) reported findings relevant to affordances and/or constraints (e.g., interaction, feedback, engagement, accessibility, digital/AI literacies, time management, or identity-related experiences). Studies were excluded if they (a) were not focused on doctoral writers or doctoral writing groups; (b) used digital tools only for administration (e.g., scheduling) without analysing writing-related interaction; or (c) provided insufficient detail to support extraction of format-related affordances/constraints.

Screening and selection procedure

Titles and abstracts were screened against the eligibility criteria, followed by full-text screening of potentially relevant records. Duplicates were removed prior to screening by using the review matrix as a guide. Screening decisions and reasons for exclusion at the full-text stage were recorded in the review matrix to support auditability, and the final set of included studies was agreed upon by the author team through discussion. The screening and selection process is summarised in Table 1, which reports the number of records identified, scree-

-ned, excluded, and included in the qualitative synthesis, together with key exclusion reasons.

Table 1. PRISMA-style summary of study selection.



Data synthesis

We used an inductive thematic narrative synthesis approach, informed by affordance theory and the CoI framework as sensitising concepts. The synthesis proceeded in four steps:

1. Initial coding:

   We conducted open coding of each study, focusing on how synchronous, asynchronous and hybrid formats shaped opportunities and barriers for interaction, feedback, engagement and doctoral identity. Codes were applied to segments describing social, cognitive and teaching processes, as well as to descriptions of specific digital affordances and constraints.

2. Development of thematic categories:

   Related codes were then grouped into broader themes, such as immediacy and social presence, flexibility and access, depth of reflection, peer accountability, digital and AI literacies, time management, and emotional/affective dimensions. The conceptual lenses helped us to interpret these themes in terms of how different formats supported or limited social, cognitive and teaching presence and what kinds of action possibilities they opened up or constrained for doctoral writers.

3. Comparative analysis across formats:

   We compared how each theme manifested across synchronous, asynchronous and hybrid settings. For example, we examined how social presence was fostered or hindered in real-time videoconferencing compared with asynchronous forums, and how different tools afforded or constrained cognitive engagement and the depth of feedback. These comparative steps highlighted tensions (e.g., between flexibility and accountability) and complementarities (e.g., between real-time connection and time for reflection).

4. Construction of the comparative and hybrid framework:

   Drawing on the cross-study and cross-format comparison, we developed the comparative framework presented in Table 2 and the hybrid model in Figure 1. These outputs integrate the thematic findings with the conceptual lenses, showing how particular combinations of synchronous and asynchronous affordances can be intentionally designed to support social, cognitive and teaching presence in doctoral writing groups.

This approach moves beyond reporting isolated case studies to offer a conceptually grounded, comparative account of the affordances and constraints of synchronous, asynchronous and hybrid computer-mediated formats in doctoral writing groups.

Affordances and constraints of digital tools

This section discusses how the integration of digital tools in doctoral writing groups has brought transformative potential, offering diverse affordances while introducing notable constraints. A comparative evaluation of synchronous and asynchronous formats highlights key dimensions that shape collaborative writing dynamics, including immediacy, accessibility and flexibility, as well as digital and AI literacy.

We demonstrate that synchronous tools enhance engagement and collaboration through real-time interaction but may hinder reflection and cause anxiety for some participants. Their reliance on stable internet and fixed scheduling can also limit accessibility and inclusivity. Asynchronous tools offer greater flexibility and support deeper reflection but require strong self-regulation and time management. The effectiveness of both modes depends on participants' digital and AI literacy, an emerging area of research, particularly given the rise of generative AI.

Immediacy

One of the most notable affordances of synchronous tools is their ability to provide real-time interaction and immediacy. Online conferencing platforms enable instantaneous feedback and dynamic discussion, which are vital for addressing misunderstandings, negotiating ideas, and fostering group cohesion (Kirkpatrick, 2019; Lokhtina et al., 2022). These tools enhance social presence by allowing real-time verbal and non-verbal communication, including tone of voice, facial expressions, and gestures, which help build rapport and sustain engagement (Zhong et al., 2022). These features closely mimic face-to-face interactions, making synchronous tools particularly valuable for collaborative writing tasks requiring negotiation, alignment of ideas, and shared decision-making (Kirkpatrick, 2019; Yoon & Leem, 2021). The immediacy provided by these platforms aligns with the CoI framework's emphasis on social and cognitive presence, as it enhances engagement and facilitates rapid knowledge construction (Castelló et al., 2023). The spontaneous and interactive nature of synchronous tools fosters stronger interpersonal relationships, contributing to a sense of academic community within doctoral writing groups.

Furthermore, synchronous tools allow participants to quickly clarify points of confusion and engage in co-authoring processes in real time. The ability to receive real-time feedback ensures that participants can address issues immediately, avoiding potential misunderstandings that may arise from delayed communication (Kirkpatrick, 2019). These tools promote the development of shared meaning and critical engagement, reinforcing collaborative decision-making processes (Kozar & Lum, 2015; Raj Subedi et al., 2022), assuming that all participants engage equally. Unlike asynchronous formats, where responses may be delayed, synchronous tools provide an interactive environment that supports iterative discussion and alleviates feelings of isolation.

The affordance of immediacy also contributes to heightened levels of engagement, social interaction, and motivation. Participants often feel more invested in group discussions when their contributions are acknowledged and addressed in real-time, creating a dynamic and participatory learning atmosphere (see, e.g., Fabriz et al., 2021). For doctoral students, who frequently face the challenges of disconnection during the writing process due to the isolated nature of the PhD (Cutri et al., 2021; Kirkpatrick, 2019), synchronous tools provide critical avenues for maintaining social presence and fostering academic community (Castelló et al., 2023; Coker et al., 2023). This immediacy is particularly beneficial for collaborative writing, as it facilitates shared authorship and iterative text development, making synchronous tools integral to effective CMCW environments in doctoral education.

However, the emphasis on immediacy also introduces several significant constraints that can undermine the effectiveness of synchronous tools in doctoral writing groups. The rapid pace of synchronous interactions may hinder deeper reflection and critical engagement with feedback, as participants often feel pressured to respond quickly, leaving insufficient time to process complex ideas (Kirkpatrick, 2019). This time pressure can lead to superficial contributions and missed opportunities for richer intellectual engagement, particularly in discussions requiring careful deliberation (Castelló et al., 2023). For doctoral students, whose work frequently entails engaging with intricate and multifaceted concepts (Rena et al., 2025), the absence of adequate reflective space can significantly diminish the depth and intellectual rigour of collaborative discussions. In addition, the pressure of synchronous immediacy may heighten anxiety for certain participants, especially those who perceive themselves as less confident in their communication skills (Bahcekapili, 2021). This anxiety can disproportionately affect individuals who require more time to articulate their thoughts, potentially leading to a sense of marginalisation or reluctance to participate fully (Côté & Gaffney, 2021; Kirkpatrick, 2019). Additionally, it is our experience that newer writing group members may not have the confidence to contribute in the same way as a student who has been part of the group for a while. These socio-affective factors highlight the importance of structuring synchronous interactions to ensure inclusivity and cognitive depth, aligning with the principles of the CoI framework. This highlights that achieving and maintaining a strong sense of social presence in these virtual environments requires deliberate facilitation (Raj Subedi et al., 2022).

Accessibility and flexibility

Accessibility is a foundational consideration for the success of digital tools in writing groups. Synchronous tools support real-time feedback exchanges, which are valuable for immediate clarification and collaborative problem-solving (Lokhtina et al., 2022). The effectiveness of these tools, however, cannot be fully realised without addressing accessibility concerns that intersect with infrastructure challenges and participants' digital literacy. For example, synchronous formats enable the immediacy of real-time interactions, but this benefit is often undermined by technical constraints. A critical limitation lies in the reliance on external factors, such as stable internet connectivity and functional digital technologies (Vishnu et al., 2024). Additionally, technical issues, including lag or system crashes, can disrupt the flow of interaction, frustrating participants and interrupting the collaborative process (Lokhtina et al., 2022; Lowenthal, 2023).

These accessibility challenges are particularly pronounced in diverse doctoral cohorts, where disparities in digital infrastructures may further exacerbate inequities in participation (Kruse et al., 2023). Moreover, the reliance on scheduled sessions can pose logistical complexities, particularly for participants navigating time zone differences or balancing competing personal and professional commitments (Lowenthal, 2023). The rigidity of synchronous engagement may inadvertently exclude voices that could otherwise contribute meaningfully, affecting the inclusivity of doctoral writing groups (Kaufhold & Yencken, 2021). This exclusion not only limits individual participation but also narrows the range of perspectives that inform collaborative writing. Such exclusions also compromise the development of the social and cognitive aspects of the CoI framework, limiting opportunities for shared collaborative knowledge constraints and sustained interpersonal connection. To address this, facilitators must adopt flexible approaches that account for the material and temporal constraints shaping engagement in real-time interactions.

In contrast, asynchronous platforms, such as Google Docs, and discussion boards offer more flexible and gener-

-ally accessible alternatives (Castelló et al., 2023; Fabiz et al., 2021). These tools allow participants to contribute at their own pace, making them more inclusive for individuals managing competing demands, such as employment, caregiving responsibilities, or living in different time zones (Bawa, 2016; Watts, 2016). This flexibility can reduce participation barriers that often accompany scheduled, real-time interactions, and it creates opportunities for deeper cognitive engagement through extended periods of reflection and revision (Castelló et al., 2023; DiPasquale & Hunter, 2018). Asynchronous collaboration also supports iterative writing processes, enabling doctoral students to revisit and refine their work over time, which is particularly valuable for complex academic tasks that benefit from critical thinking and sustained attention (Yallop et al., 2021). By enabling thoughtful engagement with feedback, these tools support cognitive presence within the CoI framework, reinforcing deeper analytical and metacognitive processes in doctoral writing.

Nevertheless, the advantages of flexibility are accompanied by challenges that can affect equity and participation. While asynchronous tools can reduce barriers linked to time zones and scheduling, they can also produce uneven engagement when expectations are not explicit, and participation is irregular. Additionally, asynchronous collaboration places greater demands on participants' capacity to navigate platform features (e.g., commenting conventions, version history, and collaborative editing) and to sustain interaction without real-time dialogue, which may reduce connection if a strong sense of community is not deliberately fostered (Broadbent & Poon, 2015). Accordingly, writing groups using asynchronous formats benefit from clearly communicated participation expectations and facilitation practices that support both productive workflow and relational connection.

Digital and AI literacy

Digital literacy is crucial in determining how well participants navigate collaborative tools. Digital literacy here refers to the ability to locate, apply, and share information effectively and ethically in digital contexts (Pretorius, 2018). A lack of familiarity with digital platforms may inadvertently hinder group dynamics and impede progress (Rinekso et al., 2021). Despite its importance, doctoral students' digital literacy remains an underexplored area, with most research focusing on undergraduate or general university populations. While studies on university students broadly demonstrate that digital literacy significantly impacts academic engagement (see, e.g., Getenet et al., 2024; Kwiatkowska & Wiśniewska-Nogaj, 2022; Yuan et al., 2024), there is limited empirical evidence on how doctoral students develop and apply these competencies within their research and academic practices. Improving digital literacy through structured interventions can foster effective engagement with digital platforms (Joseph et al., 2024). To partially address this gap, Paul et al. (2024) investigated doctoral students' information literacy and identified significant gaps in their ability to retrieve and manage scholarly resources effectively. These limitations not only reduce research efficiency but also compromise the rigour of their academic work, underscoring the urgent need for targeted training initiatives that integrate advanced digital literacy skills into doctoral education (Paul et al., 2024). Without such interventions, doctoral students may struggle to navigate the increasingly digitised research environment, placing them at a disadvantage in conducting high-quality scholarly work. This challenge is particularly pronounced in the context of synchronous and asynchronous doctoral writing groups, where digital literacy is crucial for effective participation.

Beyond technological competencies, digital literacy in doctoral education now extends to artificial intelligence (AI) literacy, an emerging yet under-examined area that is reshaping academic engagement. When students engage with collaborative writing tools, they are increasingly presented with automated AI-mediated feedback and generative AI-mediated suggestions for improvement. When thoughtfully integrated, there is significant learning potential related to the diverse and powerful affordances of these technologies, including personalised learning, real-time interactivity, and accessibility (see, e.g., Farrokhnia et al., 2023; Wang et al., 2024).

However, the empirical evidence based on AI-mediated feedback in doctoral writing groups remains emerging and context-dependent, and findings should be interpreted cautiously given variations in institutional policy, access to reliable infrastructure, and differences in disciplinary writing norms (Jin et al., 2025). Practical implementation also raises challenges related to data privacy, academic integrity expectations, uneven access to tools, and the risk of over-reliance on automated feedback, which may shift influence towards platforms and institutional rule-setting rather than writers' agency (UNESCO, 2025; Zhai et al., 2024). This also necessitates a le-

-vel of AI literacy from both the students and the writing group facilitator. AI literacy can be defined as understanding "how to communicate effectively and collaboratively with generative AI technologies, as well as evaluate the trustworthiness of the results obtained" (Pretorius, 2023, T3). Pretorius and Cahusac de Caux (2025) also emphasise that AI literacy should be conceptualised as more than just functional proficiency with AI tools; rather, it must include the ability to critically evaluate, ethically engage with, and strategically integrate AI-generated content into research and writing practices.

With intentional integration and appropriate scaffolding, AI tools can meaningfully advance doctoral students' scholarly development. For example, a recent study by Pretorius et al. (2025) highlights the role of AI literacy in promoting epistemic justice, particularly for students from linguistically and epistemically marginalised backgrounds who can use generative AI to navigate barriers in traditionally Anglophone-centric academic spaces. This study demonstrated how generative AI helped doctoral students in engaging more deeply with scholarly communities, fostering a shared academic identity, and reinforcing their sense of belonging within collaborative spaces of knowledge creation (Pretorius et al., 2025). However, scholars also warn that without structured AI literacy training and reflexive engagement with generative AI tools, educators may inadvertently reinforce existing inequalities, such as a widening digital divide and the reinforcement or exacerbation of societal stereotypes (Eacersall et al., 2025). This underscores a pressing need to reframe digital literacy in doctoral education to include AI literacy as a critical component, especially as AI increasingly mediates engagement, feedback, collaboration, and knowledge exchange in both synchronous and asynchronous doctoral writing groups.

While some studies highlight potential benefits for access and participation, other scholarship cautions that AI systems can introduce bias, opacity, and uneven accountability, and that benefits are not distributed equally without explicit safeguards and critical pedagogy (UNESCO, 2025). Across this review, evidence is strongest for the role of digital competence in enabling participation in online writing group practices (Joseph et al., 2024; Paul et al., 2024); whereas claims about AI-mediated feedback and AI literacy remain promising but nascent (Farrokhnia et al., 2023; Pretorius, 2023; Pretorius et al., 2025; Wang et al., 2024), requiring further empirical work across disciplines, program types, and institutional contexts.

Balancing structure in synchronous and asynchronous formats

The previous section highlights the critical need to balance structure and flexibility when integrating synchronous and asynchronous formats into doctoral writing groups. Synchronous sessions introduce a time-bound structure that promotes real-time accountability, sustains collaborative momentum, and enhances cognitive presence, a key element of the CoI framework. The opportunity to synchronously negotiate writing decisions, clarify ideas, and receive immediate feedback fosters shared understanding and strengthens group cohesion. However, the logistical demands of real-time participation, such as scheduling across time zones or managing personal and professional commitments, can unintentionally exclude some participants (see, e.g., Lowenthal, 2023). Conversely, asynchronous tools like Google Docs afford participants the flexibility to contribute on their own terms, supporting inclusivity and sustained reflection. Yet, without deliberate structure, asynchronous engagement can risk reduced accountability, delayed progress, and disengagement (see, e.g., Ishtaiwa & Aburezeq, 2015).

Additionally, self-motivation and time management have emerged as key factors influencing participation and engagement in both synchronous and asynchronous formats (Kirkpatrick, 2019). While the flexibility offered by these environments is an advantage, it can also lead to procrastination if not effectively managed. Structured activities, such as goal setting and progress reviews, have been shown to help participants stay accountable and maintain momentum (Raj Subedi et al., 2022). In this context, targeted support and training become essential for fostering engagement and productivity. Workshops, for instance, can serve as powerful interventions; when designed to address self-regulation, they provide participants with practical tools to enhance their writing productivity (Vincent et al., 2023). Furthermore, as Bottomley and Bourgeois (2022) demonstrate, workshops that facilitate meaningful interactions between students and faculty not only build participants' confidence and competence in academic writing but also contribute to a sense of community and shared purpose within writing groups. By integrating these aspects, virtual writing groups can more effectively address individual challenges w-

-hile promoting collective success.

To maximise the pedagogical affordances of both formats, facilitators must, therefore, adopt strategic design principles that intentionally bridge the gap between structure and autonomy. Asynchronous engagement can be scaffolded through shared timelines, regular check-ins, and peer accountability mechanisms to maintain momentum. Meanwhile, synchronous interactions should be purposefully designed with clear agendas, focused breakout tasks, and structured feedback cycles to enhance learning while respecting participants' scheduling constraints (see, e.g., Naidoo et al., 2023; Richardson et al., 2017). Crucially, the tension between structure and flexibility should not be viewed as a binary, but as an opportunity to design hybrid practices that are both inclusive and pedagogically effective. Beyond logistical considerations, this balance also influences the social dimensions of collaborative writing, where maintaining interpersonal connection and a sense of academic community is central to the success of doctoral writing groups. Effective leadership within doctoral writing groups plays a key role in making this a reality by fostering trust, structuring engagement, and ensuring inclusivity (Chakraborty et al., 2021; Hradsky et al., 2022; Lokhtina et al., 2022). Leaders who facilitate discussions, set clear expectations, and actively promote equal participation contribute to stronger group cohesion and more meaningful engagement (Chakraborty et al., 2021; Hradsky et al., 2022; Lokhtina et al., 2022). Intentional trust-building strategies, such as structured introductions, collaborative goal-setting, and periodic check-ins, can also help sustain social presence over time.

Ultimately, both synchronous and asynchronous formats require deliberate strategies to foster social presence, highlighting its importance as a key dimension of successful virtual writing groups. Without sufficient attention to social presence, the effectiveness of such groups may be diminished, as participants may struggle to feel connected to their peers or invested in group objectives. By integrating strategies to enhance leadership, intentional engagement, and participant self-management (especially with the support of experienced facilitators), virtual writing groups can create more supportive and productive environments, enabling participants to thrive in both formats.

Transferability and contextual considerations

Although this review synthesises doctoral writing groups in general, the included studies do not consistently report disciplinary field, program type (e.g., professional versus research doctorate), or institutional characteristics in a way that supports robust cross-context comparison. As a result, our findings should be interpreted as identifying format-level affordances and constraints that may be enacted differently depending on local conditions (Garrison et al., 1999; Garrison et al., 2001). For example, participation patterns and the relative value of synchronous versus asynchronous engagement may vary with candidates' enrolment intensity (full-time/part-time), cohort composition, access to digital infrastructure, and the degree of facilitation support provided (Naidoo et al., 2023; Richardson et al., 2017). Where doctoral candidates balance employment, caregiving responsibilities, or distributed time zones, flexibility may become a more salient affordance, while maintaining momentum may require more explicit expectations and facilitation to sustain engagement (Maher et al., 2014; Smith, 2020). Conversely, in contexts with stable schedules, strong cohort identity, and institutional support for peer learning, synchronous interaction may be easier to sustain and can strengthen social presence and timely feedback, as emphasised within CoI–informed analyses of online scholarly communities (Garrison et al., 2000; Garrison et al., 2010). Future research would benefit from more systematic reporting of contextual variables so that transferability across disciplines, program structures, and institutional settings can be examined directly.

We have constructed the following table to illustrate the comparative dimensions of synchronous and asynchronous formats in doctoral writing groups. We have found through our review of the literature and our personal experiences as writing group members and facilitators. By integrating key insights from the literature, Table 2 also illustrates how these two modes influence collaboration, engagement, and productivity in different ways. The structured comparison underscores the strengths and limitations of each format, offering a nuanced perspective on their applicability in doctoral student writing contexts.

Table 2. Comparative analysis of synchronous and asynchronous formats in doctoral writing groups.

Criteria	Synchronous Format	Asynchronous Format	Literature
Immediacy	Supports immediate feedback, negotiation, and co-construction; fosters engagement and collaboration.	Delayed but supports thoughtful, deliberate reflection and revision.	Castelló et al. (2023); (2019); Lokhtina et al. (2022); Rena et al. (2025); Yoon & Leem (2021)
Accessibility and Flexibility	Requires stable internet, functional technology, and scheduling across time zones; less flexible; may exclude some participants.	More accessible; highly flexible; accommodating diverse schedules and enabling participation at one's own pace.	Lokhtina et al. (2022); Lowenthal (2023); Vishnu et al. (2024); Kruse et al. (2023); Kaufhold & Yencken (2021); Castelló et al. (2023)
Digital Literacy	Requires proficiency with real-time communication platforms to avoid technical disruptions.	Requires ability to navigate collaborative platforms (e.g., Google Docs); challenges for those unfamiliar with tools.	Rinekso et al. (2021); Paul et al. (2024); Joseph et al. (2024); Getenet et al. (2024); Yuan et al. (2024)
AI Literacy	Needs facilitation and participant awareness to critically engage with AI-mediated features in live settings.	Requires training and intentional design to embed and ethically use generative AI tools.	Pretorius & Cahusac de Caux (2025); Pretorius et al. (2025); Farrokhnia et al. (2023); Wang et al. (2024)
Social Presence	High real-time cues (tone, expression) support trust, group identity, and community.	Lower absence of real-time cues can reduce connection; may require effort to sustain community.	Kirkpatrick (2019); Yoon & Leem (2021); Castelló et al. (2023); Coker et al. (2023)
Feedback Quality	Immediate but potentially superficial due to time pressure; may lack depth.	Detailed, reflective feedback; supports metacognition and revision.	Castelló et al. (2023); Lokhtina et al. (2022); Raj Subedi et al. (2022)
Time Management	Requires punctuality and external structure; promotes accountability.	Relies heavily on self-regulation, planning, and motivation.	Bottomley & Bourgeois (2022); Raj Subedi et al., (2022); Ishtaiwa and Aburezeq (2015)
Cognitive Engagement	Promotes engagement through real-time discussion, but may limit deeper reflection due to immediacy.	Supports deep cognitive processing through extended reflection and iterative revision	Castelló et al. (2023); Rena et al. (2025); DiPasquale & Hunter (2018)
Anxiety / Confidence	May heighten anxiety, especially for less confident or second-language users.	Reduces performance pressure but may cause disengagement without regular check-ins.	Bahcekapili (2021); Côté & Gaffney (2021); Kirkpatrick (2019)

Hybrid approaches: Bridging the best of synchronous and asynchronous formats

Given the distinct affordances and constraints of synchronous and asynchronous tools, hybrid models emerge as a compelling pedagogical solution for doctoral writing groups. Hybrid models, as shown in Figure 1, strategically integrate the immediacy and interactivity of synchronous methods with the flexibility and reflective depth of asynchronous communication, creating a balanced and adaptable framework for collaboration. By leveraging the affordances of both modes, hybrid approaches support knowledge co-construction, facilitate structured feedback exchange, and foster sustained engagement over time.

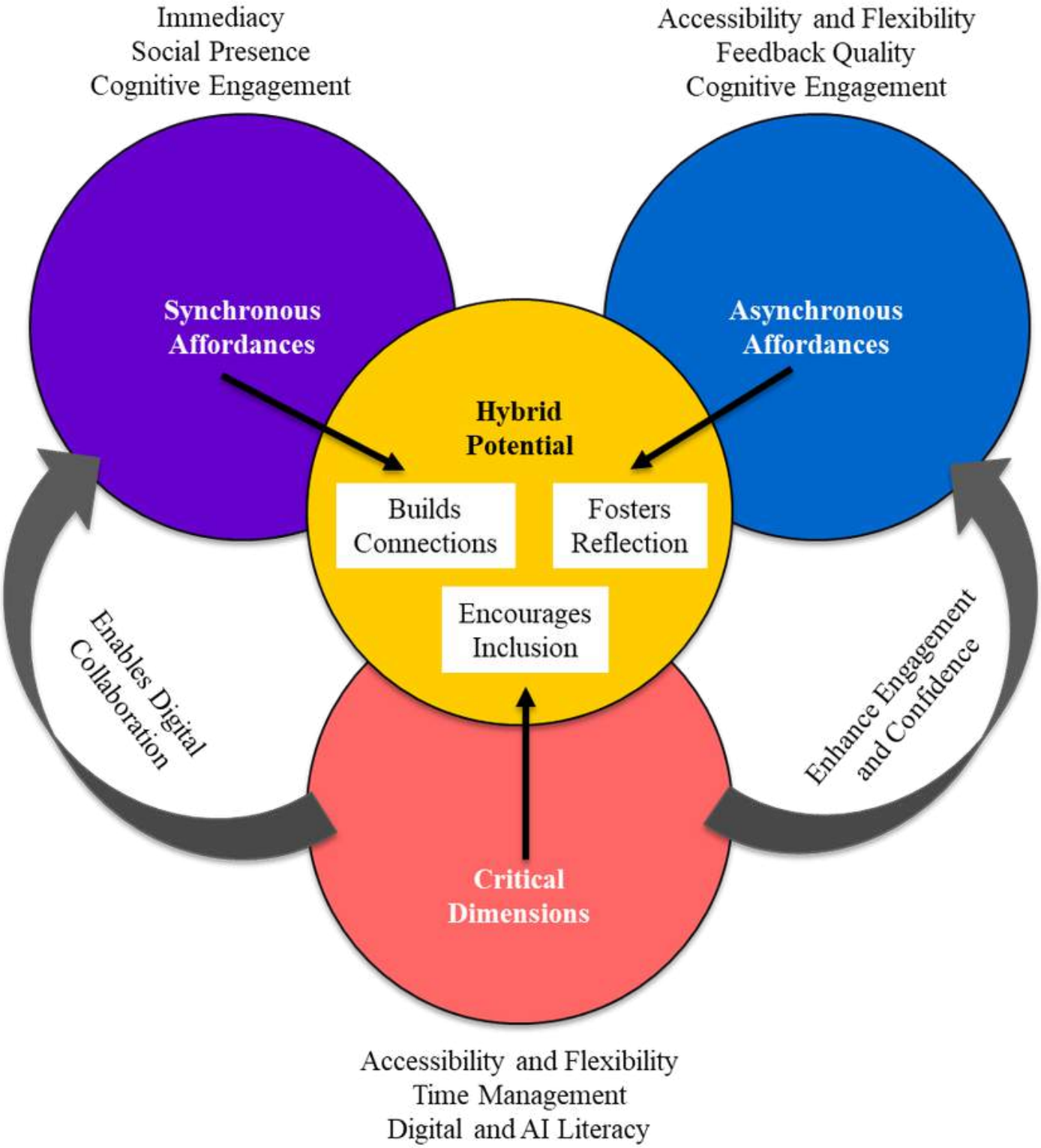


Figure 1. Harnessing hybrid potential: Intersecting affordances for inclusive and reflexive learning in doctoral writing groups.

Figure 1 illustrates the dynamic interplay between synchronous and asynchronous affordances, highlighting their convergence within a central zone of hybrid potential. The figure demonstrates how each modality contributes distinct strengths: synchronous affordances support the building of connections through immediacy and social presence, while asynchronous affordances promote reflection by providing space for thoughtful engagement and sustained contemplation. Critical dimensions such as time management and digital and AI literacy underpin our hybrid model, intended to support inclusive participation. At the intersection of these lies the hybrid learning space, which harnesses both immediacy and reflection to create more inclusive, engaging, and adaptive educational experiences when supported by intentional design and facilitation. The arrows depict the flow of influence and mutual reinforcement between the components, underscoring the importance of designing learning environments that integrate these dimensions holistically. This model emphasises that when educational practices intentionally balance synchronous and asynchronous elements with critical pedagogical concerns, they can more effectively meet the diverse needs of learners in writing groups. This integrated model aligns well with the CoI framework, reinforcing cognitive, social, and teaching presence across both interaction modalities. Chakraborty et al. (2021) have previously recommended embedding hybrid models into doctoral programs to mitigate geographical and time-zone barriers, support remote and international students, and enhance doctoral students' sense of agency. This alignment with the CoI framework ensures that cognitive, social, and teaching presence are reinforced across multiple interaction modalities. By combining synchronous immediacy with asynchronous depth, hybrid models enable a more flexible and inclusive collaborative environment, which can broaden opportunities for meaningful contribution across diverse schedules, locations, and participation preferences.

We argue that hybrid approaches not only build academic confidence and foster a sense of agency among doctoral students but also facilitate collaborative knowledge production. By combining the complementary strengths of synchronous and asynchronous communication tools, hybrid models foster deeper engagement and structured support for doctoral students navigating complex tasks. Li et al. (2025) emphasise the critical role of hybrid learning in enhancing student engagement and supporting the development of learner autonomy, both of which are crucial for maintaining long-term motivation and participation in collaborative academic settings. Similarly, Singh et al. (2021) explore hybrid learning models in higher education, highlighting the effective integration of synchronous and asynchronous tools to foster engagement, collaboration, and interaction. While their research focuses broadly on the challenges and opportunities of hybrid learning during the pandemic, the strategies they propose, such as leveraging diverse digital tools and fostering social, cognitive, and teaching presence, are directly applicable to virtual doctoral writing groups. For instance, Singh et al. (2021) highlight the need for appropriate infrastructure and professional development to ensure the successful implementation of hybrid models, a consideration particularly critical for doctoral programs. The principles behind a suitably enabled and supported hybrid approach enhance academic confidence, provide structured support, and promote interaction and productivity, making the approach invaluable for doctoral students navigating complex writing tasks.

Implications for practice

The findings of this review carry significant implications for the design and facilitation of doctoral writing groups, particularly in light of the growing adoption of hybrid models that integrate synchronous and asynchronous elements. While hybrid formats are often promoted as offering a complementary combination of synchronous and asynchronous affordances, this assumption requires critical examination. Hybrid approaches do not inherently ensure inclusivity or effectiveness; their success depends on the intentionality of their design and the degree to which they support equitable engagement among doctoral students.

For doctoral students, hybrid formats require navigating multiple modes of participation and communication, often without explicit guidance on how to manage the associated cognitive and emotional demands. Cognitive presence in hybrid environments is not only about processing content, but also about managing cognitive load, digital fragmentation, and delayed responses (Skulmowski & Xu, 2022). Similarly, doctoral students are expected to cultivate social presence through both real-time interaction and asynchronous engagement. While synchronous sessions may offer relational immediacy, students who require more time to formulate their thoug-

-hts may struggle to participate fully in fast-paced discussions (Mochizuki, 2022). In asynchronous formats, opportunities may be more flexible but still require careful scaffolding to prevent disengagement.

For educators and facilitators, implementing hybrid writing groups involves more than technical competence or familiarity with tools. It requires a deep understanding of how learning presence, power, and participation intersect in CMC environments. In hybrid doctoral writing groups, teaching presence must be sustained across synchronous and asynchronous modalities, demanding pedagogical strategies that ensure coherence and continuity. Educators also need to develop strategies that do not simply alternate between synchronous and asynchronous tasks. Instead, they must purposefully integrate both modes in ways that enable meaningful and reflective student contribution. This includes designing feedback loops that value asynchronous deliberation as much as real-time commentary, thereby supporting students with slower processing styles or those working in additional languages.

This review not only draws on the CoI framework to examine doctoral writing groups but also advances its theoretical development by critically assessing its application in hybrid learning environments. While CoI offers a valuable lens for understanding cognitive, social, and teaching presence, it does not fully account for the distinctive dynamics introduced by hybrid formats where synchronous and asynchronous interactions intersect in complex ways. The findings of this review indicate that the enactment of presence in hybrid doctoral writing groups is shaped by additional factors such as time-delayed feedback, uneven participation across modalities, and the potential marginalisation of participants in high-paced synchronous exchanges. In doing so, this review extends the CoI framework by foregrounding equity-related considerations and emphasising the need for inclusive, modality-sensitive approaches to supporting academic development in hybrid settings.

This review also calls into question some of the underlying assumptions commonly found in doctoral education, particularly regarding what constitutes presence in collaborative academic environments. Traditional models of doctoral education often privilege physical co-location as a prerequisite for meaningful engagement, overlooking the evolving nature of presence in digitally mediated settings. However, our analysis as well as our lived experiences of participating and facilitating both in-person and virtual writing groups suggest that online presence (either synchronous or asynchronous presence, that is) can be equally as significant as physical presence in terms of learning and academic development. Additionally, offering virtual spaces acknowledges the complexities and intersectionality of doctoral students' lived realities, contributing to a more inclusive educational environment. This redefinition of presence acknowledges that connection, collaboration, and support are not confined to shared physical spaces but can be powerfully cultivated in well-facilitated digital environments.

We, therefore, argue for a more refined and expanded understanding of presence that accounts for how digital, social, and institutional conditions interact to shape doctoral students' levels of engagement, their development of academic identity, and their evolving sense of belonging. These findings underscore the importance of designing writing groups that intentionally foster presence across modalities, ensuring that participants feel seen, heard, and valued, regardless of the format. In doing so, this review highlights the need for doctoral education to move beyond binary conceptions of "online" versus "in-person" and to embrace the nuanced realities of presence as they play out in hybrid scholarly spaces.

Conclusion

This literature review has critically examined the affordances and constraints of synchronous and asynchronous formats in doctoral writing groups, highlighting their respective contributions to collaborative writing, reflective practice, and knowledge co-construction. The findings reveal that synchronous formats enhance immediacy, real-time feedback, and social presence, fostering dynamic engagement and strengthening academic community ties among doctoral students. However, they also introduce logistical and cognitive challenges, including time-zone constraints, scheduling difficulties, and the heightened cognitive load associated with rapid interaction. Such fast-paced exchanges can inadvertently privilege more confident or quick-thinking participants, contributing to a sense of marginalisation among those who require more time to formulate their ideas. This dynamic may lead to reduced participation, feelings of exclusion, or a reluctance to contribute, particularly for st-

-udents whose language proficiency, confidence, or cultural norms make rapid interaction more challenging. Conversely, asynchronous formats afford greater flexibility, enabling reflective contributions, iterative revisions, and equitable participation. Yet, their effectiveness is contingent on self-regulation, structured facilitation, and sustained engagement strategies to mitigate challenges related to social presence and interaction gaps.

The comparative analysis of these two modalities underscores the complex interplay of factors shaping doctoral writing groups. The review demonstrates that neither synchronous nor asynchronous formats alone sufficiently address the diverse needs of doctoral students. Instead, a hybrid approach that strategically integrates the strengths of both formats offers the most effective and comprehensive support for doctoral writing groups. This alignment with the CoI framework ensures that cognitive, social, and teaching presence are reinforced across multiple interaction modalities, creating a more structured yet flexible learning environment. By combining the immediacy and interactivity of synchronous engagement with the reflective depth and flexibility of asynchronous interaction, hybrid models mitigate the inherent limitations of each individual format, fostering a more balanced and sustainable approach to collaborative writing. Moreover, hybrid formats may reduce the risk of marginalisation by offering alternative avenues for expression and engagement, particularly when participation structures are intentionally designed to support equitable contribution.
Furthermore, structured facilitation, intentional scaffolding, and digital literacy development are pivotal in maximising the benefits of hybrid approaches. Effective leadership, clear goal-setting, and social presence strategies contribute to fostering a sense of belonging, equitable participation, and sustained engagement in virtual writing groups. To make these implications actionable, we recommend that facilitators and institutions design doctoral writing group workshops with three core components: (a) explicit participation structures (e.g., agreed turn-taking norms, rotating roles, and clear feedback protocols) to support equitable contribution; (b) a predictable hybrid rhythm (e.g., brief synchronous goal-setting and feedback sessions paired with structured asynchronous drafting and peer response cycles supported by timelines and check-ins); and (c) targeted scaffolds for self-regulation (e.g., weekly goals, accountability pairs, and prompts that guide reflective peer feedback).

As digital technologies continue to evolve, future research should investigate how emerging tools such as AI, adaptive learning platforms, and intelligent writing assistants can further enhance collaborative doctoral writing experiences. Where AI tools are used, we recommend embedding AI literacy development that includes (a) how to collaborate effectively with generative AI (e.g., prompt practices aligned with writing goals), (b) how to evaluate and verify outputs (e.g., checking accuracy, sources, and bias), and (c) how to use AI ethically and safely (e.g., attribution expectations, privacy and data handling, and alignment with institutional integrity policies).

Additionally, future empirical studies could examine: (1) the effects of different hybrid sequencing patterns (e.g., synchronous goal-setting followed by asynchronous drafting and peer feedback) on doctoral students' writing development and sustained participation across full-time and part-time cohorts; (2) which facilitation strategies (e.g., structured turn-taking, pre-writing prompts, or asynchronous preparation) are most effective in reducing participation inequities during synchronous sessions; (3) the impact of an AI-literacy intervention on doctoral writers' agency, confidence, and uptake of feedback in hybrid writing groups; and (4) how disciplinary writing norms and program structures (professional versus research doctorates) shape the perceived value of synchronous versus asynchronous engagement over time.

Ultimately, this review advocates for the intentional and evidence-based design of doctoral writing groups that harness the affordances of both synchronous and asynchronous formats while addressing their inherent challenges. By adopting a hybrid, pedagogically grounded approach, institutions and facilitators can create more inclusive, engaging, and effective writing environments that support doctoral students in developing advanced writing proficiency, fostering academic resilience, and navigating the complexities of scholarly communication in an increasingly digital academic landscape.

Statements, Declarations, and Data Availability

Dr Elham (Ellie) Manzari contributed to the investigation, data curation, formal analysis, and writing (both draft and final version) of this study. Dr Michael J. Henderson contributed to the conceptualisation, resources, supervision, and writing (both draft and final version) of this study. Dr Lynette Pretorius contributed to the conceptualisation, investigation, project administration, resources, supervision, and writing (both draft and final version) of this study.

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Modelling optimal learning pathways: A Markov Decision Process approach to the pedagogy–heutagogy continuum

Dyane Smith[A] [A]*Data Science & Analytics, Kaplan Business School, Australia*

Sanjeev Naguleswaran[B] [B]*Data Science & Analytics, Kaplan Business School, Australia*

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Correspondence

dyane.smith@kbs.edu.au[A]

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Abstract

This paper presents a novel application of an AI model based on a Markov Decision Process (MDP) and leverages Dynamic Programming and value iteration to model the student learning journey across pedagogical, andragogical, and heutagogical learning paradigms. In contrast to a traditional static educational model, the proposed approach can adapt to changing cohort engagement and progress to provide more personalised and effective learning. Thus, the model can provide deeper insights into how students navigate self-directed learning, stay motivated, and achieve job readiness by considering different learning states, choices, and their associated outcomes. This work offers a theoretical contribution by formalising the pedagogy-heutagogy continuum and a practical framework through integration of analytics systems to optimise the learning process. It establishes a conceptual shift where personalisation moves from a design choice to a mathematically optimised strategy, bridging educational theory with computational decision science. While the current model uses illustrative data, it establishes a scalable foundation for future empirical integration using learning analytics.

Introduction

Higher education institutions are increasingly challenged by student disengagement, diverse learner profiles, and the demand for job-ready graduates. The advent of digital transformation has introduced new methodologies, profoundly reshaping the requirements of teaching and learning. For example, developments in artificial intelligence have emerged with great speed, requiring new critical skills and knowledge, influencing the effectiveness of the learning process, and highlighting the role of continuous learning in modern education.

The rapidly evolving labour markets, along with flexible delivery models, amplify the above-mentioned challenges putting a strain on traditional pedagogical frameworks that tend to be a one-size-fits-all approach. Although new modes of delivery and data-rich learning environments have been introduced, little has been done to improve students' engagement and learning outcomes. Much of the current implementation is around static learner dashboards or predictive models that identify at-risk students. While they provide sound fundamentals, these approaches treat learner engagement as a linear concept, discounting the dynamic and non-linear continuum in the learning journey.

A deeper exploration of curriculum design frameworks can identify possible alternative, complementary pathways for knowledge acquisition and engagement. These pathways, framed within the paradigms of pedagogy, andragogy, and heutagogy, cater to adult learners with distinct needs, fostering differentiated levels of learner engagement and autonomy.

Conceptual and research gap

The growing interest in personalised approaches to education has ignited an interest in individualised learning methods. While there is activity in this area, current models lack the explicit representation of the learner journey as a probabilistic and state-dependent process. Pedagogical theory is rarely integrated with computational modelling, making this framework highly contemporary, addressing the conceptual and current research gap. Most models assume a fixed pathway for learners rather than a continuum and do not adequately capture the transitions between learning paradigms based on learner engagement. Primarily, current models do not adequately compute the transitions between pedagogy, andragogy and heutagogy based on the learner's capabilities.

A Markov process-based conceptualisation offers a framework to mitigate these limitations. This model represents learning as probabilistic state transitions, where future learning is based on current conditions and not static contexts. The model computes learning as a dynamic progression capturing transitions between states and the end goal, in this case, job readiness. This work contributes to a theoretical and computational framework to model learner progression and lays the groundwork for adaptive curriculum design and personalisation in higher education. It integrates behavioural, cognitive, and contextual data into a systematic structure, thereby supporting adaptive curriculum design pathways informed by transitional probabilities. The timeliness of this study can take advantage of the educational systems that generate continuous learner interaction data, making it adaptable at scale.

The conceptualisation of learner progression as a Markov process nested into the pedagogy-andragogy-heutagogy continuum undertaken in this study links educational theory with probabilistic modelling. In addition, this AI-based model lays out the groundwork that informs curriculum personalisation, student autonomy and scalable learning interventions.

The proposed model and its adaptation

We use a Markov Decision Process (MDP) to model the student learning journey across pedagogical, andragogical, and heutagogical learning paradigms. An MDP is a mathematical model used to describe situations where an agent makes decisions in an uncertain environment (Puterman, 2014). In our context, the "agent" is the student. This framework is used to model sequential decision making and has been widely applied in operations research, robotics and reinforcement learning (Sutton & Barto, 2018). Applications of AI in education have been

discussed in Rasul et al. (2023). In education research, there have been exploratory studies of modelling adaptive learning pathways and curriculum sequencing, where learner progression can be represented as transitions between knowledge states (Canty & Greyling, 2020; Chi et al., 2011; Clement et al., 2015).

Figure 1. The conceptual gap: Fixed pathways across the learning journey (generated by ChatGPT with guidance from the authors).

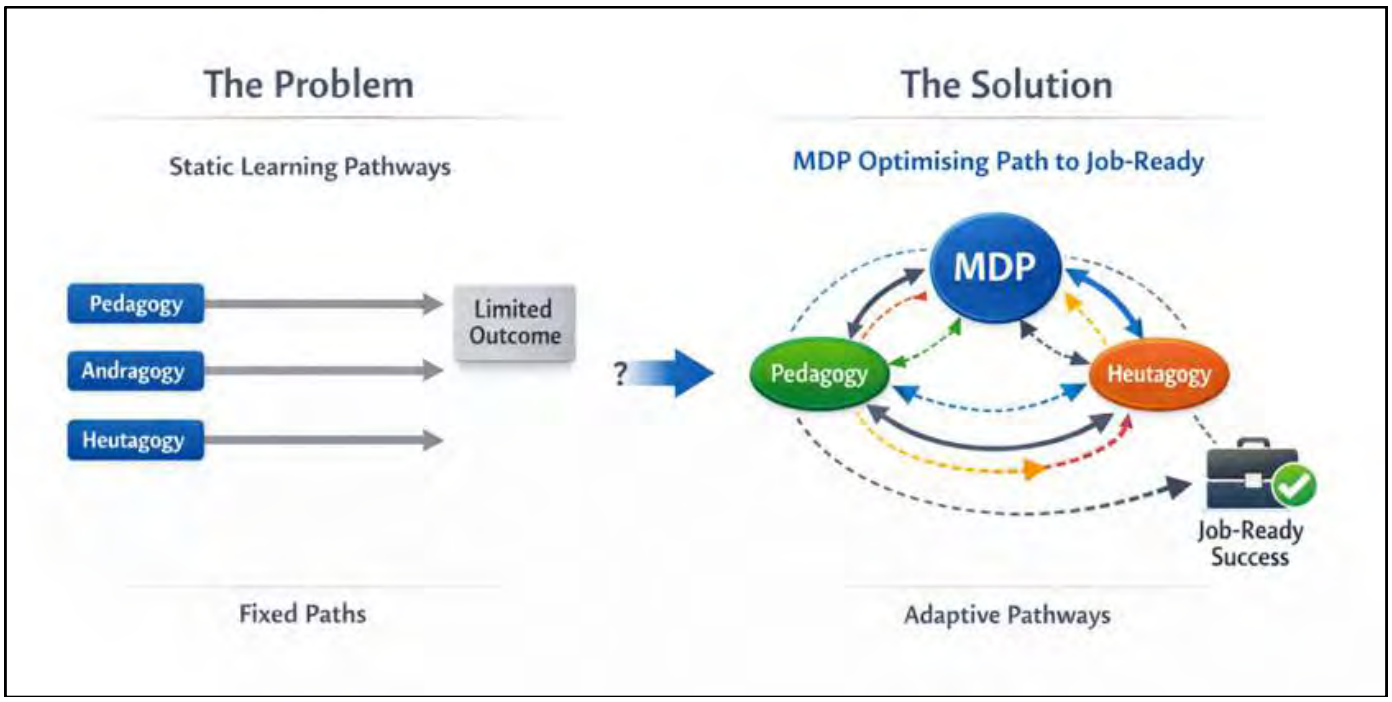

Figure 2. MDP as a solution to the limitations (generated by ChatGPT with guidance from the authors).

An MDP consists of states represented by stages in the learning paradigm, actions that represent learner choices or instructor interventions facilitating state transitions, transition probabilities which quantify the likelihood of moving from one state to another after taking a specific action, and the reward function which assigns a value (positive or negative) to each state or state-action pair. This element represents the value of achieving a state or performing an action. For instance, successfully transitioning to the "Job-Ready Graduate" state yields the highest reward. Dynamic programming is used to optimise the learning journey towards job readiness, where the cumulative rewards are maximised. In the context of this paper, the model is applied to a student's learning journey to optimise the pathway with the highest rewards. This is explained in more detail in the sections titled "Conceptual framework and model development" and "Learning states and transitions: A conceptual view".

Learning paradigms

Pedagogy is a teacher-centred approach, where the instructor transmits knowledge and students passively receive it. It's often associated with childhood education, where learners are seen as dependent on the teacher for guidance (Kumar Shah, 2021).

Andragogy focuses on adult learners who are self-directed and bring their own experiences to the learning process. The instructor acts as a facilitator, guiding the learning process and creating opportunities for discussion and application of knowledge (Halupa, 2015).

Heutagogy takes self-directed learning a step further. Learners become self-managed, identifying their learning needs, finding resources, and evaluating their progress independently. The instructor acts more as a mentor or coach, providing support and guidance as learners navigate their own learning journeys (Hase & Kenyon, 2013).

These paradigms form a progression of learner autonomy, which this study proposes to model computationally as a decision-making process. The interplay between these approaches can be seen as a continuum in a tertiary educational setting where pedagogy is often a starting point, especially for learners who lack background knowledge or skills to be fully self-directed. Andragogy becomes more prominent as learners gain experience and confidence (Knowles, 1980). Heutagogy represents the stage where learners take complete ownership of their learning process. However, it's important to note that this continuum isn't always linear. Effective education may use elements of all three approaches depending on the learning context and the needs of students. The pr-

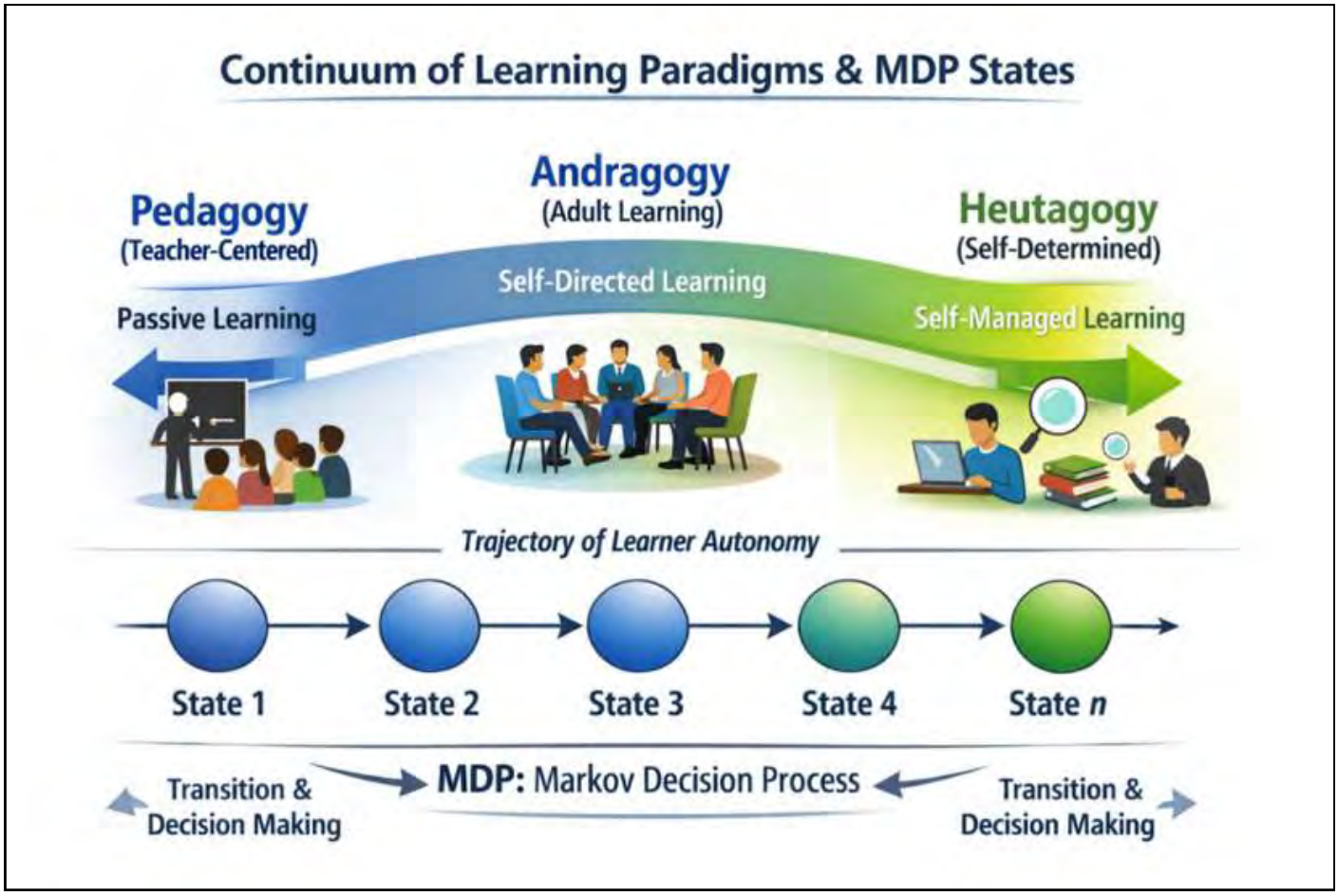

Figure 3. A conceptual representation of the continuum of learning paradigms and MDP states (generated by ChatGPT with guidance from the authors).

-ogression to heutagogy is important in the context of rapid advancements that would make pedagogical learning obsolete within a short time frame (Kaushal et al., 2022).

In this paper, we propose that it is possible to approach the decision problem about learning methodology with more mathematical sophistication by modelling discrete states of the continuum between pedagogy and heutagogy. We propose a model based on an MDP that can be optimised using Dynamic Programming.

Conceptual framework and model development

This section introduces a conceptual MDP framework as an illustrative and theoretical tool for how learners move through different modes of learning on their journey to being job-ready. The purpose of the framework is to support curriculum designers and educators to understand how different teaching approaches can be effective based on state transitions, learner autonomy and study conditions.

The model is developed using the Value Iteration algorithm to determine optimal policies for transitioning between learning states. The MDP framework was selected due to its suitability for modelling sequential decision making under uncertainty, conditions commonly found in educational environments where learners' choices evolve based on feedback and outcomes. Its formal structure also allows for integration with real-time analytics in digital learning systems.

Learning as a journey through a country

A student's learning progression can be understood through the analogy of guiding a student through the roads of a country toward a shared destination of the capital of the country, in this case, Job readiness.

Consider the three learning paradigms as their own districts: the Pedagogy district, the Andragogy district and the Heutagogy district. Pedagogical districts are structured, guided and well-signposted. Andragogical districts al-allow for choice, reflection and negotiated pathways, while heutagogical districts are open, exploratory and self-directed.

Each district will have neighbourhoods with streets and intersections. Some neighbourhoods are closer to the capital, and others are further away. Well-lit structured roads are like Pedagogical approaches, while andragogy roads encourage exploration. Heutagogy roads are self-directed backstreets and shortcuts. Traffic conditions represent uncertainty where not every road will lead to the capital, some routes may take longer, and some may require detours and additional support.

As a learner moves through each neighbourhood using various roads, their autonomy and circumstances can dictate how they navigate through the district across the different neighbourhoods via various roads that lead them to the capital. Some learners may start with a well-lit road, and as they gain confidence and skills in navigation, they may explore backstreets and shortcuts, while other learners may have the confidence and know-how of the shortcuts to get to the capital sooner than the others. While on route, learners could face uncertainty by choosing a route that took longer or road work resulting in detours.

Figure 4. Learner progression is shown through navigating to the capital of a country (generated by ChatGPT with guidance from the authors).

This dynamic navigation to the capital can be computed as probabilistic state transitions. Imagine guiding a learner through a country with multiple routes to the same destination: "Job Readiness". Each road (learning state) offers different experiences, time durations, and levels of difficulty. At each intersection (decision point), the learner chooses which way to go with some chance of success or failure. Our model helps identify the most efficient, rewarding path based on how learners typically travel, adjusting for their choices and progress.

Learning states and transitions: A conceptual view

An MDP is a mathematical model used to describe situations where an agent makes decisions in an uncertain environment. This is what the MDP captures: it simulates the learner's learning journey using mathematics to identify optimal steps, balancing structure, autonomy, and goal-orientation. In other words, the framework models learning as a sequence of states and decisions under uncertainty. The MDP framework enables us to estimate which sequence of decisions is likely to get the student to job readiness most efficiently. It consists of four key elements (Hull, 2021; Russel, 2016):

- **States** represent stages within pedagogical, andragogical, and heutagogical pathways. In the case of the example, the various neighbourhoods would be the states.
- **Actions** or the roads chosen represent movement between these states as a result of learner choices and instructor interventions.
- **Transition probabilities** quantify the likelihood of moving from one state to another after taking a specific action.
- **Reward function** assigns a value (positive or negative) to each state or state-action pair.

If the action leads to the destination more quickly, then a higher reward is assigned, while actions that lead away from the destination, such as risk or uncertainty, would yield a negative value. Successfully transitioning to the "Job-Ready Graduate" state yields the highest reward. The rewards here are not considered as performance metrics; they reflect educational desirability, such as the development of skills, increased learner autonomy, and professional practice readiness.

The model assumes that where the learner goes next depends on where their current state is and is not a function of their entire history. This ties in well with common educational practice, where educators and curriculum designers respond to learners based on their current state and not every previous action they may or may not have taken. Curriculum designers have a balancing act of structure vs. autonomy, feedback vs. application, and the value of exploration vs. disengagement. Educators must articulate the kind of learning experience that is most likely to support progress toward job readiness. This framework provides reasoning to systematically consider these questions rather than relying on a static state of a curriculum or intuition.

The optimal pathway taken by learners is interpreted as curriculum design signals, indicating the transitions that need to be made for the learner to be job-ready. It suggests that while a structured pedagogical approach is vital at the start of the learning journey, the curriculum should fade pedagogical structure and conditionally introduce andragogical and heutagogical elements to the curriculum. Such teaching practices shape the likelihood of moving from one state to another (transition probabilities) through assessment and learning design. Therefore, this conceptual model situates the learning paradigms on a continuum of increasing learner autonomy, mediated by curriculum design levers, and culminating in job readiness as an emergent outcome. The learning design choices are considered probabilistic transitions and rewards in the MDP process formalising education theory. It bridges teaching science and computational decision science.

Value Iteration as a planning metaphor

Value Iteration is an algorithm used in Markov Decision Processes (MDPs) to find the optimal policy (Russel, 2016). Value Iteration can be used to systematically assess the long-term rewards of each learning approach. Starting with an initial estimate of each learning state's value, the algorithm repeatedly updates its understanding of each state until convergence to a best strategy based on final state values. This is analogous to planning each step of a student's educational journey to determine the best strategy for job readiness.

While Value Iteration is a mathematical construct, it is best understood as a planning metaphor where it conceptually asks *which learning approach would consistently lead to outcomes that are of higher value over time?* For educators and curriculum designers, value iteration can be interpreted as an iterative curriculum refinement, starting with assumptions about which states are valuable, examining how different transitions influence long-term outcomes, and adjusting learning design to support the desirable transitions and outcomes, mirroring reflective teaching practice that is articulated in a formal conceptual structure.

The technical explanations are provided in the Appendix.

Assumptions and limitations

The model currently assumes:

- Learning pathways are independent of external disruptions such as illness, changes in personal motivation, or institutional constraints.
- Rewards and transition probabilities are static and do not vary over time, cohort, or individual learner profiles.

That learners behave rationally to maximise long-term rewards, and that all transition probabilities remain static over time. In practice, learner decisions may be influenced by emotional, social, or contextual factors not captured in this framework.

Representation of learning

Five high-level states corresponding to the pedagogical, andragogical, and heutagogical paths are first identified. While these learning paradigms were mentioned in the Introduction section, this section focuses on how their associated learning states are represented within the MDP.

Table 2. Comparative analysis of synchronous and asynchronous formats in doctoral writing groups.

Paradigm	Stage	Description
Pedagogy	No Knowledge and Skills	Learners depend on the teacher to deliver fundamental knowledge and guidance.
	Basic to Advanced Knowledge	Structured progression through curriculum content.
	Validation of Knowledge	Demonstration of learning via assessments.
Andragogy	Personalised Goals	Learners set personal goals through self-assessment.
	Skill Development	Independent study through projects, reading, and feedback loops.
	Growth Mindset	Learners adopt reflective practices and focus on continual improvement.
Heutagogy	Self-Directed Exploration	Learners initiate learning, challenge assumptions, and co-create knowledge.
	Meta-Cognitive Reflection	Focus on lifelong learning, adaptability, and knowledge transfer.
	Self-Actualisation	Learners achieve personal and professional transformation.

Pedagogical path

In the pedagogical pathway of a learning environment, states could represent different stages or levels of progress within the instructional process. Exemplar states in the pedagogical pathway:

1. No knowledge and skills: This is the initial stage where learners explore course objectives, curriculum, and basic concepts, starting with enrolment.
2. Basic Knowledge: Learners progress to this state after completing the introductory concepts and topics.
3. Intermediate Knowledge: Learners reach this state after mastering intermediate topics, delving into advanced concepts and applications within the field of study.
4. Advanced Knowledge: This state signifies advancement to more complex topics and theories, building upon the fundamentals learned in the previous module.
5. Validation of knowledge: This indicates successful completion of the course requirements and attainment of learning objectives, which covers assessments and feedback on performance.

For the agent to progress from one state to another, the choices they make are considered actions. Exemplar actions in the above pedagogical pathway can be listed as follows:

1. Introduction/enrolment to course.
2. Completing Introduction and Fundamentals.
3. Completing Module 2: Intermediate Topics.
4. Completing Module 3: Advanced Concepts.
5. Complete Assessment and Evaluation.

For the agent to progress from one state to another, the choices they make are considered actions. Exemplar actions in the above pedagogical pathway can be listed as follows:

Andragogical path

1. Personalised learning preference: Learners conduct a self-assessment and then set personalised learning goals based on their aspirations and professional development needs.
2. Enhanced skills through self-directed learning, literature review, and projects: Learners engage in self-directed study, immersing themselves in chosen topics and acquiring new skills through a combination of reading, practice exercises, and hands-on projects.
3. Awareness of progress and improvement areas: Learners regularly reflect on their learning experiences, assessing goals and identifying areas for improvement. They seek feedback to gain insights and refine their approach.
4. Mastered skills through self-directed projects: Learners apply acquired knowledge and skills to real-world challenges, integrating new learnings with existing expertise to deepen understanding.
5. Growth mindset: The final stage emphasises lifelong learning where learners cultivate a growth mindset and stay current on advancements in their field.

Exemplar actions in the above andragogical pathway can be listed as follows:

1. Self-Assessment and Goal Setting
2. Independent Study and Skill Development
3. Reflection and Feedback
4. Application and Integration
5. Continual Learning and Growth

Heutagogical path

1. New knowledge: Learners explore by posing questions, challenging assumptions, and seeking answers through independent inquiry.
2. Ownership of the learning process: Learners take ownership of their learning process by developing personalised learning plans, identifying interests, setting objectives, and strategies for acquiring and applying knowledge.

3. Co-create knowledge and enhance new knowledge: Learners participate in communities, engage with peers, mentors, and experts to share insights, and co-create knowledge collaboratively. They embrace experiential learning, experimenting with new concepts, technologies, and approaches in real-world contexts, embracing failure as an essential part of the learning process.

4. Meta-cognitive skills: Learners engage in reflection, evaluate their learning journey and strategies, and adjust their approach as needed. They develop meta-cognitive skills, becoming aware of their own thinking processes and learning habits.

5. Lifelong learners: The final stage represents the culmination of the heutagogical learning journey, where learners achieve self-actualisation and personal transformation. They emerge as lifelong learners, capable of navigating complex challenges, pursuing passions, and contributing to society.

Exemplar actions in the above heutagogical pathway can be listed as follows:

1. Curiosity and Inquiry
2. Autonomous Learning Planning
3. Collaboration and Experimentation
4. Reflective Practice and Meta-Cognition
5. Self-Actualisation and Transformation

Job-ready graduate

The final state across all pathways is the "Job-Ready Graduate." This represents a learner who has not only acquired the necessary content knowledge and skills but also exhibits lifelong learning capacity, adaptability, and professional readiness.

A job-ready graduate is considered to possess the subject matter knowledge and technical and soft skills needed to effectively enter and perform in the workforce. Additionally, such graduates need an attitude of continuous learning to thrive in the workforce and facilitate growth in their careers.

Students incorporate various learning practices to be job-ready, navigating combinations of different learning practices. The proposed model, based on a Markov Decision Process (MDP), will present the optimal pathway across Pedagogical, Andragogical, and Heutagogical high-level states for a learner to achieve their policy of being job-ready.

The five high-level states for each teaching and learning practice led to the long-term goal of being job-ready. We established that learning may not be linear and could contain transitioning pathways that lead to the end goal. These pathways can be mapped with informed estimates of success probabilities and rewards.

Each of these states is treated as a node in the MDP graph. Actions taken by the learner (or instructor) serve as transitions between nodes. Transition probabilities and rewards are attached based on expected learner progression, motivation, and instructional impact. This allows for comparative analysis of learning trajectories through each paradigm.

Simulation of the conceptual framework

This section simulates the contextual framework discussed thus far. While the estimates for the probabilities and rewards provide a proof-of-concept foundation, we acknowledge that they are not drawn from a formal empirical dataset. The primary aim here is to demonstrate the feasibility and utility of applying MDPs to model learning journeys. Future work will focus on calibrating the model using anonymised academic performance records, LMS engagement logs, and survey-based learner self-assessments to strengthen empirical validity. The total rewards from one learning practice to another are the cumulative rewards of all the states in that learning practice. Pedagogical pathways may take longer and yield fewer rewards compared to andragogical and heutagogical approaches to achieve a job-ready state. Higher rewards were assigned to heutagogical states to reflect their alignment with long-term employability skills such as adaptability, metacognition, and lifelong learning, all valued outcomes in modern workforce environments.

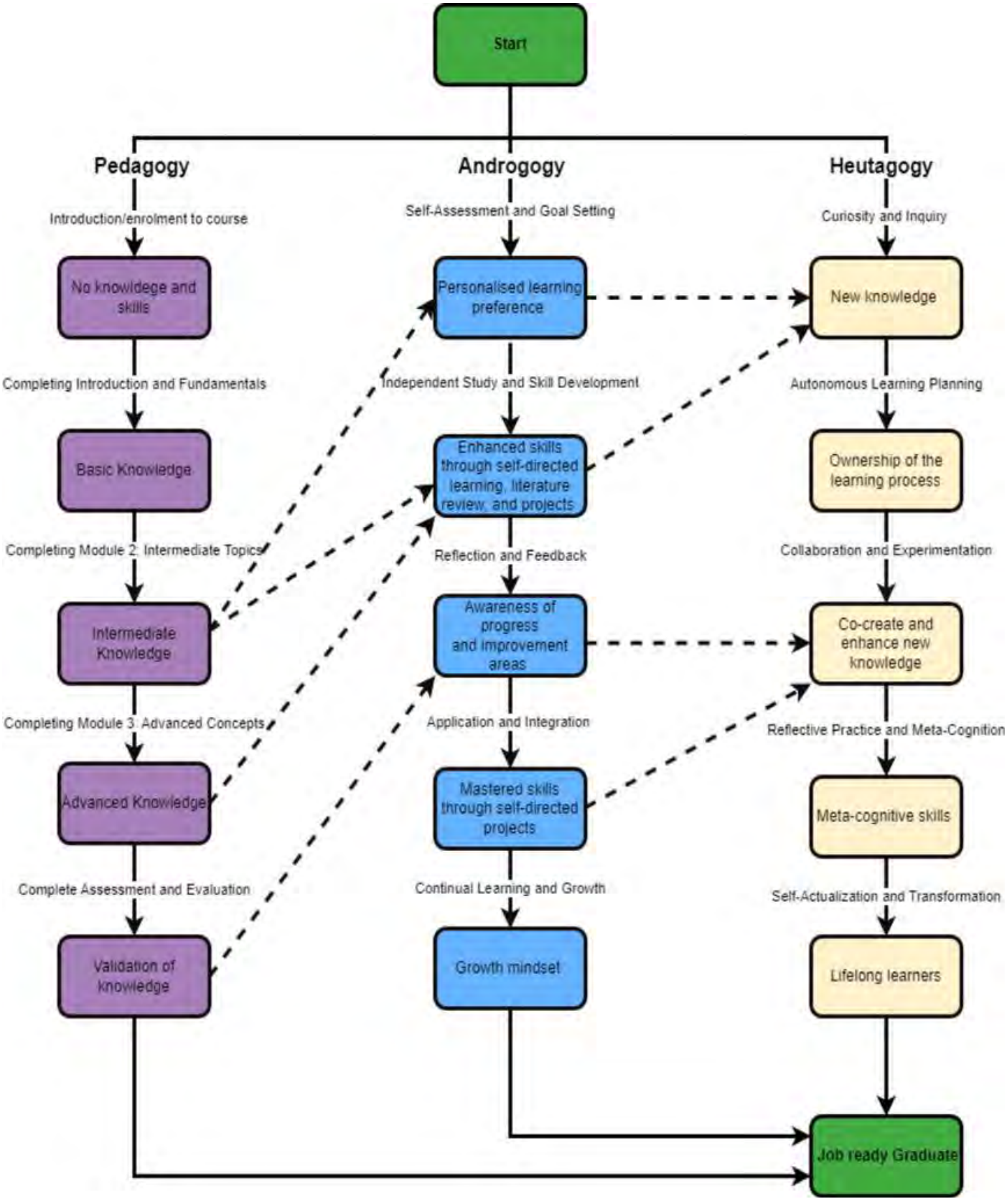

Figure 5. Learning pathways map representing states, actions, and transitions toward achieving job readiness.

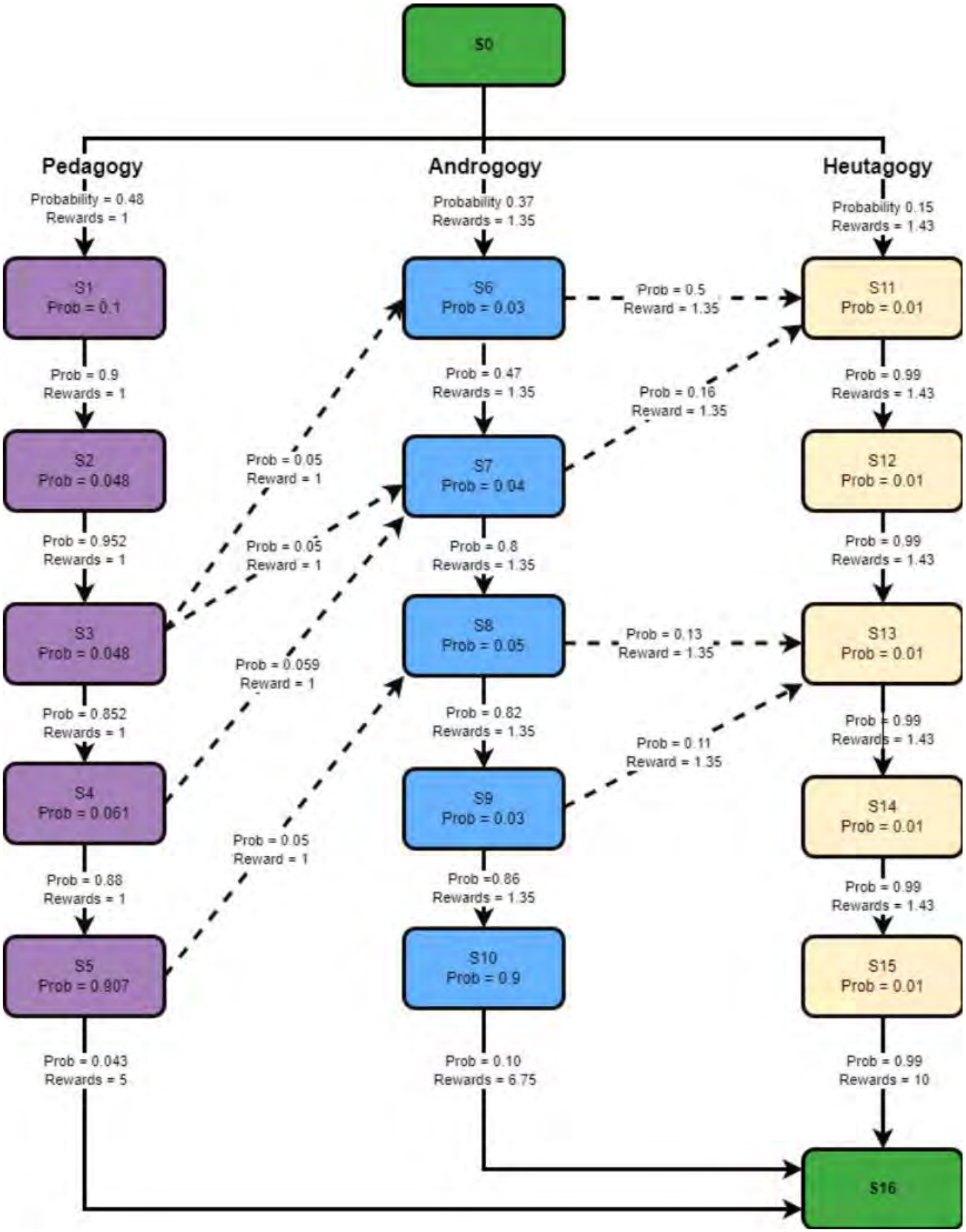

Figure 6. Learning pathways are mapped with associated probabilities and rewards for each transition, informed by an overarching view as given in the Selected Higher Education Statistics 2023 and the authors' tenure in the academic industry.

This transition information was represented as an adjacency matrix with the following columns:

The adjacency matrix includes the following columns:

1. **Current State:** Represents the current state in the MDP.
2. **Current State Title:** Describes the current state.
3. **Next State:** Represents the next possible state.
4. **Next State Title:** Describes the next state.
5. **Probability:** The probability of transitioning from the current state to the next state.
6. **Reward:** The reward for transitioning from the current state to the next state.

The states are listed in the following table.

Table 2. Table of all states sequentially leading to being job-ready.

State	Current State Title
S0	Start
S1	No knowledge and skills
S2	Basic Knowledge
S3	Intermediate Knowledge
S4	Advanced Knowledge
S5	Validation of knowledge
S6	Personalised learning preference
S7	Enhanced skills through self-directed learning, literature review, and projects
S8	Awareness of progress and improvement areas
S9	Mastered skills through self-directed projects
S10	Growth mindset
S11	New knowledge
S12	Ownership of the learning process
S13	Co-create and enhance new knowledge
S14	Meta-cognitive skills
S15	Lifelong learners
S16	Job-ready Graduate

Results of the simulation

The Value Iteration algorithm yielded insights into the optimal pathways for student learning.

Optimal pathway identification

The policy derived from the Value Iteration algorithm highlighted the following:

- **Pedagogical Pathway:** A longer path with moderate cumulative rewards. This pathway benefits learners who need structured instruction and guidance.
- **Andragogical Pathway:** A medium-length pathway offering greater rewards due to self-directed efforts and practical application of skills.
- **Heutagogical Pathway:** The shortest path to the "Job-Ready Graduate" state, characterised by high rewards for learners who exhibit strong autonomy and reflective practices.
- The optimal policy often favours non-linear transitions (e.g., from early andragogical to late heutagogical states) because these pathways yield higher long-term rewards. This reflects the fluidity of adult learning, where experience and self-efficacy can accelerate progression beyond rigid sequences.

Transition probabilities and rewards

- A matrix of transition probabilities and rewards revealed that heutagogical states (e.g., "Meta-Cognitive Skills") offer higher rewards and smoother transitions to advanced states.
- Pedagogical states (e.g., "Basic Knowledge") required more transitions, with lower rewards per action.

Cumulative value function

- The cumulative value function indicated the superiority of the heutagogical pathway in maximising long-term rewards.
- A graph of state values showed a steeper growth curve for self-directed learning approaches compared to instructor-led methodologies.

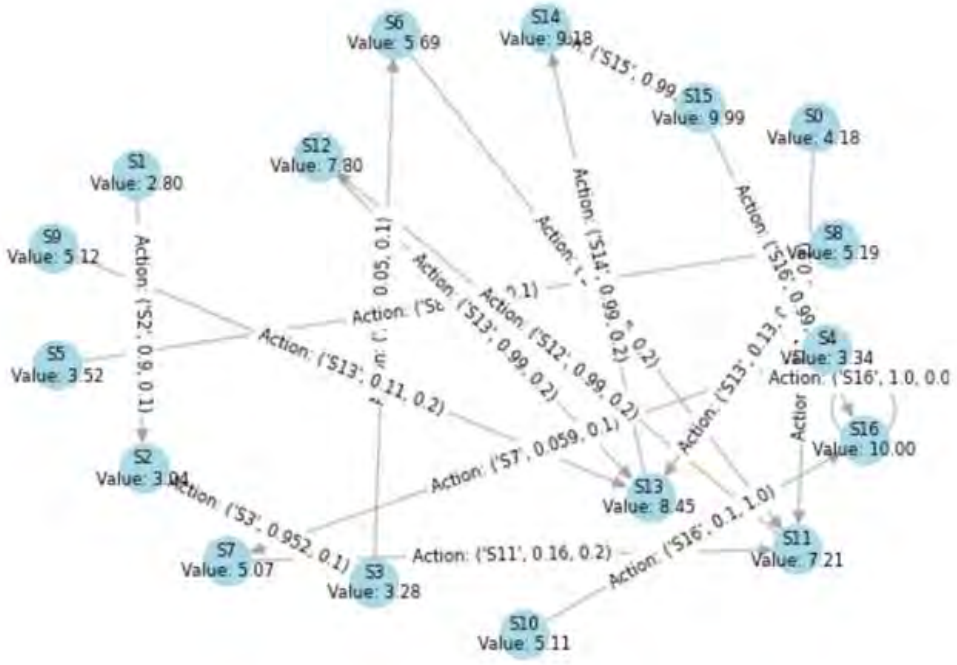

Figure 7. Optimal Policy Map - Highlighting recommended actions for each state.

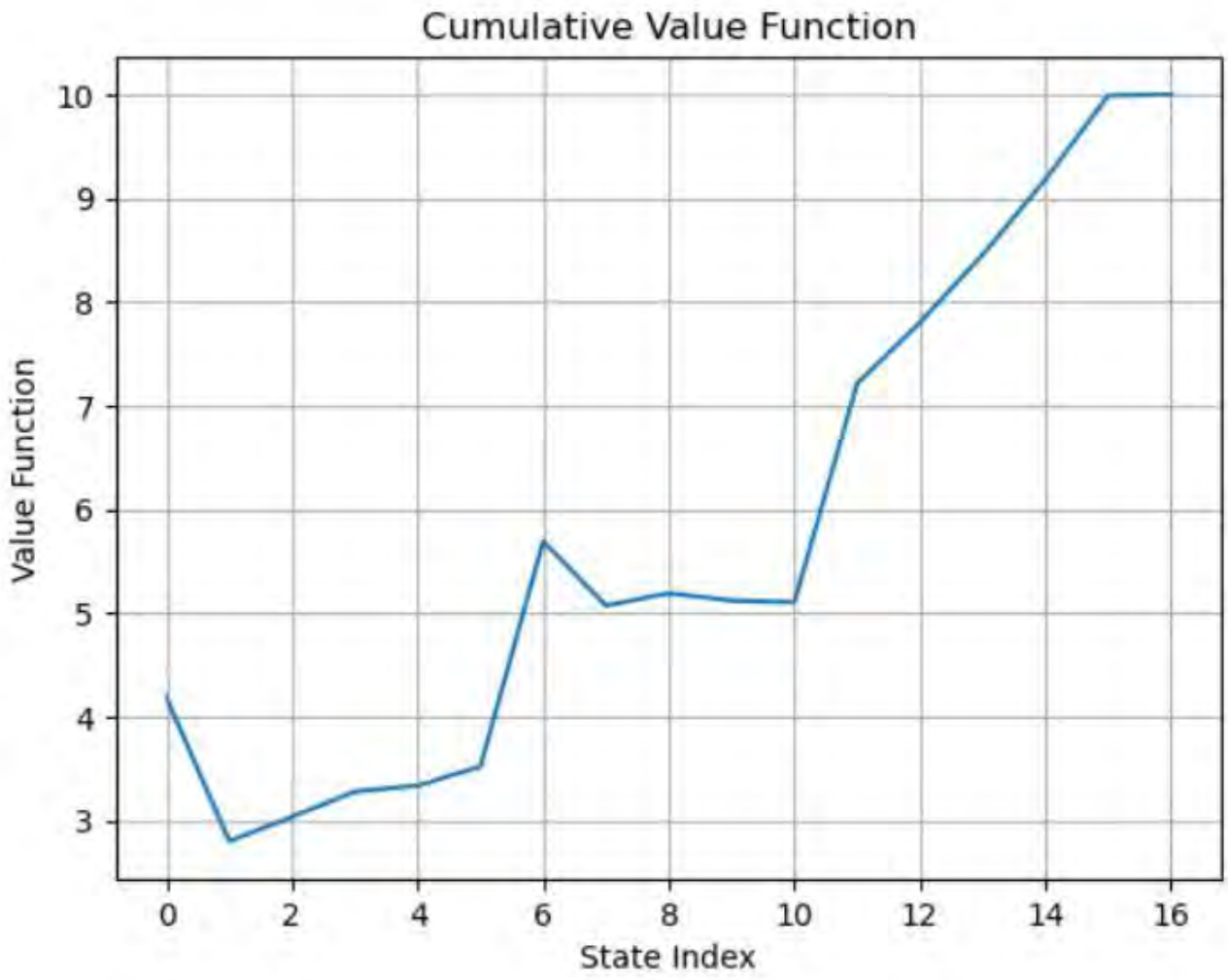

Figure 8. Cumulative value function depicting the rewards of each pathway.

Validation and sensitivity analysis

The robustness of the results was confirmed through sensitivity analysis. Variations in rewards and probabilities had minimal impact on the relative efficiency of pathways, reinforcing the reliability of the findings.

Implications for education

The findings suggest that educational institutions should incorporate elements of self-directed and experiential learning into their curricula to better prepare students for real-world challenges.

In practice, the proposed model can serve as a decision-support tool for curriculum designers, learning technologists, or academic advisors. It can be integrated into Learning Management Systems (LMS) to suggest tailored learning pathways for students based on prior engagement or assessment performance. Consider the following example where students enter a postgraduate subject in Marketing and Social Media Analytics. The students come from diverse backgrounds. Some of the students have a solid understanding of the technical capability needed for this subject, and others have a strategic understanding due to their industry knowledge. The subject consists of technical applications of social media and marketing analytics while also evaluating the strategic implications of social media and marketing on the organisation, amalgamating the technical knowledge with the strategic foresight. For instance, if the subject contains assessments such as quizzes, case study analysis, predictive analytics, and a capstone project, students may do well in combinations of these assessments based on their engagement, autonomy and learning styles. Those who are strategic and grounded

in industry knowledge may achieve better grades for the case study analysis and the capstone project, while having room for improvement in technical quizzes and predictive analytics assessments, while tech-savvy students may achieve an inverse outcome. The LMS system could suggest learning activities based on the results of the students. Perhaps the students who need to improve in the technical aspect of the subject may get tailored activities that concentrate on data cleaning, analysis and model creation, while those who need support in strategy may be exposed to more case study analysis and alignment with business goals and decision making (Rudolph et al., 2023).

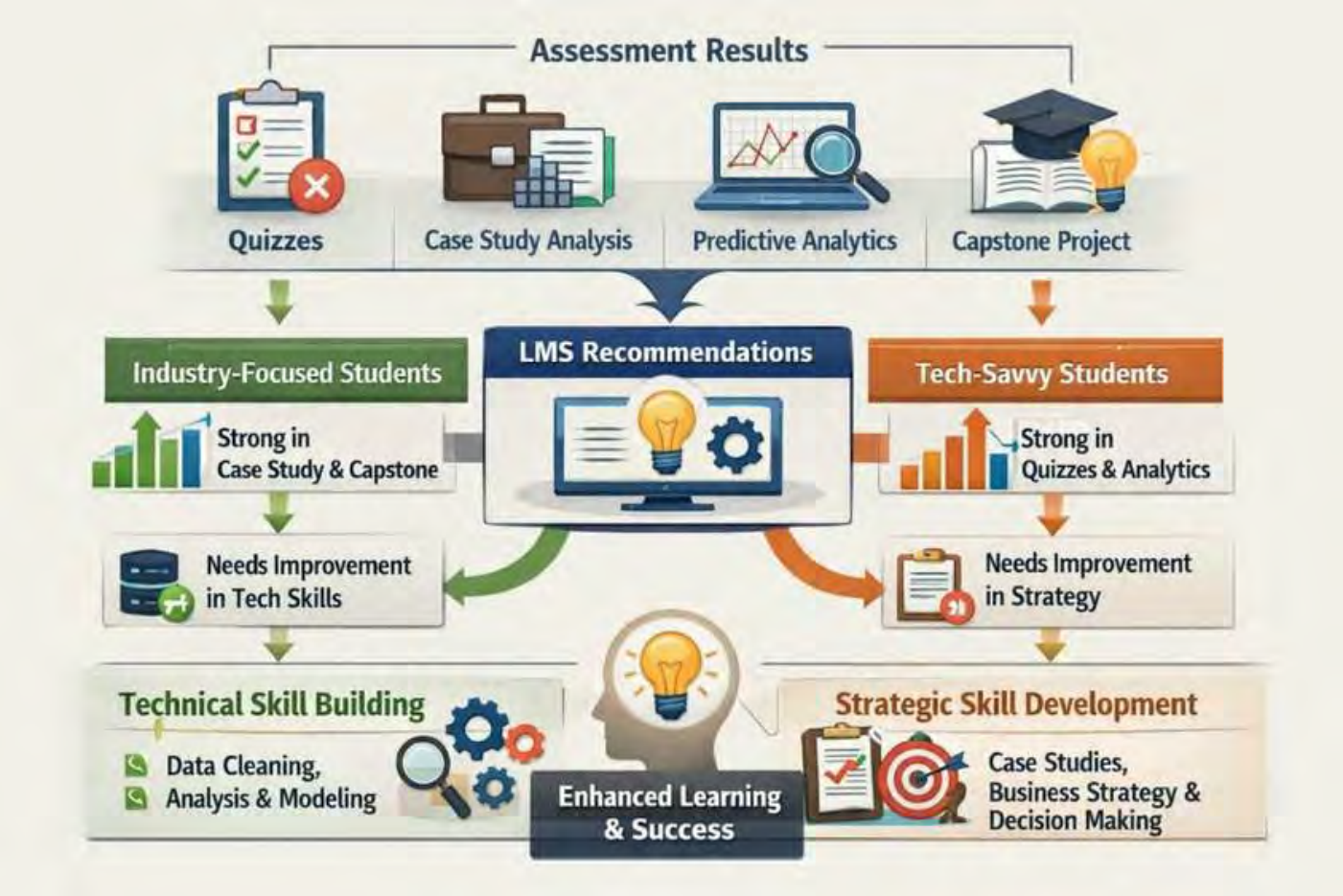

Figure 9. An example of using the conceptual framework in LMS integration (generated by ChatGPT with guidance from the authors).

Educators could use the model to forecast student progression across learning paradigms and proactively design interventions that accelerate self-directed learning. Learners who display self-directed learning have a higher probability of moving quickly through the learning journey to achieve job readiness, while those who require structured support may need scaffolding that leads to self-directed learning and then job readiness. Currently, analytics in student progression is shown after performance declines, where the optimal next step would need to be deliberated over a period. The delays incurred while deliberating can be a disadvantage to student progression. In addressing this situation, this conceptual framework not only optimises the learning pathway but can also predict the next step in the learner journey. It reduces reaction time and pre-empts a personalised action plan for the learner to reach job readiness fast. It is imperative to mention that it does not replace academic judgement; it augments it by providing the optimal pathways and next steps to achieve job readiness.

Additionally, institutions may use this model to audit existing courses and programs, evaluating whether they disproportionately favour pedagogical approaches or facilitate transitions toward heutagogy. The model's output can inform course redesign efforts that emphasise autonomy, metacognitive skills, and reflective practice. For instance, for courses going through a reaccreditation process, the framework can be used to evaluate the extent of traditional teaching methods vs meaningful progression towards learner autonomy.

The model can be used to analyse the assessments, subject outlines, content for each subject in the course as well as factors external to the course, such as student feedback, academic and facilitator feedback, and employer data. An audit with the use of this framework could reveal an over-reliance on pedagogical or traditional methods with a limited exposure to self-directed learning and autonomy, thereby signalling a scaffolded change in the course to employ meaningful ways of integrating metacognition, autonomy, and practice in lifelong learning. Recommendations could include redefining capstone subjects and projects to involve real-world problems defined by the student, progressively increasing student choice in case study and data analysis and embedding more reflective checkpoints to improve self-directed learning. As mentioned above, rather than replacing academic decision making and judgment, the framework provides structured recommendations to assist scaled decision making in the education institution.

Figure 10. An example of using the conceptual framework in a course audit or reaccreditation (generated by ChatGPT with guidance from the authors).

Figure 11. MDP Learning Optimisation Framework (generated by ChatGPT with guidance from the authors).

Application of the model in an education setting

The model is generally feasible across a range of educational contexts, but its successful application depends on several contextual factors. These include the learners' level of maturity and readiness for self-directed learning, the complexity and structure of the subject matter, the institutional culture and assessment requirements, and the availability of supportive learning technologies and resources. In practice, the model is often implemented as a continuum, with more pedagogical approaches used in foundational learning and more self-directed approaches applied as learners gain experience and autonomy. Its success is therefore facilitated by careful instructional design, appropriate scaffolding, and organisational support that enables flexible, learner-centred learning environments.

The following procedure was used when applying the proposed model:

1. **Define the states** that represent stages within the learning paradigm based on discrete learner knowledge. The states should represent the progression in the domain.
2. **Define the actions** that represent movement between the established states due to learner decisions and instructor interventions.
3. **Estimate the transition probabilities** by using expert judgement or empirical data to quantify the likelihood of moving from one state to another after taking a specific action.
4. **Define a reward structure** that assigns a value (positive or negative) to each state or state-action pair. If the action leads to the destination more quickly, then a higher reward is assigned, while actions that lead away from the destination, such as risk or uncertainty, would yield a negative value.
5. **Construct the MDP** by inputting the states, actions, probabilities and reward function into the framework.
6. **Apply dynamic programming** by using optimisation techniques such as value iteration to determine the optimal policy.
7. **Evaluate and refine the results** to validate against the learning outcomes and adjust the model where necessary.

The MDP framework offers a scalable method to evaluate and refine learning strategies across diverse contexts. It is possible to increase the modelling sophistication of MDPs. Partially Observable MDPs (POMDPs), Hierarchical MDPs, and Factored MDPs are examples of extensions that may be useful.

Conceptual reflection

AI modelling helps understand learner self-direction not just by improving pathways, but by grounding the idea of "being self-directed". When concepts like autonomy or agency are translated into modelled choices, constraints, and feedback, there is clarity about what is meant by them.

Limitations and future work

Future research should refine transition probabilities with real-world dynamic data, drawing from academic performance records, online learning analytics, and workplace competency assessments (Kolodner et al., 2003), drawing from academic performance records, online learning analytics, and workplace competency assessments. Challenges in data collection include ensuring privacy, managing data variability across institutions, and addressing biases in self-reported learning outcomes.

Additionally, the assumption of rational learner behaviour does not account for bounded rationality, cognitive biases, or situational constraints. Exploring agent-based simulations or reinforcement learning frameworks with heterogeneous agent profiles could address these nuances.

The current simulation uses illustrative data informed by expert judgment rather than large-scale empirical datasets. This limitation restricts the model's predictive reliability for specific institutional settings. Future research should involve collaboration with universities or online learning platforms to access de-identified learni-

l-ng analytics, allowing for data-driven tuning of transition probabilities and reward structures. This will improve model generalisability and enhance its potential as a decision-support tool for curriculum designers.

The current model does not account for regressions or skipped stages. In reality, learners may oscillate between states or bypass traditional sequences. A future extension could incorporate stochastic backtracking or multi-path transitions to better reflect such non-linear behaviour.

Implementation of this model in institutional settings may be constrained by ethical considerations, including data privacy, learner autonomy, and algorithmic transparency. Consent protocols and bias mitigation strategies would be required for real-world deployment, particularly when integrating with LMS or advising systems.

Summary and conclusions

This study demonstrated that heutagogical approaches provide the most efficient pathway to achieving job readiness, with significant cumulative rewards and shorter transition times. In comparison, pedagogical and andragogical pathways offer structured and moderately self-directed options, respectively, but with longer trajectories. This signals that learner autonomy is state dependent and a probabilistic capability rather than a fixed trait. Therefore, learner autonomy can be influenced by curriculum design where the increased presence of heutagogical elements in the curriculum will inevitably bring the learner closer and sooner to a state of being job-ready.

These findings suggest a need for strategic integration of self-directed learning frameworks into curriculum design. Educators and programme leaders should consider scaffolding learners' progression through these paradigms, gradually building autonomy and reflection capacity through intentionally designed interventions.

Heutagogical pathways encourage autonomy and meta-cognitive skill development, which align with modern workforce demands. Pedagogical and andragogical methods remain essential for learners at different starting points or those requiring varied levels of guidance. These findings align with Knowles' adult learning theory, which posits that greater autonomy and self-direction result in more effective and sustainable learning outcomes. The model confirms that heutagogical learners reach job-readiness faster, consistent with experiential and constructivist learning principles.

In order to translate these findings into practice, institutions could begin by identifying courses where learners typically transition toward higher autonomy (e.g., capstone projects, internships). The MDP model can then be piloted in these settings to recommend next-step learning activities and track progress toward job-readiness.

Recommendations

To maximise learning outcomes, curricula should adopt a phased approach that transitions learners from pedagogy to heutagogy. By fostering a growth mindset and autonomy early, institutions can better equip students for lifelong learning and professional success.

In future phases, this modelling framework can be integrated into Learning Management Systems (LMS) to provide real-time, data-informed guidance to students and feedback loops to instructors. By aligning instructional design with optimal learning pathways, the model holds potential to enhance both learner agency and institutional effectiveness in preparing job-ready graduates.

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Generative AI tools were used to assist in generating conceptual diagrams and subsequently edited and verified by the authors.

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Appendix

Markov Decision Process

An MDP is a mathematical model used to describe situations where an agent makes decisions in an uncertain environment. In our context, the "agent" is the student. The "states" represent stages in their learning journey (e.g., beginner, skilled, job-ready), and the "actions" refer to decisions such as taking a course module, self-studying, or seeking feedback. The MDP framework enables us to estimate, based on historical data or expert input, which sequence of decisions is likely to get the student to job readiness most efficiently. It consists of four key elements (Hull, 2021; Russell, 2016),

The agent's goal is to learn a **policy**, which dictates the best action to take in each state to maximise the long-term reward.

More precisely, an MDP is a discrete time control process characterised by a set of states; in each state, there are several actions from which the decision maker must choose. For a state s and an action a, a state transition function Pa(s,s') determines the transition probabilities to the next state. There is a cost associated with each action. The states of an MDP possess the Markov property implying that if the current state of the MDP at time t is known, transitions to a new state at time t1 are independent of all previous states.

The solution to an MDP can be expressed as a policy p, which gives the action to take for a given state, regardless of prior history.

It is our goal to represent the learning process as a shortest-path problem where the deterministic problem is defined as:

Assuming a discrete finite-state system, the deterministic shortest path (DSP) problem consists of finding the path formed by a minimum-cost sequence of successor states starting at the initial state i and terminating at a special cost-free goal state G. The system can be represented on a directed graph consisting of nodes 1, 2, . . ., N, where node G is a goal state, and non-negative costs are assigned to each edge. At each node s, s' is a successor node such that (s, s') is an edge, which is selected.

The Stochastic Shortest Path (SSP) problem generalises the DSP problem by introducing transition probabilities with the goal of choosing an optimal action at each state to minimise cost in reaching the goal state.

Value Iteration

Value Iteration is an algorithm used in Markov Decision Processes (MDPs) to find the optimal policy (Russel, 2016). It can be used to systematically assess the long-term rewards of each learning approach. Starting with an initial estimate of each learning state's value, the algorithm repeatedly updates its understanding of each state until convergence to a best strategy based on final state values. This is analogous to planning each step of a student's educational journey to determine the best strategy for job readiness and is accomplished by solving the Bellman equation:

Vk+1(s) = max_a ∑_{s'} P(s'|s,a)[R(s,a,s') + γVk(s')] where,

Vk+1(s): Value of state s at iteration k+1.

a: Action.
P(s′ | s,a): Probability of transitioning to state s′ from state s by taking action a.
R(s,a,s′): Reward received after transitioning from state s to s′ via action a.
γ: Discount factor (between 0 and 1).

The process of Value Iteration involves:

1. Initialisation: Start with an arbitrary value function V_0(s) for all states.
2. Iteration: Update the value function using the key equation until convergence.
3. Policy Extraction: Derive the optimal policy from the converged value function.

Implementation and simulation

1. Dynamic Programming Approach:

- Value Iteration was implemented to compute the optimal policy.
- The Bellman equation was iteratively solved until convergence.
- The adjacency matrix of state transitions and rewards was directly integrated into the algorithm.
- The algorithm was iterated until the maximum change in state values between successive iterations fell below a convergence threshold (ε = 0.001), ensuring stability of the derived policy.

2. Data Modelling:

- The transition probabilities and rewards were based on an analysis of academic performance data.
- It is important to note that all probabilities and rewards in this model are illustrative, derived from expert judgement and observed learner behaviours rather than empirical datasets. These estimates were intended to demonstrate the conceptual feasibility of the MDP framework, with future versions designed for calibration using institutional learning analytics.
- Probabilities were adjusted to reflect the observed tendencies of learners in progressing through states.

3. Simulation Setup:

- Python libraries such as NumPy were employed for matrix computations.
- The state space was implemented as a directed graph, with nodes representing learner states and edges encoding possible transitions. An adjacency matrix captured these transitions and associated rewards, allowing efficient computation of value functions and policy updates.
- States were encoded as nodes in a directed graph, with edges representing feasible transitions.

4. Pathway Analysis:

- Pathways through pedagogical, andragogical, and heutagogical states were compared based on time to job readiness and cumulative rewards.
- Metrics included the number of transitions and the rewards accumulated in the process of achieving the "Job-Ready Graduate" state.

Transitioning probabilities and rewards

Each action taken to achieve a defined state has an associated probability and reward value. For this initial model, reward and transition probability values were estimated based on aggregate trends observed in university-level progression data, combined with domain expertise from instructors and programme designers. While not empirically derived, these values reflect typical learner behaviours and were calibrated to distinguish between structured, self-directed, and autonomous learning patterns. These values were normalised so that cumulative transition probabilities from each state sum to 1, and reward values reflect the perceived learning impact of each action.

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AI literacy in an uncertain world

Sam Choon Yin[A] [A]*Kaplan Higher Education Academy, Singapore*

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Correspondence

choonyin.sam@kaplan.com

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Abstract

As Artificial Intelligence (AI) continues to reshape industries, education, and daily life, the ability to critically engage with AI has become essential. In an increasingly unpredictable and AI-saturated world, AI literacy has emerged as a cornerstone for effective learning, ethical reasoning, and professional adaptability. This paper conceptually examines the necessity of AI literacy in education through a theoretical and narrative approach, drawing on contemporary literature and reflective analysis. The paper urges educators and institutions to embed AI literacy across curricula through interdisciplinary design and ethical awareness. Recommendations for future research include empirical testing of AI literacy frameworks, development of reliable assessment tools, and cross-cultural analyses of AI literacy education. Ultimately, the paper underscores the enduring role of human wisdom and critical reflection in ensuring that AI serves as a catalyst for learning and professional growth rather than a replacement for human judgment.

Introduction

In the ever-evolving landscape of education, technology has consistently played a pivotal role in shaping teaching methodologies and learning experiences. Among these innovations, Artificial Intelligence (AI) stands out as a transformative force that is redefining how knowledge is created, accessed, and personalised. Broadly speaking, AI refers to the ability of machines to perform tasks that typically require human intelligence such as reasoning, learning, perception, and problem-solving (Marr, 2020). Its applications now permeate everyday life, from virtual assistants and recommendation systems to autonomous vehicles and medical diagnostics. In education, AI-driven systems are being used to provide adaptive learning, automate assessment, and generate data-driven insights that support teachers in identifying students' learning needs (Luckin et al., 2016; Shah, 2023; Southworth et al., 2023; Khan, 2024).

As AI becomes an integral part of educational practice, the question is no longer whether to use it but how to do so effectively and ethically. This calls for more than functional use of AI tools; it requires AI literacy, the ability to think critically about, evaluate, and apply these technologies responsibly (Long & Magerko, 2020; Pinski & Benlian, 2024; Yang et al., 2025).

The role of AI in learning also invites reflection on how human cognition and educational objectives evolve in response to intelligent technologies. Here, Bloom's Taxonomy (Bloom, 1984) offers a valuable lens. Originally designed to classify educational goals into hierarchical levels of thinking, from remembering and understanding to creating, Bloom's framework remains a cornerstone in curriculum design and assessment. When re-examined in the age of AI, the taxonomy provides a structured way to align AI tools with specific cognitive outcomes. For instance, AI can assist lower-order processes such as remembering and understanding through summarisation and retrieval tools, while also supporting higher-order thinking by enabling analysis, evaluation, and creation through interactive simulations or generative models.

Recent scholarship has begun to merge these two domains, proposing frameworks that extend Bloom's taxonomy into the AI era. For example, Mohammad Hmoud and Shaqour (2024) conceptualise how AI can support each cognitive level from factual recall aided by intelligent tutoring systems to creative synthesis facilitated by generative AI. Similarly, Lubbe, Marais, and Kruger (2025) discuss how AI, Bloom's Taxonomy, and critical thinking interrelate in assessment pedagogy. Jain and Samuel (2025) argue that generative AI introduces co-creation as a new cognitive layer within Bloom's hierarchy, while Clark (2025) provides practical guidance for educators seeking to adapt Bloom's model to AI-driven classrooms. These frameworks collectively suggest that effective AI integration depends on aligning technological capabilities with pedagogical intent.

Understanding AI literacy is crucial for educators and institutions seeking to integrate AI meaningfully into teaching and learning. By mapping AI tools to cognitive objectives, educators can design experiences that empower students to think critically, act ethically, and use technology as a catalyst for intellectual growth. Against this backdrop, the present paper explores the capabilities and limitations of AI, the necessity of developing AI literacy, and the implications of AI for teaching and learning.

What is AI literacy?

AI literacy is a multifaceted and evolving concept that encompasses technical, cognitive, ethical, and sociocultural dimensions. Its multidimensional nature reflects the diverse ways individuals engage with AI from understanding its underlying mechanisms to applying it responsibly and critically in daily life and professional settings. As such, AI literacy cannot be reduced to mere technological know-how; it integrates understanding, use, evaluation, and ethical reflection (Long & Magerko, 2020; Yang et al., 2025).

While AI literacy shares some characteristics with digital literacy, the two are distinct in scope and depth. Digital literacy focuses primarily on the ability to access, evaluate, and create digital content using information and communication technologies (Ng, 2012; UNESCO, 2018). It equips individuals to operate effectively in online environments, emphasising functional and communicative competence. AI literacy, on the other hand, extends beyond digital fluency to include understanding how intelligent systems work, how they make decisions, and ho-

-w they can perpetuate bias or ethical concerns. In other words, digital literacy helps individuals use digital tools effectively, whereas AI literacy enables them to understand and critically reason with intelligent technologies (Long & Magerko, 2020; Zhou & Schofield, 2024).

This distinction highlights AI literacy as an evolutionary progression of digital literacy, reflecting the growing autonomy and complexity of modern technologies. While both literacies share a commitment to critical thinking, ethical responsibility, and lifelong learning, AI literacy adds a crucial layer of cognitive and ethical discernment, empowering individuals not only to use technology, but to question, evaluate, and co-create responsibly with it (Gilster, 1997; Ng, 2012; Long & Magerko, 2020).

Beyond digital literacy, AI literacy can also be differentiated from related constructs such as AI competence, AI proficiency, and AI familiarity that refine our understanding of how humans engage with intelligent technologies. Specifically:

- AI familiarity refers to basic awareness of AI and its everyday presence, for instance, recognising that recommender systems or chatbots are powered by AI. It reflects surface-level exposure rather than skill.

- AI proficiency implies the ability to use AI tools effectively to achieve specific tasks, often within defined contexts such as writing, data analysis, or customer support.

- AI competence goes further, denoting applied and contextual mastery; the capability to select, adapt, and integrate AI solutions while understanding their implications. It combines procedural skill with decision-making.

AI literacy encompasses all the above and extends them by incorporating critical awareness, ethical reasoning, and sociocultural understanding. An AI-literate person not only knows how to use AI, but also understands why and when to use it, questions its biases and limitations, and reflects on its impact on society.

In this regard, it is useful to conceptualise AI literacy using Long and Magerko's (2020) foundational framework, which remains one of the most cited and comprehensive models. They define AI literacy as a set of competencies enabling individuals to evaluate AI systems critically, interact with them meaningfully, and use them as tools in varied settings. This framework highlights three central domains:

- Conceptual understanding: grasping how AI works (e.g., algorithms, data, learning).

- Practical application: being able to interact with and use AI tools productively.

- Critical and ethical reflection: recognising AI's limitations, biases, and societal consequences.

This tripartite model has since been expanded by researchers such as Kong et al. (2021), who identify cognitive, affective, and sociocultural dimensions, and Zhou and Schofield (2024), who propose four domains: Know and understand AI, Use and apply AI, Evaluate and create with AI, and AI ethics. These extensions align closely with the present paper's focus on integrating cognitive, ethical, and educational perspectives.

A number of instruments and benchmarks have been developed to assess AI literacy, reflecting growing global attention to this field. For example, Hornberger, Bewersdorff and Nerdel (2023) created the AI Literacy Test to measure university students' conceptual and applied understanding of AI. Du et al. (2024) developed a teacher-oriented assessment to evaluate educators' AI literacy, encompassing both cognitive and affective dimensions. In the corporate domain, the AI Readiness Index (OECD, 2023) gauges nations' and institutions' preparedness for AI adoption. While these instruments differ in focus, they collectively underscore that AI literacy involves not only knowledge of AI systems but also the ability to engage critically and ethically with a broad range of AI tools.

The interpretation and emphasis of AI literacy vary across educational levels and cultural contexts. In higher education, AI literacy is increasingly recognised as an essential digital-age competency, comparable to information or media literacy (Snow, 2025). At the same time, some scholars, such as Corbin et al. (2025), charac-

-terise the assessment of generative AI use as a "wicked problem" due to its complexity and evolving ethical implications. In school settings, generative AI has been described both as a valuable tool that supports inquiry-based learning and creative exploration (Hollands & Breazeal, 2024) and as a potential source of educational fraud, where students might complete qualifications with limited genuine understanding (Corbin et al., 2025). Cross-cultural studies reveal nuanced differences in how AI literacy is conceptualised and applied. For example, research across Asian contexts such as China, Singapore, and South Korea highlights an emphasis on collective responsibility and ethical harmony in AI use, whereas Western frameworks often prioritise innovation and individual critical inquiry (Barnes et al., 2024; Lim et al., 2025; Ma et al., 2024). These distinctions highlight that AI literacy is both universal and contextual anchored in global principles of understanding, application, and ethics, yet shaped by local values and educational priorities.

The need to equip students with AI literacy is increasingly urgent, driven by key stakeholders, including employers, students, and government bodies, who recognise its importance for workforce readiness and the development of AI-literate citizens in an AI-driven economy (see Rudolph et al., 2025). The World Economic Forum (2024) projects that 50% of employees will require reskilling by 2025, with a particular focus on AI capabilities. While having a foundational understanding of how AI systems work is certainly beneficial, achieving AI literacy does not require deep technical expertise. In line with the definition of AI literacy referenced earlier, being AI literate includes the ability to critically understand and engage with AI tools, recognise their capabilities and limitations, and make informed decisions about which tools to use in various contexts.

The next two sections will explore what AI is currently capable of and its limitations. Understanding both the capabilities and limitations of AI is essential to foster an appreciation of AI literacy.

What can AI do?

Through algorithms that detect patterns in data, AI can now emulate many cognitive and sensory functions once considered uniquely human. Its growing influence spans multiple domains, transforming how people work, learn, and communicate.

In education, AI systems analyse learning patterns to deliver personalised support. Platforms such as Carnegie Learning's MATHia, Squirrel AI, and Knewton adapt lessons to student performance, helping close knowledge gaps and enhance comprehension (Luckin et al., 2016). Tools like Duolingo and Socratic use natural language processing and image recognition to aid self-directed learning (Godwin-Jones, 2020), while Grammarly and large language models such as ChatGPT, Claude, and Gemini support academic writing and idea generation (Hagiu & Wright, 2025). AI-driven grading systems such as Gradescope streamline assessment and free educators to focus on formative feedback (Hansel et al., 2024).

AI's cognitive capabilities extend to text and data processing. Systems like Facebook's DeepText can analyse multilingual text at scale (Abdulkader et al., 2016), and Google's Mariner autonomously executes online tasks from booking travel to synthesising research, demonstrating advanced procedural automation (Morris et al., 2025). In journalism, Natural Language Generation (NLG) enables media outlets such as The New York Times and Bloomberg to automate news production (Chace, 2020).

AI also performs perceptual tasks that simulate human senses. Visual recognition systems support facial identification and surveillance applications, from KFC China's "smile-to-pay" technology (Reuters, 2017) and Beijing's subway ticketing (Dai, 2019) to law enforcement image matching (Brunette, 2025). Auditory and speech technologies, including Baidu's Deep Voice (Cole, 2018), replicate human tone and accent with minimal data. In healthcare, AI can analyse chemical compounds in breath to detect illness (Soltoggio, 2018).

Beyond perception, AI demonstrates physical and operational capability. Robotics and machine learning allow intelligent systems to move, manipulate objects, and interact in physical environments. Google Glass Enterprise Edition 2, for example, provides hands-free access to information in inspection and quality-control contexts (Garcia, 2019). In agriculture, John Deere and Blue River Technology employ computer vision and machine learning to monitor crop health and optimise yield (Hassan, 2024).

AI is also reshaping creative and affective domains. Generative AI systems such as Deep Dream Generator produce new artistic forms, while the AI-generated painting Portrait of Edmond de Belamy sold for US$432,500, signalling a new frontier in creative production (Cohn, 2018). IBM's Watson collaborates with McCormick & Company to generate innovative flavour combinations (Newcomb, 2019). In affective computing, AI now recognises and responds to emotional cues, detecting deception in insurance claims (Narimal, 2025), assessing student engagement (Holcombe & Wozniak, 2024), and supporting mental health interventions (Olawade et al., 2024).

Across industries, AI is transforming workflows and decision-making. In healthcare, wearable technologies such as the Apple Watch conduct ECGs, while AI-assisted eye screenings in Singapore help detect diabetic symptoms (Tan, 2025). Smart contact lenses monitor glucose levels (Elsherif et al., 2022). In finance and business, AI analyses vast datasets to identify trends and improve efficiency (Minson, 2024). These capabilities highlight AI's expanding role in enhancing productivity and insight across sectors.

While these advancements demonstrate AI's impressive functional breadth - from perception and cognition to creativity and empathy - they also underscore its dependence on human oversight. AI can simulate intelligence but lacks consciousness, contextual understanding, and ethical reasoning. The subsequent section examines these limitations more closely, considering why human discernment remains essential in an AI-driven world.

The limits of AI

The notion that AI can surpass human capability applies mainly to environments governed by fixed rules and predictable outcomes, such as chess or Go. In contrast, AI performs poorly in complex, dynamic contexts like education, law, or social interaction, settings where ambiguity, emotion, and moral judgment are central. As Gigerenzer (2022) explains, AI thrives on large, stable datasets but struggles when the future diverges from past patterns, making it unreliable in real-world situations marked by uncertainty.

Frank Knight's (1921) distinction between risk and uncertainty helps clarify this limitation. Under conditions of calculable risk, algorithms excel; under uncertainty where probabilities are unknown, human intuition, empathy, and contextual awareness remain irreplaceable. In education, for example, AI can analyse student data, but it cannot interpret personal circumstances, motivation, or the moral nuances that guide teachers' judgments.

Human and machine learning diverge at a deeper cognitive level. While AI processes data statistically, human cognition integrates consciousness, emotion, and ethical reflection (Kahneman, 2011; Minda, 2021). AI systems optimise for accuracy and efficiency, not meaning or morality. As Harari (2024) observes, algorithmic platforms amplify engagement rather than truth, a tendency that fuels misinformation and polarisation. These tendencies reflect the data on which AI is trained; datasets often infused with societal bias, making human oversight indispensable for interpreting AI outputs responsibly (UNESCO, 2023).

Scholars broadly agree that current AI systems lack inferential reasoning and moral discernment. Dehaene (2020) argues that while machines recognise patterns and simulate reasoning, they cannot engage in abstract thought or reflective learning. McKendrick and Thurai (2022), Gärdenfors (2023), and Likierman (2024) likewise contend that AI cannot exercise judgment in the ethical sense; it can only approximate decision-making within defined parameters. These insights underscore that AI functions best as a supportive instrument rather than an autonomous decision-maker.

The ethical pitfalls of uncritical AI use illustrate these limits vividly. Microsoft's chatbot Tay quickly adopted offensive language after exposure to biased data (Rudolph et al., 2023). Gender bias in AI-generated search results further demonstrates how algorithms reproduce stereotypes (UNESCO, 2023). In constitutional law, AI lacks the interpretive reasoning required to navigate moral and political complexity (Coan & Surden, 2024). In accounting, Minson (2024) proposes a "trust but verify" approach, arguing that AI insights must be contextualised by human expertise.

Philosophically, these examples affirm Aristotle's (2004) claim that knowledge serves the good only when guided

by wisdom. Data and logic alone cannot replace the moral and experiential dimensions of human reasoning. As Dehaene (2020) and Rudolph et al. (2024) suggest, progress in AI should not aim to eliminate human agency but to enhance it through critical oversight, ethical literacy, and discernment.

In sum, the limits of AI lie not only in what machines cannot do but in what they fail to understand, context, meaning, and morality. These boundaries highlight the enduring necessity of human judgment and the importance of cultivating AI literacy that equips individuals to navigate technological uncertainty wisely and ethically.

Rethinking ethics education in the age of AI

It is well known that in profit-driven organisations, employees face pressure to prioritise financial outcomes, sometimes at the expense of ethics. For instance, in for-profit hospitals, healthcare professionals may feel compelled to limit the time spent with each patient to increase revenue. Beyond daily business practices, ethics plays a critical role in corporate decisions such as mergers and acquisitions, which are often motivated by financial incentives (in mergers and acquisitions, overlooking cultural and human factors in favour of economic goals can lead to employee dissatisfaction and integration failures, highlighting the need for ethical leadership that values all stakeholders).

Traditionally, this is where *ethics education* in higher education institutions plays a critical role. Ethical reasoning, whether in law, business, healthcare, or the arts, revolves around the ability to think critically about the impacts of decisions and their alignment with fundamental values such as fairness, justice, and respect for human dignity. Two major ethical frameworks are utilitarianism and deontological ethics. Utilitarianism evaluates actions based on their outcomes, aiming to maximise overall happiness. The principle behind it is that the best course of action produces the greatest good for the greatest number (Bentham, 1789/1981; Mills, 1863/2014). This framework has influenced policies across various sectors, from economics to healthcare, by focusing on collective well-being (Mulgan, 1998; Singer, 2004; Congleton, 2022). Determining what constitutes the "greatest happiness" can be complex, as it depends on subjective factors and situational context. In contrast, deontological ethics, as articulated by Immanuel Kant (1788/2012), emphasises moral duties and principles over outcomes. Kant's categorical imperative insists that individuals act according to rules that could be universally applied, treating people as ends in themselves rather than as means to an end. His framework provides clear guidance for making ethical decisions, ensuring that human dignity and individual rights are prioritised.

In an AI-driven world, traditional ethics education is no longer sufficient. While conventional ethics focuses on human decision-making, interpersonal conduct, and moral philosophy, it often assumes that decisions are made by agents capable of empathy, accountability, and contextual judgment. However, AI systems function very differently. They operate at immense speed and scale, making automated decisions that influence millions of people across domains such as healthcare, education, law enforcement, finance, and social media. These systems are not conscious moral agents; they process data based on patterns and algorithms, often without transparency or accountability. As a result, the ethical issues they raise, such as algorithmic bias, data privacy violations, surveillance, and the amplification of misinformation, require new frameworks of understanding that go beyond traditional moral theory. Ethical questions now extend to how data is collected and labelled, how AI models are trained, who has access to them, and how their impacts are measured and mitigated (Crawford, 2021; Pietropaoli, 2022). To prepare students and professionals for these realities, ethics education should evolve to include AI ethics, such as data governance, algorithmic accountability, and the social implications of automation. Only then can we ensure that future professionals are prepared to responsibly engage with AI-driven decision-making in their respective fields. [There is a substantial and growing body of literature on AI ethics. For readers seeking thoughtful and in-depth discussions, several key texts offer valuable insights. Notable among these are Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence by Kate Crawford (2021), Nexus by Yuval Noah Harari (2024), AI Ethics by Mark Cockelbergh (2020) and Human Compatible: Artificial Intelligence and the Problem of Control by Stuart Russell (2019)].

AI literacy in higher education

Building on the previous sections, which have outlined what AI is, its capabilities, and its inherent limitations, I turn next to examine the value of AI literacy within educational contexts.

Research has shown that higher levels of AI literacy are positively associated with enhanced academic performance. Students with greater AI literacy are more adept at utilising AI tools for tasks such as language support, personal development, and exam preparation, leading to increased learning efficiency and subject comprehension (Asio, 2024; Moosa et al., 2024). AI literacy enables students to leverage AI-powered platforms that tailor educational experiences to individual needs, allowing for personalised feedback, improved study techniques, and better time management. These factors contribute to higher grades, reduced study-related stress and enhanced emotional well-being, leading to higher energy levels, increased motivation, and greater overall happiness among students (Shahzad et al., 2024; Moosa et al., 2024; Klimova & Pikhart, 2025). Students with higher AI literacy also report increased motivation and engagement with their studies, as AI tools can make learning more interactive and accessible (Mansoor et al., 2024). Over 80% of students surveyed believe that using AI enhances their academic performance, citing benefits such as improved comprehension and efficiency (Vieviu & Petrea, 2025). As AI shapes industries, influences decision-making, and transforms societal interactions, its integration into university curricula has become a pressing priority.

Indeed, universities are increasingly accepting the use of AI tools, recognising both their permanence in society and the likelihood that students will use them independently. AI assist in generating ideas and prompts that enhance learning. However, this acceptance is grounded in the need to cultivate AI literacy such as the ability to critically assess, question, and make informed use of AI-generated content. Zhou Xue and Lilian Schofield (2024) present an AI literacy framework that can be useful to guide and support educators in effectively incorporating AI into their teaching practices. This framework consists of four key dimensions that collectively foster a well-rounded understanding of AI. The first dimension, “Know and understand AI”, aims to introduce learners to fundamental AI concepts, ensuring they grasp the basic functions and applications of AI in various learning contexts. The second dimension, “Use and apply AI”, emphasises the practical application of AI for problem-solving, enabling students to leverage AI tools to enhance their analytical and decision-making abilities. The third dimension, “Evaluate and create with AI”, focuses on the critical assessment of AI-generated content, encouraging higher-order thinking skills such as analysis, synthesis, and innovation. Finally, the fourth dimension, “AI Ethics”, underscores the importance of understanding the ethical and moral implications of AI, equipping learners with the awareness needed to navigate issues related to bias, privacy, and responsible AI usage. This structured framework serves as a valuable resource for programme directors and module developers, providing a roadmap for integrating AI literacy into curricula.

Recognising this, an increasing number of universities worldwide have begun to integrate AI-focused programmes and interdisciplinary initiatives into their curricula. These efforts reflect a growing consensus that AI literacy represents not merely a specialised domain of study but a core competency for lifelong learning and citizenship in an increasingly digital world. Notable examples include:

- University of Florida (UF), USA: UF’s “AI Across the Curriculum” initiative aims to infuse AI education across all its colleges, equipping students with AI skills, societal awareness, and ethical considerations (Southward et al., 2023).

- Nanjing University, China: Nanjing University has launched a compulsory AI core course to enhance AI literacy, offering interdisciplinary courses that integrate AI with various disciplines (EduTech Talks, 2024).

- Arizona State University (ASU), USA: ASU offers a course on “AI Literacy in Design and the Arts”, focusing on the ethical and practical implications of AI in creative fields (Faller & Sussman, n.d.).

- The Education University of Hong Kong (EdUHK), Hong Kong: EdUHK’s AI Literacy Programme helps students understand AI’s ethical use and its societal impact (The Education University of Hong Kong, n.d.).

- Singapore University of Technology and Design (SUTD), in partnership with Certis, offers a digital literacy pro-

-gramme aimed at enhancing AI mastery among security professionals (Techno Global Staff, 2024).

The increasing integration of AI in education has brought renewed attention to variations in learners' levels of AI literacy. While AI-literate learners, those capable of critically and ethically engaging with intelligent tools, tend to exhibit higher levels of autonomy, adaptability, and digital discernment in technology-mediated environments (Long & Magerko, 2020; Kong et al., 2021; Mansoor et al., 2024; Du et al., 2024; Asio, 2024), this does not diminish the enduring strengths of traditional learners. Learners who rely more on instructor-led guidance and structured approaches often demonstrate valuable attributes such as discipline, persistence, and reflective depth, which continue to play a vital role in meaningful learning and cognitive development (Hollands & Breazeal, 2024). Consequently, rather than framing AI literacy as a dichotomy, it is useful to conceptualise it as an evolving continuum. Pedagogical strategies could aim to bridge the gap by supporting traditional learners in developing confidence and competence in AI-mediated contexts, while also encouraging AI-literate learners to refine their critical, ethical, and reflective engagement with intelligent systems.

It is equally important to recognise that even before the advent of AI-driven learning environments, educators have long promoted exploration, dynamic learning, creative problem-solving, and reflective judgment as central tenets of effective pedagogy. These foundational principles remain at the heart of quality education and continue to shape how learners construct understanding in diverse contexts. The integration of AI does not replace these established practices but rather amplifies the need to sustain and adapt them within digitally mediated classrooms. In this sense, the pursuit of AI literacy should be viewed not as a departure from traditional pedagogical values, but as a natural extension of them grounded in curiosity, critical thinking, and ethical reasoning that empower all learners to navigate and contribute meaningfully to an AI-enhanced educational landscape.

AI literacy has gone beyond students. At Stanford University, the Stanford Teaching Commons' "Understanding AI Literacy" guide offers educators a comprehensive framework to navigate the integration of generative AI in educational settings. This framework is structured around four key domains:

- Functional Literacy: Focuses on understanding how AI operates, including knowledge of AI tools, basic prompting skills, and awareness of AI developments. Educators are encouraged to familiarise themselves with AI technologies, their capabilities, and limitations.

- Ethical Literacy: Addresses the moral considerations of AI usage, such as issues of bias, privacy, and academic integrity. It emphasises the importance of forming personal ethical positions and promoting responsible AI practices within educational contexts.

- Rhetorical Literacy: Involves the effective use of language in collaboration with AI, understanding the nuances of AI-generated content, and developing skills to critique and refine such content to meet specific educational goals.

- Pedagogical Literacy: Centers on integrating AI to enhance teaching and learning practices. This includes exploring AI-powered educational tools, attending professional development related to AI, and adapting teaching strategies to incorporate AI in a manner that supports evidence-based practices.

NUS has also taken significant steps to equip its administrative staff with essential data literacy and AI skills, reinforcing its commitment to lifelong learning. Through two key initiatives - the Data Literacy Programme (DLP) and the Artificial Intelligence Competency Course (AICC) - NUS aims to enhance employees' technical capabilities and enable them to apply data-driven decision-making in their roles.

- Data Literacy Programme (DLP): Launched in mid-2020, the DLP provides staff with foundational knowledge in data analytics, empowering them to extract meaningful insights and improve business performance. The programme follows a blended learning approach, combining eLearning modules with 15 hours of hands-on workshops and a group project.

- Artificial Intelligence Competency Course (AICC): Introduced in early 2021, the AICC builds on this foundation

by training staff in AI applications, including machine learning and deep learning. Designed across basic, intermediate, and advanced levels, the course features weekly three-hour discussions and culminates in a group project where participants propose AI-driven solutions for real-world challenges. Notable projects include automating the verification of postgraduate admission documents and leveraging AI to enhance alumni engagement.

The 24 Vice Chancellors of the Russell Group universities have pledged their commitment to ensuring the ethical and responsible use of generative AI technologies such as ChatGPT (see Daws, 2023). Their joint statement outlines key principles, including AI literacy support for students and staff, faculty training to guide students in the appropriate and effective use of generative AI, and the ethical integration of AI in teaching and assessment. It calls for universities to maintain rigorous academic integrity while embracing AI's role in education. Incorporating AI literacy into university education is no longer optional; it is essential.

While AI offers valuable tools for personalised and efficient learning, educators should be mindful that its overuse can lead to several negative effects. Students may experience technostress and digital fatigue, especially when constantly engaging with digital platforms or struggling to keep pace with evolving technologies. Excessive reliance on AI can also reduce face-to-face interactions, weakening interpersonal skills and emotional intelligence, and increasing feelings of isolation. Concerns over data privacy in AI-driven environments may further contribute to student anxiety and mistrust (Crawford et al., 2024; Klimova & Pikhart, 2025).

Growing concerns have also emerged about AI's impact on students' cognitive development and critical thinking. A 2025 study by Microsoft and Carnegie Mellon University found that overreliance on AI assistants can erode critical thinking, as students tend to accept AI-generated information without adequate scrutiny, leading to a decline in independent problem-solving skills (Lee et al., 2025). Evidence also suggests that students lack confidence in their own writing abilities and increasingly turn to generative AI tools like ChatGPT to complete even simple assignments (Lee et al., 2025; Messner, 2025; Gerlich, 2025). Such dependency reflects a deficit in self-efficacy and critical engagement rather than genuine learning. Dergaa et al. (2024) introduced the concept of AI-induced cognitive atrophy (AICICA), describing how frequent chatbot use can undermine core cognitive skills, including memory, creativity, and analytical thinking. Zhai et al. (2024) highlights the issue of overreliance on AI, which occurs when users accept AI-generated recommendations without question, leading to errors in task performance in the context of decision-making. This typically arises when individuals struggle to assess the reliability of AI or how much trust to place in its suggestions.

In 2022, the University of Wollongong in Australia developed SmartTest, a chatbot integrated into a law class. The AI was designed to support teaching by answering students' questions and helping them better understand legal concepts. However, despite its potential, the chatbot consistently produced incorrect or misleading responses. These inaccuracies not only confused students but also raised concerns about the reliability of such tools in complex, high-stakes subjects like law (Alimardani & Jane, 2025).

Wolfgang Messner (2025) raises concerns that the growing use of generative AI in education may foster mediocrity and conformity. Students are now producing essays rapidly with the help of AI, often making only superficial edits without engaging in deeper analysis. Likewise, some educators are turning to similar tools for providing feedback, further reinforcing this trend. Messner warns that such reliance on AI risks narrowing the range of perspectives during brainstorming sessions, an essential process for creative breakthroughs. Another concern is that generative AI systems tend to reflect the values and worldviews of affluent, English-speaking nations, potentially marginalising diverse voices and limiting global inclusivity in education. These examples serve as a cautionary tale about over-reliance on AI in classrooms and underscores the need for rigorous vetting, human oversight, and continued development of AI literacy among both educators and learners.

It is worth noting that high-performing students tend to use AI tools strategically, as supplementary aids rather than primary sources, preserving critical thinking and academic integrity (Mansoor et al., 2024). This cautious approach is especially important given recent admissions by OpenAI CEO Sam Altman in April 2025, acknowledging that ChatGPT can sometimes be sycophantic - agreeing too readily with users and reinforcing flawed assumptions rather than challenging them.

Current AI detectors such as Turnitin and GPTZero are unable to reliably identify instances where students have used AI tools in their work. Cases of producing false positives, wrongly accusing students of cheating, have surfaced (Davalos & Yin, 2024), which explains why some educators have remained hesitant in integrating AI into education due mainly to fears of academic dishonesty, including ghost-writing and plagiarism, as well as privacy risks, ethical challenges, and gaps in their knowledge of technology-enhanced pedagogy (Bewersdorff & Nerdel, 2023; Celik, 2023; Hornberger, Bewersdorff & Nerdel, 2023; Nah et al., 2023; Rasul et al., 2023). Clearly, we do not want to see our students outsourcing their writing and thinking to machines.

That said, the goal should not be to position humans against AI, but rather to think in terms of merging human capabilities with intelligent systems. Just as calculators were once disruptive yet ultimately became essential tools integrated into everyday learning and problem-solving, AI is poised to become a natural part of how we think, work, and live.

I would argue that the future of education lies in finding a balanced approach where AI augments human judgment, creativity, and social interaction, not replaces them. Educators play a crucial role in guiding students to develop the discernment to use AI thoughtfully, ensuring that it supports, not supplants, human learning and development. This balance will help students benefit from AI's advantages while maintaining essential life skills and mental resilience.

The following strategies offer practical guidance for achieving this balance:

- Comprehensive professional development is crucial. Teachers need continuous, targeted training that helps them integrate AI tools within their existing pedagogical frameworks. This empowers them to use technology with confidence and clarity, ensuring that instructional decisions remain firmly in their hands. Professional development should emphasise both the technical and ethical dimensions of AI use.

- Schools should adopt blended teaching approaches that combine in-person instruction with AI-driven tools. For example, hands-on projects and group discussions can be paired with adaptive learning platforms or virtual simulations. This hybrid model promotes personalisation and engagement while preserving the social and communicative benefits of classroom interaction.

- Coursework assignments may be designed to integrate both AI tools and human-centred inquiry. One effective model is to require students to critically analyse AI-generated outputs, for example, by using tools like ChatGPT, Claude and Gemini to produce initial responses or content drafts, which students then evaluate for accuracy, bias, depth, and ethical implications. This encourages active learning and cultivates critical thinking rather than passive reliance on AI. Assignments can also incorporate micro studies focusing on specific companies that have adopted AI in their operations, allowing students to contextualise AI's real-world applications and consequences within a defined business environment. Incorporating interviews with industry professionals or employees within the selected company adds a qualitative dimension that AI cannot replicate, providing insight into human perspectives, workplace dynamics, and ethical concerns. This approach reinforces the value of interpersonal communication, reflective judgment, and contextual understanding. By blending AI-generated content with empirical investigation and human interaction, students learn not only how to leverage AI effectively, but also how to challenge, refine, and complement it with human insight, fostering a well-rounded, responsible engagement with emerging technologies.

- It is essential to establish clear guidelines and ethical standards for AI use in education. These should address key concerns such as data privacy, academic integrity, and appropriate levels of AI involvement. Transparent policies help build trust among students, educators, and parents, and promote equitable access to technology.

- It is also important to foster a supportive, student-centered environment where students are encouraged to use AI tools for exploration, collaboration, and self-assessment. At the same time, traditional skills like critical thinking, creativity, and interpersonal communication must remain central. By cultivating a safe space for experimentation, educators can help students become confident, responsible users of technology.

- Embedding AI literacy across curricula requires more than the inclusion of technology-focused modules; it demands an interdisciplinary design that bridges technical competence, ethical reasoning, and domain-specific knowledge. Integrating AI literacy into diverse fields, such as business, healthcare, the arts, and the humanities, enables students to contextualise intelligent technologies within real-world and moral frameworks. Interdisciplinary collaboration between educators, technologists, and ethicists ensures that AI education is not siloed but woven throughout the academic experience. This approach cultivates both cognitive depth and ethical discernment, equipping students to evaluate AI's implications for human values, equity, and societal impact. Ethical awareness, as emphasised by Bloom's higher-order thinking levels and by frameworks such as Zhou and Schofield's (2024), should therefore underpin all AI-related curricular initiatives. By uniting disciplinary perspectives through a shared ethical and reflective foundation, universities can prepare graduates who are not only technologically proficient but also responsible, critically aware contributors to an AI-mediated world.

- While AI in education is designed to enhance students' problem-solving skills and promote psychological empowerment, its impact depends greatly on how educators guide and frame its use. AI technologies can support adaptive learning and foster metacognitive awareness; however, unmoderated or excessive reliance on such tools may inadvertently diminish students' confidence in their own reasoning and task performance, even in relatively simple activities. Educators therefore play a crucial mediating role in ensuring that AI functions as a complement to, rather than a replacement for, human cognition. Through intentional pedagogical design, such as encouraging students to justify AI-generated responses, reflect on their learning processes, and critically evaluate technological input, teachers can help learners retain agency and confidence while still benefiting from AI's affordances. In this way, AI integration becomes not merely a technological enhancement but a guided learning partnership, in which educators balance automation with human judgment to cultivate both competence and self-efficacy within AI-mediated learning environments.

- Continuous evaluation and adaptation is another essential strategy. Schools should regularly assess the effectiveness of AI tools and be ready to adjust their implementation based on outcomes and feedback. Staying attuned to evolving best practices allows educators to refine their approaches and remain responsive to student needs.

- It is vital to preserve human agency and empathy in the learning process. Teachers play a crucial role in offering moral guidance, emotional support, and nuanced understanding, qualities that AI cannot replicate. AI can take on routine tasks such as grading or providing instant feedback. By using AI to free up time and reduce workload, educators can focus more deeply on these human elements, reinforcing the foundational relationships that underpin effective teaching.

Conclusion

As AI's role in society grows, educators must lead the charge in preparing students and staff to use AI technologies ethically and effectively. Amidst the technological advancements, we underscore the indispensable need to retain the human touch in education. Educators emerge as crucial guides, navigating students through the complexities of knowledge acquisition, utilising AI as a potent tool to foster critical thinking and creativity. The harmonious integration of AI and human educators is posited as the key to unlocking the full potential of this transformative partnership.

Future research should move beyond conceptual analysis to empirical validation of AI literacy frameworks and their outcomes across educational contexts. Studies could examine how AI literacy influences learning performance, ethical reasoning, and long-term employability across disciplines and cultures. Developing reliable and adaptable assessment instruments, for example, those that combine quantitative evaluation with reflective self-assessment, will be essential for tracking learners' progress and institutional readiness. Further exploration is needed into interdisciplinary pedagogies that integrate AI literacy with ethics, creativity, and critical inquiry, as well as into models of professional development that empower educators to embed AI literacy sustainably within their curricula. Comparative research across national and cultural settings would also deepen understanding of

how contextual values shape AI education. Such investigations will advance both theory and praxis, guiding the creation of AI-literate societies capable of navigating technological change with wisdom, integrity, and innovation.

The Bloom (1984) 2-Sigma problem, the redefinition of learning measurement, and the ethical considerations surrounding AI data underscore the multi-faceted nature of this transformative journey. As we navigate this intricate path, it becomes imperative to prioritise the development of AI systems endowed with a robust moral compass and a commitment to fostering human intelligence. The future of education lies in a symbiotic collaboration between AI and human educators, ensuring that technology serves as a catalyst for learning and innovation without eclipsing the irreplaceable human touch that defines the essence of education.

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Well-being in crisis: Mindful practices for Canadian higher education instructors

Elena Tran[A]

[A]*Ontario Institute for Studies in Education, University of Toronto, Canada*

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Correspondence

elenahongle.tran@mail.utoronto.ca[A]

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Abstract

Canadian higher education instructors, particularly non-full-time instructors, are grappling with increasing challenges from precarious employment, chronic underfunding, and inequitable policy shifts. This paper draws on Harney and Moten's *The Undercommons* and Thich Nhat Hanh's mindfulness philosophy to critique the neoliberal transformation of Canadian higher education, which prioritizes profit over intellectual and social values. It explores the exploitative reliance on international students' financial contributions and the transformative yet disruptive impact of AI on teaching roles, revealing the detrimental effects of these systems on educators' well-being. By emphasizing the critical link between educators' mental well-being and systemic change, the paper advocates for mindfulness as a powerful tool to process strong emotions, promote healing, and inspire the creation of alternative spaces for resistance and meaningful reform.

Well-Being in Crisis: Mindful Practices for Canadian Higher Education Instructors

Teaching has long been recognized as one of the most stressful careers, with stress levels similar to those of paramedics and police officers (Johnson et al., 2005). In the Canadian context, almost 80 percent of teachers report increased stress levels in recent years (Froese-Germain, 2014), and approximately 60 percent of educators report experiencing anxiety, depression, and burnout (Mental Health Research Canada, 2023). The unpredictability and intensity of educators' work environments adversely affect both their mental and physical well-being and, in turn, impair their capacity to perform their professional roles. Despite the prevalence of stress-related challenges, educators' overall well-being is frequently overlooked (Hartcher et al., 2023). Within a neoliberal framework, teachers are frequently positioned as skilled technicians expected to optimize efficiency and master standardized methods for delivering prescribed bodies of knowledge (Giroux, 2011; Rigas & Kuchapski, 2018). This approach to teaching often requires educators to place institutional demands and student academic outcomes above their own physical, emotional, and psychological well-being (Thich Nhat Hanh & Weare, 2017).

However, teachers are not teaching machines; they are human beings, and importantly, a "key resource for ensuring the quality of a nation's education" (Rigas & Kuchapski, 2018, p. 392). Their emotional and mental well-being is intrinsically linked to organizational health and the future of the next generation, being identified as "a critical determinant in the achievement of positive social and academic learning outcomes" (McCallum, 2021, p. 715). When educator well-being is ignored—or worse, reduced to a discretionary benefit considered only when budgets permit (Acton & Glasgow, 2015), the consequences extend beyond individual burnout to threaten the sustainability and quality of education itself (Roeser et al., 2012). These conditions underscore the urgency of critically examining how teacher well-being can be meaningfully supported, particularly through interventions that foster positive psychological functioning and long-term resilience (Oades, 2017).

This urgency is particularly pronounced in the contemporary Canadian higher education landscape. Higher education instructors (HEIs), especially non-full-time instructors (NFTIs), are navigating an exceptionally turbulent period shaped by rapid technological automation and abrupt policy shifts. These forces have significantly intensified job insecurity, heightened occupational stress, and contributed to widespread job displacement across the sector. To date, more than 600 college programs have been eliminated, resulting in the loss of over 10,000 academic positions (Alhmidi, 2025). The repercussions of these disruptions extend beyond individual livelihoods, placing the broader academic ecosystem at risk by undermining educational quality, research continuity, and the preservation of institutional knowledge (ICEF Monitor, 2024; Usher, 2024a).

In response to this rapidly evolving and complex reality, HEIs and NFTIs must cultivate resilience and adaptive strategies to safeguard their well-being. This paper, thus, explores the multifaceted challenges confronting Canadian HEIs and NFTIs today and proposes mindful self-practices as vital tools to navigate these turbulent times while maintaining their well-being.

To understand the structural factors causing the suffering and precarious circumstances of Canadian HEIs and NFTIs, this paper draws on *The Undercommons* theory by Stefano Harney and Fred Moten (2013). Harney and Moten (2013) critique the neo-liberalization of universities, where market logics dominate decision-making and prioritizes profit over genuine intellectual or social value. They argue that the university's focus on measurable productivity—such as rankings, publications, and funding—transforms educators into managers of knowledge rather than participants in transformative praxis. This business-oriented model aligns with critiques by other scholars, including Barnett's (2013) concept of the "entrepreneurial university," Giroux's (2009; 2011) "corporate university," and Andrew's (2023, 2024) or Fleming's (2021) analysis of the "modern neoliberal university". Neoliberalism has shifted institutional values from care and collaboration to a focus on competitive advantage, fostering anger, despair, and feelings of powerlessness among educators (Blackmore, 2013, p. 147).

Confronting this reality, Harney and Moten (2013) encourage the "fugitive" scholar to operate within the cracks of the system, navigating between the university and the undercommons—a space where rebellion and critique coexist, but not through direct confrontation or the illusion of resolution: "it is not a place where we take arms against a sea of troubles/and by opposing end them" (p. 9). They argue that universities are fundamentally designed to uphold existing power dynamics, making transformative reform from within improbable, so "the on-

-ly possible relationship to the university today is a criminal one" (p. 26). This perspective calls for meaningful engagement that challenges the institution's oppressive structures by rejecting its norms, values, and expectations. It advocates for leveraging the cracks in the system to cultivate spaces of resistance, critique, and alternative ways of being.

Building on this critique, this paper suggests that such alternative space can emerge from within and through intentional mindful self-practice. Inspired by Thich Nhat Hanh's philosophy, which asserts that systemic change begins with individual consciousness— "to be peace first and to do peace later" (Plum Village App, 2023). This can potentially be the personal survival strategy of educators, which will benefit the whole educational environment, students and institutions alike (White & Kern, 2018). Mindfulness fosters personal resilience and interconnectedness, enabling educators to transform and sustain their resistance while creating ripple effects that gradually reshape institutions. Through integrating mindful self-practice into the fissures of the academic system, HEIs and NFTIs can embody a form of "fugitive" scholarship that harmonizes well-being with the capacity to disrupt institutional logics from within.

Together, *the undercommons* and mindfulness create a praxis of sustainable resistance: navigating oppressive structures while maintaining the well-being necessary for transformative possibility. While many well-being frameworks emphasize individual coping strategies divorced from structural critique, mindfulness philosophy offers a particularly relevant approach for educators who work in neoliberal academic environments. Asacknowledged, Thich Nhat Hanh's concept of teachers as first and foremost "healers" (p.15), empowers her transgressive educational work. When placed alongside Harney and Moten's (2013) concept of *The Undercommons*, mindfulness transforms from an individual wellness practice into a collective and political stance. *The Undercommons* provides the critical lens through which self-sustenance can be understood as both refusal and survival, enabling the cultivation of alternative academic lifeworlds within neoliberal regimes—an especially salient framework for interrogating the precarious realities of Canadian HEIs.

The current context of Canadian higher education and its impacts on HEIs and NFTIs

From this theoretical grounding, the analysis now turns to the complex and rapidly shifting terrain of Canadian higher education, shaped by multiple converging structural forces. Artificial intelligence (AI) is fundamentally reconfiguring traditional academic roles, while volatile funding regimes and abrupt shifts in immigration policy intensify institutional instability. These dynamics exert profound pressure on HEIs and NFTIs, the very lifeblood of the education system.

AI as a stressor for HEIs and NFTIs

Academic researchers have extensively documented the profound threats AI poses to education, particularly within higher education institutions (Felten et al., 2023; Popenici, 2023; Popenici et al., 2023; Rudolph et al., 2024). This disruption runs deeper than technological change; it represents a fundamental challenge to educational foundations. Popenici et al. (2023) describe AI as "a spike in the heart of the model of education as we have it today," arguing that governments, institutions, and educators remain "completely unprepared" for this seismic transformation (p. 322). The complexity of this disruption is further elaborated by Rudolph et al. (2024) through their conceptualization of the "Yin and Yang: Threats and Opportunities of GenAI for higher education" (See Figure 1).

Beyond institutional disruption, AI presents immediate and material risks to educator labor, especially HEIs and NFTIs. Mehdi and Frenette (2024) note that "higher-skilled jobs may be more exposed to AI-related job transformation than lower-skilled jobs" (p. 4), situating educators squarely at the centre of this reconfiguration. Similarly, Felten et al. (2023) identify postsecondary fields such as English language and literature, foreign languages, and history among those most susceptible to AI exposure. While AI might complement certain pedagogical tasks (Mehdi & Frenette, 2024), the prospect of role erosion, task automation, and professional redefinition generates acute precarity and psychosocial strain across the academic workforce.

The threat to educators extends beyond their own job security to encompass deep-seated concerns about AI's i-

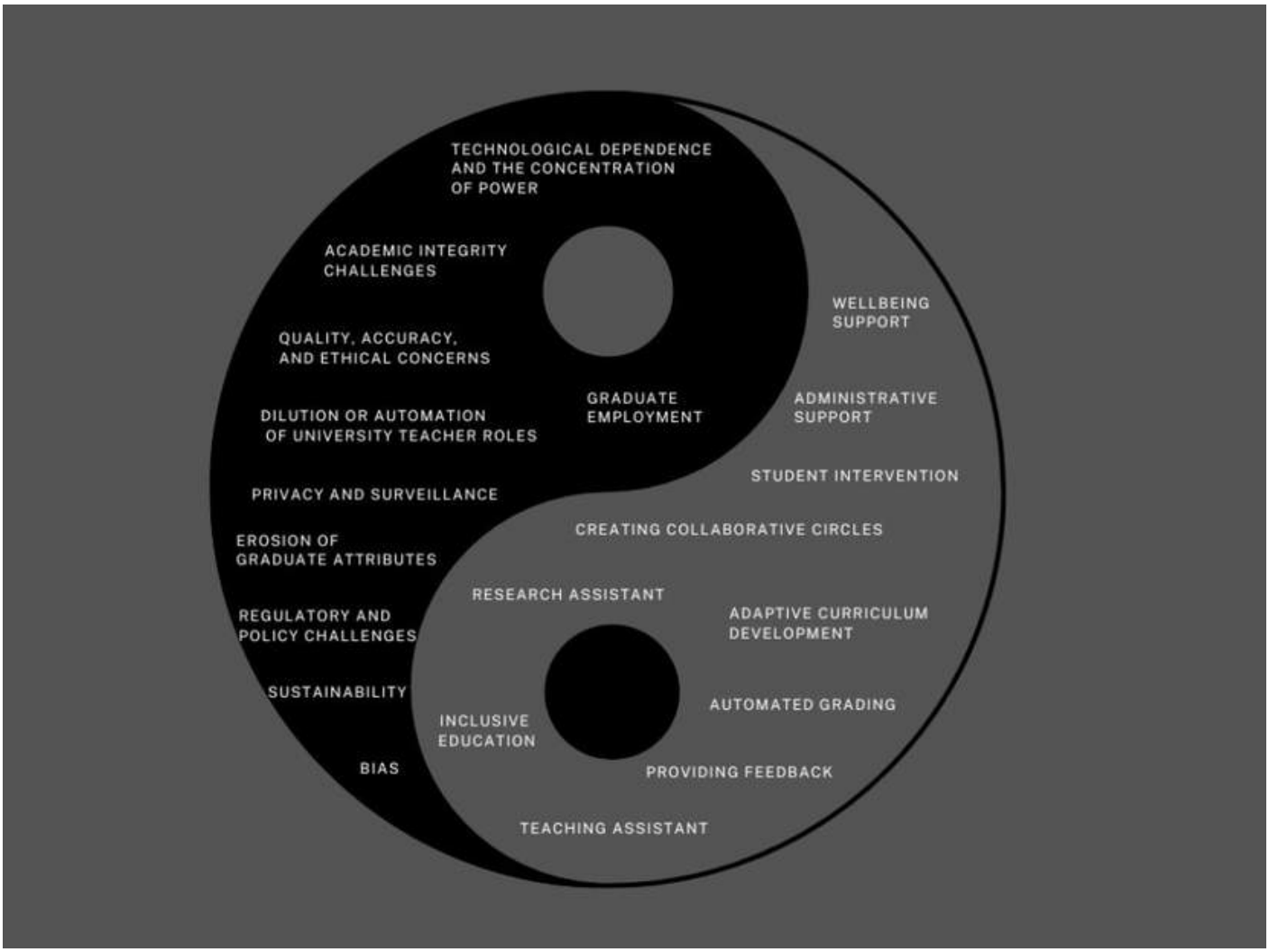

Figure 1. *Yin* and *Yang*: Threats and opportunities of GenAI for higher education (Rudolph et al., 2024, p. 3).

-mpact on student cognitive development, intensifying the psychological burden they face. Students lacking the awareness of the dangers of AI increasingly outsource their academic tasks to AI as "it can generate passable prose in seconds without triggering any plagiarism detector" (Rudolph et al., 2023, p. 353). This trend toward academic delegation carries far-reaching implications for human intellectual capacity. Rudolph et al. (2023) also warn that "as society gravitates towards an increased reliance on AI for tasks traditionally demanding human ingenuity, the threat of a diminished capacity in essential cognitive skills such as critical thinking and problem-solving among students looms" (p. 14). Gerlich (2024) also asserts the negative correlation between the frequent use of AI tools and critical thinking abilities. In Canada, in particular, more than half of the students over the age of 18 have used generative AI to complete schoolwork or pass exams (KPMG, 2023). When students increasingly rely on AI tools, their diminished engagement with deep learning processes and compromised thinking skills will eventually create even greater dependency on these technologies.

Indeed, the potential for AI to create dependency is a legitimate concern for educators navigating an evolving educational landscape. Grose (2024) cautions that "when students rely on generative AI, they lose not only the ability to think critically but also to overcome frustration with tasks that do not come easily to them" (para. 4). Excessive reliance on AI for problem-solving risks eroding students' mental resilience and their ability to confront challenges independently. The psychological implications deepen further as Hasan (2025) argues that AI not only "hampers intellectual growth but also diminishes confidence in one's own abilities over time" (p. 4693). Consequently, educators grapple not only with pedagogical challenges but also with mounting apprehension regarding the consequences of AI dependency on student development.

Policy failures threatening educator jobs

Another primary threat to the job security and well-being of HEIs and NFTIs comes directly from the Canadian government. According to the Canadian Federation of Students–Ontario (n.d.), Canada is the only major industrialized country that does not have national oversight over higher education, and the federal government has no mechanism to ensure that funds are actually spent on post-secondary education. As a result, the Canadian post-secondary sector has faced chronic underfunding for decades, forcing institutions to rely heavily on international student tuition as a financial lifeline (Dhillon, 2024). This reliance is particularly problematic, as international students often come from economically disadvantaged countries such as India, the Philippines, Nigeria, etc., (CBIE, n.d.) making them vulnerable targets. The over-dependence on international students creates an unstable financial model that leaves institutions at risk during global crises or changes in immigration policies.

Experts have highlighted the systemic failure to adequately fund education while shifting the financial burden onto international students (Alexander, 2021; Breznitz, 2024; Green, 2015). This trend reflects the erosion of public investment in higher education, transforming institutions from public goods into profit-driven enterprises. For example, in the wealthiest province of Ontario, as provincial funding has steadily declined, student fees have increased and become the main source of institutions' income (See Figure 2). This model has made higher education unaffordable for both domestic and international students, compromising educational access and quality, thus affecting the future development of students.

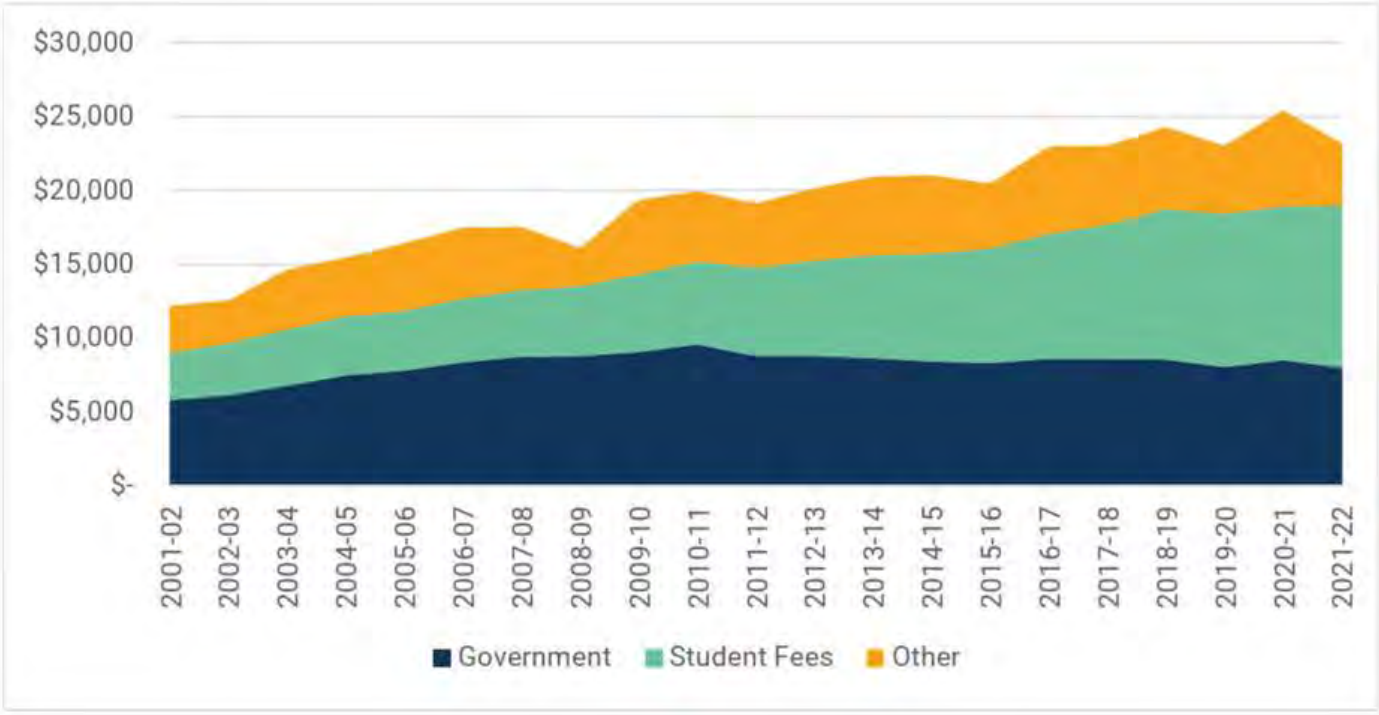

Figure 2. Total University and College Income by Source, Ontario, 2001-02 to 2021-22, Millions, in real $2021 (Usher & Balfour, 2023, p. 102).

Under this model, international students, who pay roughly five times more fees than domestic students (Statistics Canada, 2024), have effectively become the primary financial backbone of Canadian higher education. Their presence, 637,855 in 2019, 807,260 in 2022 and one million international students in 2023 (The Economic Times, 2024), significantly bolstered local and federal economies through tuition revenue, workforce contributions, and cultural enrichment (Lencioni, 2024). In 2022, international students contributed nearly $31 billion to Canada's economy and supported over 360,000 jobs (Hassan, 2024, para.11). The disproportionate dependence on their fees is particularly stark in Ontario, where Indian international students in 2023 contributed $2 billion to college operating revenues—exceeding the provincial government's entire higher education budget

allocation that year (Higher Education Strategy Associates, 2023). This reliance exposes a structural inequity: students from the Global South are not merely participants in the education system but are systematically leveraged as revenue sources, effectively subsidizing domestic education while assuming disproportionate financial risk.

Despite their critical role, political leaders have deflected responsibility for the housing crisis onto these very international students and used them as scapegoats (Lencioni, 2024). In response to public pressure, right before the election, the Canadian government implemented abrupt policy changes, including capping study permits at 485,000, eliminating the public partnership program (IRCC, 2024a) and ending The Student Direct Stream (IRCC, 2024b). While framed as solutions to housing affordability, these measures merely shift the crisis from one vulnerable population to another, destabilizing the higher education sector and jeopardizing international students' future alongside the institutions that rely on their enrolment.

The financial consequences have been catastrophic. With a 54% decline in international enrolment, colleges and universities now face approximately $2 billion in jeopardized revenue (Hassan, 2024, para.12). Program closures and widespread job losses are underway (CBC News, 2024; Chandler, 2024). Amid these crises, educators are left grappling with how to safeguard their careers, maintain their mental health, and adapt to rapidly shifting landscapes. It is predicted that 20,000 job losses will result from these changing demographics (Usher, 2024b). With nearly 50,000 foreign students listed as 'no-shows' by Canadian institutions in 2025, these figures are expected to worsen (Woolf, 2025). Amid these crises, educators are left grappling with how to safeguard their careers, maintain their mental health, and adapt to a rapidly collapsing financial model.

The "Other" lives of NFTIs

In *The Undercommons* (2013), Harney and Moten critique the modern university as an exploitative institution that depends on the invisible labor of teaching professionals while simultaneously erasing their contributions: "The university needs teaching labor, despite itself, or as itself, self-identical with and thereby erased by it." (p. 26). Teaching, while foundational to the university's existence, is systematically devalued and treated as a temporary necessity rather than dignified work: "The moment of teaching for food is therefore often mistakenly taken to be a stage, as if eventually one should not teach for food." (Harney & Moten, 2013, p. 27). The university seeks to eliminate the troublesome presence of these educators, who are described as the "tribe of moles," operating in the shadows to provide necessary intellectual sustenance while being erased by the very institution they support, much like capital aims to rid itself of labor.

This analysis is particularly applicable to NFTIs in Canada, where the precarious lives of educators exemplify the "tribe of moles" metaphor. Through the widespread use of short-term and contingent contracts, institutions avoid providing benefits while retaining the unilateral power to terminate employment. Despite these conditions, NFTIs continue to invest deeply in their teaching, engaging in what Paris (2024) terms "hope labour," defined as "uncompensated or undercompensated labour carried out in the hopes that the exposure, experience, or goodwill generated by this labour will lead to future employment opportunities" (para. 4). As Paris (2024) further observes, NFTIs remain especially susceptible to the affective pull of teaching—the "rush to stand before a class, holding forth on an obscure topic you know well" (2024, para. 4). Institutions strategically capitalize on this passion to suppress their wages (Paris, 2024, para. 4). In this way, universities weaponize instructors' genuine commitment to teaching, extracting maximum labour for minimal compensation. However, these dedicated educators are further alienated when their efforts to exceed narrow, market-oriented expectations are dismissed as "unprofessional" or "impractical" (Harney & Moten, 2013, p. 28). Within this framework, educators' labour is rendered simultaneously indispensable and disposable, orchestrated to maximize institutional gain while minimizing human and professional costs.

Reflecting on Harney and Moten's *The Undercommons* (2013), Wan (2022) poignantly captures the persistent financial vulnerability and oppressed reality of her own adjunct experience:

> … driving six hours to get to and from my two adjunct jobs, fitting ten hours of non-stop teaching in eating meals in my car, and teaching in hallways because I didn't have an office. Once, I even contemplated sleeping in my car because I didn't want to drive three hours through a snowstorm at night, and every hotel

> in town was way out of my budget. Not to mention, I was still taking a full load of courses and working as a teaching assistant at my own university. So, it's fair to say I felt exhausted and completely disillusioned .... (para.2)

Reading Wan's account felt uncomfortably familiar: My own day often begins at 5 am, commuting across the Greater Toronto Area for an early morning class, only to return home in the late afternoon, drained and lifeless. In the capitalist education system, institutions often pay instructors on a "per-course basis" (Field et al., 2014, p. 5) but implicitly expect them to recruit, mentor, and engage in activities beyond their teaching hours. I routinely teach at three institutions simultaneously—partly because, as Paris (2024) observes, "teaching is addictive" (para. 4), but more fundamentally because it is teaching "for food" (Harney & Moten, 2013, p. 27). This arrangement reflects a deeply flawed system in which, as Wan (2022) poignantly notes, "one must work more to be nourished enough (sometimes not even), and many adjuncts quickly realize that surviving and dying happen in the same breath" (2022, para. 6).

Through the practice of deep listening (Plum Village App, 2023), I have learned that many of my colleagues—and even my esteemed adjunct professors at prestigious institutions —share similar struggles. NFTIs face persistent financial and professional vulnerability, often without the protections afforded to full-time faculty (Field et al., 2014). As immigrant policies shift and contracts are terminated abruptly, NFTIs bear the brunt of institutional instability. They are the first to be displaced when international student caps are imposed by the Canadian federal government. This deliberate reliance on contingent labor exposes a broader logic of institutional and systemic extraction, undermining not only educators' livelihoods but also the integrity, equity, and social purpose of higher education.

Beyond criticizing this exploitative system, Harney and Moten's concept of *The Undercommons* (2013) offers a glimmer of hope and a means to reclaim humanity within a dehumanizing structure. Yet before educators can foster care, collective action, or envision systemic reform, they must first sustain themselves. Attending to one's well-being amid shrinking job opportunities and systemic inequities is both an act of survival and a form of resistance. In cultivating this resilience, educators lay the foundation for transformative spaces, replenishing the strength and insight necessary to reimagine and reshape the educational landscape from within.

The interconnected nature of educator well-being

To explore the topic of well-being, many studies have been conducted to understand models of burnout and salient risk factors leading to workplace stress (Hastings & Bham, 2003). More recently, attention has shifted from "the alleviation of disorder to a focus on personal and interpersonal flourishing" (Huppert, 2009, p. 137). Regarding teachers' well-being, research suggests that it is influenced by a combination of individual, relational, and contextual factors (Collie et al., 2015; Hartcher et al., 2023; Hasnain, 2023). Key aspects of teacher well-being are interconnected with core psychological needs, including a sense of autonomy, competence, and relatedness, as well as autonomous motivation and organizational commitment (Collie et al., 2015). These elements are crucial for fostering a positive teaching environment and can help mitigate the adverse effects of stress, job dissatisfaction, and burnout (Collie et al., 2015; Hartcher et al., 2023; Hasnain, 2023).

Evidence further highlights that improving teacher well-being leads to broader positive outcomes. Research affirms that well-being encompasses cognitive, emotional, physical, and psychological dimensions, reflecting teachers' emotions, attitudes, and evaluations of their work (Hartcher et al., 2023). On the contrary, when teachers are burnt out, students also suffer from higher stress levels, lower academic performance, and lower school satisfaction (White & Kern, 2018).

These findings align with the theory of "interbeing" in Buddhism (Grateful Living, 2015; Pluralism Project at Harvard University, 2020; Parachin, 2000; Pyles, 2005), which underscores the interconnected nature of existence. The well-being of educators directly influences the co-arising well-being of all stakeholders including students and institutions:

> When this is, that is.

This arising, that arises.

When this is not, that is not.

This ceasing, that ceases (Terry et al., 1993, p. 171).

By tending to their own well-being, educators not only sustain themselves but also contribute to a thriving and resilient educational ecosystem. Achieving such well-being, however, cannot be addressed with short-term remedies, as these have been proven to provide little to no lasting benefit. Instead, well-being must be pursued as a long-term, holistic goal.

Long-term strategies are essential because, as McCallum and Price (2015) note, "life-wide well-being involves a breadth of experiences, guides and locations and… takes individuals through adaptation to new situations" (p.140). In this long journey, educators must take an active role in fostering their own mental health (Hartcher et al., 2023). The next section explores practical, evidence-based strategies educators can adopt to cultivate enduring well-being, empowering them to navigate the challenges of their profession while sustaining their personal and professional growth.

The only way out is in: Cultivating inner resilience through meditation

Mindfulness is widely perceived as "receptive attention to and awareness of present events and experience" (Brown et al., 2007, p.212). Through meditation, mindfulness allows us "to be aware of what is going on – in our bodies, in our feelings, in our minds, and in the world' (Thich Nhat Hanh & Neumann, 2005, p. 14). Although the field of mindfulness and meditation studies is still young (Brown et al., 2007), it has increasingly attracted researchers' and health practitioners' attention. The growing body of research reflects the significance of mindfulness in contemporary life (See Figure 3).

Mindfulness and its relationship with HEIs' and NFTIs' well-being remain an underexplored area of research. Existing studies have predominantly focused on psychological domains such as attitude and social cognition, interpersonal relations, group and personality processes, prevention and treatment, epidemiology, and the healthcare economics of behavioral therapy (Wang et al., 2021, p. 5). Therefore, this paper seeks to contribute to this emerging field by examining how mindfulness—grounded in deep self-awareness—can support educators in achieving "lifelong, life-wide, and life-deep well-being" (McCallum & Price, 2015, p. 140). The adage "the only way out is in" (Thich Nhat Hanh, 2014) encapsulates this inward-turning approach.

In times of upheaval and uncertainty, the answers educators seek often reside within themselves in the form of attentive self-awareness and intentional practices that foster balance and resilience. This approach challenges the tendency to rely solely on external fixes or to wait for systems to provide solutions. Instead, it calls for individuals to reconnect with their inner resources and adopt practices that nurture mental, emotional, and spiritual health. By turning inward, HEIs and NFTIs can build the strength to navigate external challenges with more incredible poise, transforming personal well-being into a cornerstone for resilience and empowerment.

Slowing down to heal

From the above analysis, it is evident that HEIs, particularly NFTIs, find themselves trapped in cycles of relentless pace, chronic stress, and overwhelming demands. Breaking free from this destructive pattern requires a fundamental shift toward intentional deceleration and self-care. This transformation begins with cultivating a genuine commitment to pause, requiring both the courage to step away from constant motion and the discipline to engage in practices that allow both body and mind to find stillness and restoration.

The Buddhist master, Thich Nhat Hanh, offers profound guidance for this healing journey through his understanding of the practice of stopping. In one teaching video titled "Stop Running" (Plum Village App, 2024), he illuminates the essential nature of this practice:

"The practice of stopping is very crucial in the Buddhist tradition… There is tension in our body – a kind of

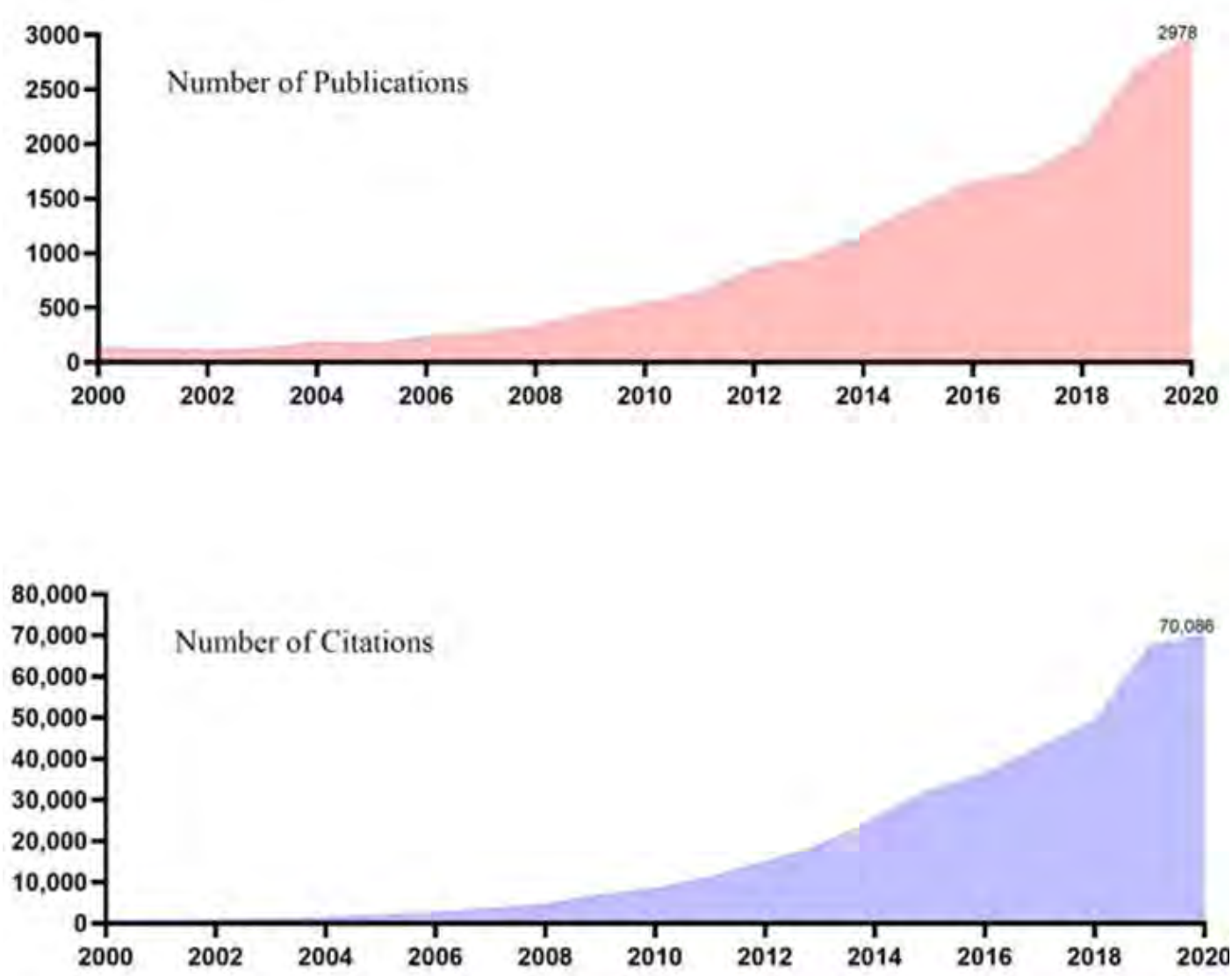

Figure 3. Mindfulness meditation publications and citations (Wang et al., 2021, p. 4).

> energy that pushes you and pushes your body. Your body wants to do something, to be active, to run, to do something. Your body does not have the capacity to rest, to stop. That is why stopping does not mean just stopping the mind, but stopping the body... The body and the mind are inter-are... You practice with the body and mind at the same time. That is why meditation includes the body... The Buddhist term of stopping is 'samatha'. You are not searching for anything at all. You are completely at ease in the present moment. It sounds easy, but we need some training..." (Plum Village App, 2024)

To facilitate this deeper engagement with the body, Thich Nhat Hanh and Katherine Wear (2017) guide educators toward deep, introspective reflection through a series of probing questions:

> "How do I feel right now, in my mind, body, breath? How did the sitting practice feel? Was it the same experience throughout or did it change? Where was my mind today? Stressed, calm, distracted? Where was my body? How easy or difficult did my body find just sitting? Did I want to move a lot? If I did, did I manage to move mindfully? If I noticed my mind wandering, was I able to bring it back to my breath and the present moment?" (p. 243)

The approach emphasizes open, non-judgmental self-inquiry and welcomes all responses, including uncertainty. Rather than demanding immediate transformation, it offers gentle redirection toward present-moment awareness, enabling educators to cultivate deeper self-understanding, release accumulated tension, and discover clarity amidst the chaos of professional demands.

The transformative potential of these practices becomes tangible through Wong's (2018) deep personal account in *"Please Call Me by My True Names": A Decolonizing Pedagogy of Mindfulness and Interbeing in Critical Social Work Education* (Wong, 2018). The practices of mindful breathing, walking, reflecting on purpose, and eating offer pathways for Wong and her students to nurture their inner well-being. Integrating mindfulness pedagogy into her Social Work course, Wong and like-minded educators create a framework for orienting themselves, embracing vulnerability, and preparing their students to confront the challenges and discomforts inherent in the learning process. She helps her students turn inward and feel "more grounded, more present, and more aware" (Wong, 2018, p. 269). Perhaps most powerfully, Wong (2018) models the courage required for authentic healing when she reflects on her personal experience: "stopped writing [the chapter] to allow the body to heal," recognizing this pause as both mindful and necessary (p. 217). Through this process, she learned to cease negating her body and spirit, embracing a holistic approach to healing and teaching that aligns with the principles of mindfulness and interbeing. Her practice stands as a compelling testament to the possibility of transformation, offering educators both inspiration and practical guidance for integrating mindfulness into their pedagogy while prioritizing their own well-being as the essential foundation for genuinely transformative teaching.

Dealing with strong emotions through breathing and walking meditation

In the current difficult times, strong emotions can often feel overwhelming, and mindful practice can be a practical way to process and embrace these feelings. Thich Nhat Hanh (2017) explains:

> When the seed of anger in us is touched, and when it manifests in our mental consciousness as the energy of anger, we have to be aware of it right away. First, we have to produce mindfulness to be aware that the energy of anger is coming up. That is the practice of mindfulness of anger. Breathing in, I know I am angry. Breathing out, I know that anger has manifested. You continue to follow your in-breath and out-breath, generating the energy of mindfulness to embrace your anger. You might like to do walking meditation to help you continue to generate the power of mindfulness. (para.1)

By aligning each step with the breath, educators can create a moving meditation that grounds them in the present moment. This practice offers a unique opportunity to manage stress and cultivate emotional resilience. Walking slowly and deliberately in a quiet space, with attention focused on the sensations of the feet touching the ground, can release emotional burdens and nurture inner peace. As Thich Nhat Hanh beautifully articulated, "healing is possible with every step… There is no way to healing, healing is the way" (Plum Village, 2013).

Mindful practices are not about escaping strong emotions but embracing them with compassion and understanding. This practice equips educators to face their challenges with greater emotional resilience, transforming their responses to stressful situations. Research supports the profound impact of mindfulness on emotional resilience and decision-making. In a study involving 116 monks and nuns who serve as leaders and educators, Burmansah et al. (2024) suggest mindfulness helps leaders and educators become fully present and aware of both internal and external challenges. By cultivating this awareness, they can pause, observe, and listen deeply to the situation at hand. This mindful approach significantly influences how individuals and organizations respond to problems, fostering creativity in finding solutions. It also promotes self-transformation and social change by encouraging the development of new habits. Additionally, the ability to manage conflict effectively is closely linked to mindfulness, as it helps individuals adopt life principles that enable them to lead with resilience, insight, and adaptability. By incorporating meditation into their routines, educators can create a foundation of emotional resilience, cultivate inner peace, and transform their responses to stress. This simple yet powerful practice provides a pathway to self-healing and developing creative and compassionate leadership in education and beyond.

In *Being Peace*, Thich Nhat Hanh illuminates the fundamental Buddhist understanding that life encompasses both profound suffering and extraordinary beauty, grounding this teaching in contemporary realities: "Each day 40,000 children die of hunger. The superpowers now have more than 50,000 nuclear warheads… Yet the sunrise is beautiful, and the rose that bloomed this morning … a miracle" (Thich Nhat Hanh & Neumann, 2005, p.14). This perspective is valuable as it allows educators to see what is rather than what is not and take on challenges with

more resilience. What is more important is how our inner peace and contentment can determine the state of our lives, not external factors that try to overwhelm us: “If we are peaceful, if we are happy, we can smile and blossom like a flower, and everyone in our family, our entire society, will benefit from our peace.” (Thich Nhat Hanh & Neumann, 2005, p. 13). This understanding reveals how personal transformation ripples outward, making individual healing an act of service to the educational community.

To cultivate this transformative peace, Thich Nhat Hanh offers a deceptively simple meditation that integrates breath, presence, and joy:

> Breathing in, I calm my body.
>
> Breathing out, I smile.
>
> Dwelling in the present moment
>
> I know this is a wonderful moment. (Thich Nhat Hanh & Neumann, 2005, p. 15)

This meditation chant allows practitioners, including novice beginners, to focus attention on their own breath and the present moment. Each chant corresponds to one full inhalation and exhalation, allowing the breath and the accompanying smile to serve as a gentle reminder that we are alive and fully awake to this yet wonderful life. Simple but profound, this practice offers educators an accessible anchor amid chaos, providing a reliable path back to centeredness regardless of external circumstances.

The theme of liberation through presence continues in "How to Walk," where Thich Nhat Hanh (2014) observes that "Most of us walk without chains, yet we aren't free" (p. 60). This paradox speaks directly to the educator's experience—physically mobile yet mentally imprisoned by regrets about past decisions and anxieties about future outcomes. By focusing on each step and each breath, educators can practice bringing the mind “home” to the body, breaking free from the mental prisons they construct. Thich Nhat Hanh provides walking meditation verses that serve as gentle mantras for this homecoming:

> I have arrived.
>
> I am home
>
> In the here,
>
> In the now
>
> I am solid
>
> I am free
>
> In the ultimate
>
> I dwell (Thich Nhat Hanh 2014, p. 102)

Each line is chanted in rhythm with a step, grounding the practitioner in embodied presence. Walking meditation emerged during the height of the Vietnam War, when Thich Nhat Hanh engaged in peace work amidst extreme violence and upheaval. In such overwhelming conditions, still meditation was often impossible; walking meditation allowed body and mind to unite amid distress and emotion.

For educators navigating their own high-stakes, stressful environments, the practices of breathing and walking meditation offer simple yet concrete pathways to cultivate inner resilience and well-being. By deepening self-awareness and mindfulness, they develop the emotional and spiritual resources necessary to meet external cha-

-llenges with equanimity. Human life is sustained by the fundamental acts of breathing and movement—how extraordinary these basic capacities, to walk and to breathe, and themselves become means of freedom and inner peace.

Implementing well-being initiatives in higher education

Although practical research on mindfulness and well-being in HEIs remains emergent (Brown et al., 2007), existing studies provide clear evidence of feasibility and impact. For example, Flook et al. (2013) examined a mindfulness program designed specifically for teachers and observed significant reductions in psychological distress and burnout, alongside improvements in sustained attention and emotional regulation—capacities directly related to effective teaching. Extending this work, Hirshberg et al. (2020) reported on a structured nine-week mindfulness and connection-based intervention integrated into preservice teacher education. Using objective classroom observations (CLASS), the study demonstrated measurable improvements in instructional support, emotional support, and classroom organization six months after the intervention. These findings demonstrate that mindfulness can be operationalized within educational systems, linking educators' internal well-being to observable pedagogical outcomes.

Therefore, greater systemic effort is required to address educator burnout and sustain teaching effectiveness in postsecondary settings. One promising direction involves integrating structured mindfulness programs, professional development workshops, and wellness resources into institutional policies to ensure faculty have ongoing and equitable access to support. International initiatives such as CARE for Teachers, SMART-in-Education, Inner Resilience, Mindfulness, Courage, and Reflection for Educators, Mindful Schools, and PassageWorks' *Soul of Education* offer replicable policy models (Roeser et al., 2012). These programs incorporate concrete practices including mindful instructional strategies, breath-awareness meditation, mindfulness meditation, loving-kindness and forgiveness practices, progressive body scans, mindful movement, staff retreats, individual stress-reduction sessions, and school-based professional development workshops (Roeser et al., 2012, p. 169). Many also emphasize the integration of play, ritual, stillness, expressive arts, community-building, reflective practice, and the cultivation of "teaching presence" (Roeser et al., 2012, p. 169).

Some universities in Canada, such as the Ontario Institute for Studies in Education of the University of Toronto, are already implementing yoga and meditation outreach programs for students, recognizing the benefits of mindfulness in reducing stress and improving focus (Rise & Realign, n.d.). The sessions offered allow participants, primarily teachers in training, to check in and "listen to and respect body and mind" (Rise & Realign, n.d.). Such initiatives demonstrate how well-being practices can be normalized within academic cultures.

While institutional policies play a critical role in supporting educator well-being, mindfulness practices need not wait for large-scale structural reform. Educators can initiate meaningful change at the classroom and collegial levels through intentional, accessible practices that cultivate presence, connection, and care. In my own teaching, I begin each class with a brief grounding meditation to help both students and myself transition from the pace of commuting and external pressures into a state of focused presence. When approached in a secular and inclusive manner, such practices respect diverse beliefs while fostering attentiveness, emotional regulation, and receptivity to learning. These small but deliberate interventions contribute to classroom environments that prioritize well-being, resilience, and sustainability. Embedding these moments of care into teaching spaces exemplifies the *undercommons* in practice, transforming spaces shaped by institutional exploitation into sites for mindfulness, presence, and human connection.

Beyond individual classrooms, faculty can cultivate grassroots mindfulness communities through shared practices such as mindful walking, tea meditation, or reflective dialogue circles. These spaces exemplify the *undercommons* in action, allowing educators to reclaim agency, solidarity, and relational care within institutions structured to exploit and marginalize them. Integrated into teaching and collegial life, educators not only sustain their own well-being but also practice a deliberate form of resistance to assert presence, humanity, and self-determination amid the precarity and disposability imposed by neoliberal academic structures.

Conclusion

Teaching is widely recognized as a high-stress profession, and Canadian HEIs, particularly NFTIs, are confronting intensified pressures shaped by automation, chronic underfunding, and abrupt policy shifts. These conditions have deepened employment precarity while systematically marginalizing educators' well-being. Drawing on Harney and Moten's *The Undercommons*, this paper has critiqued the neoliberal transformation of universities, exposing how institutional priorities increasingly privilege efficiency, profitability, and measurable outputs over relational labor, pedagogical care, and human sustainability.

Against this backdrop, this paper argues that educator well-being must be recognized as a structural and ethical imperative. Without mental, emotional, and physical resilience, educators' capacity to teach effectively, support students, or engage meaningfully in institutional transformation is severely constrained. Mindfulness practices, grounded in attentive self-awareness and embodied presence, offer concrete pathways to cultivate such resilience. Practices such as conscious breathing, walking meditation, and reflective pauses allow educators to reclaim agency, sustain themselves within precarious systems, and assert humanity in spaces designed to render them expendable. As Nhat Hanh (2008) writes, liberation emerges through learning to "live fully awake, joyfully and freshly, at ease and in peace" (p. 48). When integrated into the fissures of academic life, these practices allow educators not only to endure but to quietly rehumanize the institutions they inhabit.

To advance educator well-being more broadly, institutions must embed it into strategic planning, collective agreements, and quality assurance frameworks rather than treating it as optional or individualized. Policies should ensure equitable access to well-being resources, integrate evidence-based mindfulness practices into faculty development and teacher education, and legitimize grassroots, faculty-led initiatives without instrumentalizing them. Crucially, time for care-based practices must be protected, and the emotional and relational labor of teaching recognized. Well-being must be decoupled from narrow productivity metrics and affirmed as an ethical responsibility essential to sustaining educational quality, institutional integrity, and long-term academic resilience.

Yet educators cannot wait for institutions to act, as reforms may be performative or delayed. Through grassroots mindfulness and attentiveness, educators can realign their professional aspirations with authentic purpose, establish protective boundaries against burnout, and cultivate collective resilience. This inward turn does not signal withdrawal from institutional life; rather, it generates a ripple effect that strengthens educational communities. In an era of deep uncertainty and growing inequity, the *undercommons* approach to care becomes essential for sustaining a more just, humane, and resilient higher education system. Educators' personal and collective inner strength thus function simultaneously as survival strategies and transformative acts, nurturing the capacity to reimagine and reshape the educational landscape from within.

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Is AI the solution to the problems that make higher education "ill" in the first place? Towards a technology-agnostic, future-proof approach

Junhong Xiao [A] [A]*Open University of Shantou, China*

David CL Lim [B] [B]*Open University Malaysia, Malaysia*

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Correspondence

frankxjh@outlook.com [A]

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Abstract

Artificial intelligence (AI) is being deployed in higher education at an unprecedented scale and pace as a silver bullet for the "sick" higher education system. This opinion paper examines whether and to what extent AI is the solution to the problems that make higher education purportedly outmoded and/or dysfunctional in the first place. It begins by identifying two persistent challenges confronting the sector: uneven quality and enduring inequities in access. The discussion then turns to the deeper structural causes of these challenges, before examining four potential roles that AI is commonly assumed to play in addressing them. In doing so, the paper critically explores whether AI can meaningfully remedy higher education's underlying problems, and concludes by proposing a technology-agnostic, future-proof approach to transforming higher education in more sustainable and principled ways. The position of this paper is that the future of higher education should not hinge on any particular technology, no matter how cutting-edge it may appear. Accordingly, a fundamental principle for the selection and use of technology in higher education is proposed, whereby a technology should be adopted only when it enables educators to do what they otherwise cannot, or when it demonstrably performs better than educators at an affordable cost, or when it performs as well as educators while reducing costs. Higher education should remain open to technological advancement, but it must not allow itself to be defined by it.

Introduction

The attempt to use artificial intelligence (AI) for educational purposes dates back more than half a century (Carbonell, 1970). AI has been with educators ever since, albeit with its ups and downs. However, it was not until OpenAI released ChatGPT to the public in late 2022 that this technology came into the spotlight. The fervent enthusiasm for AI in education appeared almost overnight and has continued to gain powerful momentum. Stakeholders are no longer limited to the higher education community and EdTech businesses; they now include national governments as well as regional, international, and even global organisations such as the EU, UNESCO, and the OECD. The prevailing discourse suggests that AI is good, necessary, and inevitable for education.

Is AI always good for education? Why is it considered a necessity? What renders its use inevitable? In other words, what problems does the current higher education system face that are thought to require an AI fix? Exploring these questions is of both theoretical and pragmatic relevance to the future of higher education, which in turn has profound implications for the future of human society. While Rudolph et al. (2025a) provide illuminating insights into the impact of AI in higher education by critically interrogating eight popular myths in contemporary AI discourse, this opinion paper adopts a narrower scope and examines whether, and to what extent, AI is the solution to the problems that purportedly render higher education outmoded or dysfunctional in the first place.

The paper begins by outlining the problems facing higher education as identified in literature. It then analyzes their root causes, summarizes the potential roles of AI in addressing these problems, and evaluates whether AI can cure higher education's "illnesses". It concludes by proposing a technology-agnostic, future-proof approach to transforming higher education for the better.

What are the problems of the current higher education system in the discourse of AI?

The higher education system is not perfect. However, given that no panacea exists for all the problems of any sector of human society, we need to identify its existing problems to develop the right cures for them. This point is self-evident, though often ignored.

The arguments for using AI in higher education can be categorized into two major types according to relevant literature. One is that existing curricula and/or courses are outmoded and need updating to teach students AI-related knowledge and skills, thereby preparing an AI-capable workforce for an AI-dependent future (Gao et al., 2024; Jin et al., 2025; O Donnell et al., 2024; Zhai et al., 2021). The other is that AI can decisively expand equitable access to quality education for all and, in doing so, advance Sustainable Development Goal Four (SDG 4) (Cazzaniga et al., 2024; UNESCO, 2019; Zhai et al., 2021).

Often, problems related to these arguments are taken for granted and not spelt out (Xiao & Bozkurt, 2025). When this is the case, we infer what problems are being referred to by drawing on the theory of conversational implicatures (Grice, 1975). For example, by stating that AI "can redefine higher education, fostering an ecosystem where learning is more personalised, equitable, and efficient" (Howard & Ulferts, 2025, p. 1), the authors imply that the current system fails to sufficiently cater for individual learners' needs, ensure equitable access to education for all, and operate efficiently. Another case in point is UNESCO (2021), which outlines five master plans for using AI to address problems associated with an outdated education system. They are to:

- l leverage AI to boost and upgrade education management and delivery;
- l cultivate learner-centered use of AI to enhance learning and assessment;
- l ensure that AI is used to empower teachers;
- l plan the use of AI to support lifelong learning across ages, locations and backgrounds;
- l develop values and skills for life and work in the AI era (UNESCO, 2021, pp. 34-36).

As Mochizuki et al. (2025) aptly observe, these plans rest on the implication that current education systems suffer from inefficient administration, ineffective pedagogy and learning assessment, the disempowerment of teachers, limited flexibility, and a failure to cultivate skills deemed relevant for the future (pp. 10-11).

The first argument for AI in higher education, namely that existing curricula and/or courses need updating, is largely self-evident. The second argument, namely that AI can contribute to the delivery of SDG 4, functions more as an umbrella claim, covering a range of issues that broadly center on two concerns: the quality of higher education and access to it. It is therefore important to distinguish between AI as knowledge and skills to be taught, which underpins the first argument, and AI as a means of improving learning and teaching and widening access, which underpins the second (Xiao & Bozkurt, 2025). These two are often conflated in the literature (for example, Jin et al., 2025; Sousa et al., 2021). While university students must indeed acquire AI-related knowledge and skills (Waring, 2024), it remains, as Selwyn (2025a, p. 39) cautions, "a highly questionable presumption" that the digitization of education in itself prepares students for future forms of work. In other words, simply adopting AI as a means of educational delivery does not necessarily improve students' job readiness.

What are the root causes of higher education problems?

Looking back, higher education institutions have regularly revised and updated curricula and courses to respond to changing societal needs. A comparison between what universities offered five or ten years ago and what they offer today readily reveals this capacity for self-initiated adaptation. Such adaptability is the norm and therefore hardly warrants special emphasis, even in the case of AI. AI-related knowledge and skills will be integrated into university curricula and courses and are likely to become increasingly "invisible", much as earlier technological and disciplinary additions have been absorbed into higher education programs. Universities are able to adapt to this need on their own, whether or not national governments or regional, international, or global organizations explicitly call for the inclusion of AI in curricula and courses. Given this institutional adaptability, the remainder of the paper focuses on problems associated with the second argument, namely issues of quality and access.

The problems underlying the second argument are, broadly speaking, unsatisfactory quality and insufficient access, both of which stem from inadequate funding for higher education in the first place. Global higher education enrolment rates bear clear testimony to the impact of funding on the sector. As UNESCO (2024a, p. 32) reports, high-income countries reached an enrolment ratio of over 79 per cent in 2022, whereas the corresponding figure for low-income countries was only 10 per cent. Economically developed regions such as Europe, North America, and East and Southeast Asia consistently record much higher enrolment ratios than less developed regions, including Central and South Asia and Sub-Saharan Africa. This disparity helps explain why insufficient funding remains a major barrier to widening access to higher education. At the same time, economically developed countries are also home to the world's leading universities, including those ranked in the top 200 of the Times Higher Education World University Rankings 2025 (Times Higher Education, 2025). Moreover, North America and Western Europe remain the most attractive host regions for internationally mobile students, together accounting for 46 per cent of the global market share in 2021 (UNESCO, 2024b). Taken together, these indicators underscore the close relationship between funding levels and the quality of higher education.

If the aim is to widen access to higher education of high quality, substantial and sustained investment is required. This entails the expansion of institutional capacity through the establishment of additional universities, whether physical or virtual, the development and upgrading of infrastructure, and the recruitment and professional development of academic and support staff. In the absence of adequate funding, commitments to widening access to quality higher education risk remaining largely rhetorical. Of course, financial investment alone does not guarantee broader access or improved quality, even though it constitutes a necessary precondition. Equally critical is the capacity of higher education stakeholders to exercise agency in pursuing these goals, including their ability to mobilize contextual affordances and to deploy emerging technologies, such as AI, in ways that are pedagogically and socially meaningful. It is against this backdrop that this paper examines whether AI can meaningfully address systemic dysfunction in higher education by breaking the iron triangle of access, quality, and cost (Daniel et al., 2009).

What can AI potentially do to transform higher education for the better?

An earlier study (Xiao, 2024a) synthesizes the affordances of AI for open and distance education into four broad categories: personalization, automation, cost effectiveness, and virtual learning environments. It argues that, insofar as these affordances can be realized, they are "hardly distinguishable from those associated with campus-based higher education" (p. 18). Put differently, the application of these AI affordances is often presented as a means through which higher education, more generally, might be transformed for the better.

Personalization in higher education refers to how "AI tailors the educational process to each student's individual learning pace and assigns tasks of increasing complexity" according to learners' performance, mastery of knowledge and skills, and other idiosyncratic characteristics (Hamilton, 2020). It also involves recommending what are presented as optimal learning pathways, namely what to learn, when to learn, and how to learn. In this sense, personalization overlaps with adaptation and customization (Taylor et al., 2021) and is used in this paper as an umbrella term encompassing both for the sake of analytical convenience. It is widely argued that AI can address the lack of personalized attention to individual learners in large-scale educational settings (Lodge et al., 2023), thereby enhancing educational quality. AI-enabled personalization is said to cover a wide range of activities, including but not limited to:

- personalizing learning support (Wang et al., 2023), instruction and feedback (Paskevicius, 2024), and assessment (Naidu & Sevnarayan, 2023);
- enabling learning at one's own pace (Crompton & Burke, 2023);
- customizing instructional content based on individual students' needs and actual level of competence (Howard & Ulferts, 2025);
- offering one-on-one tutoring (Zawacki-Richter et al., 2019).

Automation is increasingly normalized on administrative fronts, integral to routine university businesses (Xiao, 2023). A typical case in point is the "invisibility" of learning management systems, which are becoming increasingly intelligent and can provide more and more "automated" services.

Closely related to automation is the promise of cost effectiveness. The primary rationale for automation in education is to reduce manual input by institutions and to increase efficiency, thereby lowering costs. It is often further claimed that automated outputs can match, or even surpass, the work of education professionals. For instance, Naidu and Sevnarayan (2023, p. 3) argue that "AI powered assessment tools can provide more accurate and objective assessments compared to human assessors, at a fraction of the cost." This line of reasoning suggests that cutting-edge technologies such as AI make it possible to provide quality education to larger numbers of learners without increasing expenditure, thereby widening access to quality education. A similar logic underpins UNESCO's (2019) Beijing Consensus on Artificial Intelligence and Education, which, in its Preamble, reaffirms the commitment first articulated in the Qingdao Declaration in 2015 to harness emerging technologies "to strengthen education systems, access to education for all, quality and effective learning, and equitable and more efficient service provision" (Article 3). The document further "reaffirm[s] that technological breakthroughs in the field of AI in education are an opportunity to improve access to education for the most vulnerable groups" (Article 22). Taken together, these claims reflect a broader narrative advanced by national governments and international and global organizations, in which technology-enabled cost effectiveness is presented as a means of simultaneously expanding access and enhancing quality in higher education (Marín et al., 2022; Munro, 2018; World Bank, 2020).

Using AI to create virtual learning environments can enhance the learning experience by allowing "students to explore and revise more complex phenomena in ways that traditional methods of teaching may not address" (Rajan et al., 2025, p. 1; also see Papaioannou et al., 2023). Such environments are also presented as a means of addressing safety concerns and accessibility constraints, as they enable learning in contexts that are "inherently

dangerous, costly to access, or logistically impractical for students to visit in person" (Hanna, n.d.). Virtual learning environments are therefore considered particularly relevant for off-campus learners. They can, for example, support virtual field trips to museums or historical sites, facilitate the acquisition of hands-on skills in simulated settings, and enable collaboration across multiple remote locations (Lee et al., 2021; Ryan & Knight, 2023). One illustrative example is the use of 360-degree virtual learning environments, which allow engineering students working remotely to access sites that would otherwise be unavailable to them (Shih et al., 2022).

Can AI cure higher education "illnesses"?

In this section, we examine how and to what extent AI can widen access to quality higher education. More specifically, we ask whether AI-enabled personalization, automation, and virtual learning technologies can enhance educational quality and, at the same time, contribute to broader access to higher education, and if so, to what extent.

(AI-enabled) personalization

"One to one human tutoring has long been thought to be the most effective approach to teaching and learning (since at least Aristotle's tutoring of Alexander the Great!)" (Luckin et al., 2016, p. 24). Bloom's (1984) seminal "2 sigma" study further intensified enthusiasm for personalization as the putative holy grail of education and has since become a key theoretical reference point for AI-enabled personalization. Bloom (1984) compared student achievement under three instructional conditions. In the conventional model, a teacher taught a class of approximately thirty students and assessed learning through periodic tests. In the mastery learning model, conventional instruction was supplemented with feedback, alongside "corrective procedures and parallel formative tests to determine the extent to which the students have mastered the subject matter" (Bloom, 1984, p. 4). The tutoring model closely resembled mastery learning, except that students studied the subject matter individually or in very small groups under the guidance of a tutor. Bloom's findings showed that students in the tutoring and mastery learning conditions performed approximately two standard deviations and one standard deviation higher, respectively, than those in the conventional classroom. However, Bloom also noted that one-to-one tutoring "is too costly for most societies to bear on a large scale" (Bloom, 1984, p. 4), giving rise to what later became known as the "2 sigma" problem. Today, AI-driven personalization is frequently promoted as a solution to this problem. As Sam Altman (2024), founder of OpenAI, has suggested, "our children will have virtual tutors who can provide personalized instruction in any subject, in any language, and at whatever pace they need."

Is one-on-one tutoring the most effective pedagogy across subject matters and levels of education? The one-on-one tutoring referred to by Bloom (1984, p. 4) involved "students at grades four, five, and eight and with two different subject matters, Probability and Cartography." The intervention lasted just over three weeks and comprised eleven instructional sessions. Although the study was replicated with four student samples, it remains unclear whether the reported learning gains reflected durable learning or were partly attributable to novelty effects associated with the short duration of the intervention. Moreover, a pedagogy that proves effective for particular subject areas at the elementary or secondary level may not translate equally well to other disciplines or to university-level education. The question may, therefore, be reframed as follows: Is one-on-one tutoring the most universally effective pedagogy? Evidence suggests otherwise. A recent meta-analysis indicates that individualized instruction is not among the most effective approaches, with effect sizes reported as follows: "individual instruction d = 0.24, one-on-one laptops d = 0.16 compared to cooperative learning d = 0.55, and collaborative learning d = 0.46" (Hattie & O'Leary, 2025, p. 16). In light of these findings, one-on-one tutoring appears to yield mixed outcomes at best, with no clear consensus regarding its overall effectiveness (Linderoth et al., 2024).

Should learning be conceived as an obstacle-free, linear, and sequential journey, as implied by models of one-on-one tutoring? As Farthing (2025) argues, "education, at its best, is about exploration, freedom, and the messy, often non-linear journey of learning. Mistakes, detours, and curiosity are not inefficiencies to be optimized away; they are the substance of learning itself" (see also Konstantinidis, 2025). This view is particularly pertinent in the context of higher education. By contrast, one-on-one tutoring as conceptualized in Bloom's (1984) work tends to optimize away such "inefficiencies", a move that risks infantilizing education (Hillman & Couldry, 2025). As a resul-

-t, it sits uneasily with the aims of higher education, which include the cultivation of adaptive, autonomous, and agentic learners.

Is AI-enabled personalization the solution to Bloom's (1984) "2 sigma" problem in terms of educational quality? To address this question, it is first necessary to clarify how AI-enabled personalization currently operates. Put simply, such personalization relies on patterns of typicality, large-scale data, and predictive algorithms. Individual learners' knowledge and competencies are matched against established patterns, on the basis of which recommendations are generated. Unlike human teachers, however, an AI tutor is not "a relational partner" (Sidorkin, 2025, p. 1218), as it cannot bring its own experiences, emotions, or social understanding to the learning process (p. 3). Learning, as Prinsloo (2025) argues, should involve "a range of formal but also serendipitous inter- and intra-actions with human and non-human actors and networks" (p. 72). By contrast, AI-enabled personalized learning tends to operate within calculable frameworks that reduce learners "to objects within calculable frameworks, stripping away opportunities to engage with and learn to manage real-world complexities" (Hillman & Couldry, 2025, p. 1). Moreover, genuine personalization, as exemplified by human tutoring, is inherently idiosyncratic and involves bespoke support tailored to individual learners. AI-enabled personalization, by contrast, amounts at best to mass customization (Mamlok, 2021) or what has been described as generic personalization (Xiao, 2024b). While AI tutors may take on some functions associated with human tutors, they are no substitute for them.

At present, there is little robust evidence that AI can perform as well as, let alone better than, educators, particularly at scale and over the long term (Holmes, 2023; Porayska-Pomsta et al., 2023). Much of the existing research in this area falls short of the methodological rigor required to support firm conclusions. For instance, Weidlich et al. (2025) show that common methodological weaknesses, including "loosely defined treatments, mismatched or opaque controls, and outcome measures with unclear links to durable learning", render many claims about the effectiveness of ChatGPT unfounded (p. 1). In this sense, the evidence base currently available is not one that can be relied upon with confidence. This assessment is echoed by Tuomi (2025), who argues that existing empirical research on AI in education "should not be used to guide policy or practice" because of persistent methodological and conceptual shortcomings (p. 1). In a similar vein, Mochizuki et al. (2025) contend that there is "no plausible explanation" for why AI should or could be expected to fix an outmoded education system (p. 11). Taken together, these critiques suggest that substantially more rigorous research is required before it is possible to determine whether, and if so how and to what extent, AI-enabled personalization can meaningfully contribute to the quality of higher education.

Automation

Automation can generate high levels of productivity, albeit often in the short term. However, efficiency should not be conflated with effectiveness. In education, efficiency is not always a desirable goal. For students, one of the most consequential paradigm shifts associated with automation is cognitive offloading, defined as "the use of physical action to alter the information processing requirements of a task so as to reduce cognitive demand" (Risko & Gilbert, 2016, p. 676). From the perspectives of neuroscience, cognitive psychology, and learning theory, extensive offloading of declarative and procedural cognitive activities to AI risks undermining students' reasoning, critical thinking, creative problem-solving, and productivity over time. This is because genuine expertise and insight develop through the internalization of knowledge, specifically through its progression from the declarative system to the procedural system (Gerlich, 2025; Oakley et al., 2025; Walter, 2024; Zhai et al., 2024). Persistent reliance on external tools for cognitive work can result in what has been described as cognitive debt, which "defers mental effort in the short term but results in long-term costs, such as diminished critical inquiry, increased vulnerability to manipulation, [and] decreased creativity" (Kosmyna et al., 2025, p. 141). These concerns are reinforced by empirical evidence from a study of 348 students, many of whom reported that AI made them less independent and less critical in their thinking, more comfortable with automation, and more susceptible to algorithmic bias (Mohammadkarimi & Omar, 2025).

Moreover, AI systems remain vulnerable to misinformation, error, and bias, with responsibility for identifying and correcting these problems frequently shifted onto learners themselves. Universities often instruct students to "think critically about GenAI and carefully evaluate, fact check, and verify the information from GenAI" because

"the output of GenAI models may be inaccurate, misleading, biased, and even fictitious" (An et al., 2025, p. 18). Yet this expectation is difficult to justify. If students are required to take responsibility for verifying the accuracy and reliability of what they learn from AI systems, the rationale for the continued central role of universities as epistemic authorities becomes increasingly unclear.

As for teachers, automation is often presented as a means of relieving them of labor-intensive and time-consuming tasks, thereby reducing workload and allowing greater focus on what is framed as more meaningful work. Common examples include the use of AI to mark assignments, generate feedback, prepare lesson plans, and create educational resources. Yet such claims invite closer scrutiny of both their necessity and effectiveness. Marking assignments, providing feedback, and designing lessons are core components of teachers' professional responsibilities, for which they are employed and trained. What, then, are the more important tasks that would justify offloading these responsibilities to machines? Moreover, how frequently do teachers face student numbers so large that assessment and feedback become unmanageable without automation? Where such conditions exist, why should investment in AI be preferred over the employment of additional teaching staff? There is also limited evidence that AI can perform these tasks as well as human teachers, let alone better or at a lower cost. Finally, it is worth questioning whether the routine creation of instructional resources by individual teachers is always necessary, or whether alternative organizational solutions might address this issue more effectively.

Empirical evidence does not support the claim that automation saves time or reduces teachers' workloads. Research indicates that substantial, and often invisible, manual input by teachers is required for AI-driven automation to function at all (Selwyn et al., 2025; Sperling et al., 2023). Teachers must continually reskill and upskill in order to use AI competently, while also reviewing, correcting, and in some cases reworking AI-generated outputs. Equally important are the implications for teachers' professional practices and identities. Many of the so-called "mundane" and labor-intensive tasks targeted for automation are integral to teachers' professional learning and development (Frelin, 2013). If teachers no longer engage in these practices, or are no longer capable of doing so, their professional status is fundamentally undermined. For example, marking and commenting on assignments play a crucial role in helping teachers understand their students and informing subsequent lesson planning. Without such engagement, it becomes unclear how teachers can judge whether AI-generated lesson plans are fit for purpose in specific educational contexts, or how they might meaningfully adapt and improve them. As Mutton et al. (2011, p. 399) observe, "it is through [lesson] planning that teachers are able to learn about teaching and through teaching that they are able to learn about planning." From this perspective, the risk of deprofessionalizing education through automation cannot be overstated.

By comparison, investment in automating back-end administrative operations may be justified where it demonstrably reduces human input and workload (Xiao, 2024a). Even so, particular caution is warranted when automation is applied to high-risk functions with direct consequences for students, such as identifying potential dropouts, flagging at-risk learners, e-proctoring, plagiarism detection, student counseling, and career advising. Overall, there remains little conclusive evidence that automation has a positive impact on the quality of higher education. At present, its effects, whether beneficial or detrimental, remain largely conjectural rather than empirically established.

Virtual learning environment

Virtual learning environments are often presented as having significant potential to enhance educational quality. As noted earlier, such environments enable students to engage in activities that would otherwise be too dangerous, too costly, or impractical to undertake in physical settings. In doing so, they may contribute to more effective learning through increased engagement and, in some cases, improved learning outcomes. A synthetic review of the literature suggests that the use of virtual learning environments in higher education can indeed improve and enrich students' learning experiences, albeit with important limitations (Rajan et al., 2025). According to this review, learning gains vary considerably depending on the specific environment or technology deployed (see Table 5 in Rajan et al., 2025). That said, these potential benefits are contingent upon a critical precondition, namely, whether universities are able

to afford the substantial costs associated with developing, implementing, and maintaining such environments.

Cost

In policy documents issued by governments and international or global organizations, such as the OECD (2021, 2023), cost is rarely treated as a significant constraint (Xiao & Bozkurt, 2025). The prevailing assumption appears to be that the more cutting-edge a technology is, the more educationally useful it will be, and the more cost-effective education will become as a result. However, this "newer is better and cheaper" rhetoric runs counter to empirical realities (Chihi & Peral, 2022). In practice, the more advanced a technology is and the broader the range of use cases it supports, the more expensive it tends to be (Córdova-Esparza, 2025). As Likhadzed (2025) explains, the cost of AI is shaped by five interrelated factors: software type, data volume and quality, level of intelligence, algorithmic accuracy, and system complexity. Costs rise as demands across these dimensions increase. From the perspective of quality assurance, universities must ensure that AI systems are customized "to cater for the specificity and diversity of use cases, namely their courses and programs" (Xiao, 2024a, p. 17). This requirement places high demands on all five dimensions identified by Likhadzed (2025), rendering such systems far from cost-effective. Moreover, AI deployment is not a one-off investment. Beyond initial acquisition, institutions must account for supporting infrastructure, ongoing maintenance and updates, routine technical support, and recurring subscription fees, all of which pose substantial challenges to the large-scale use of AI in higher education (Rajan et al., 2025; Shete et al., 2024).

The demand for substantial financial investment also has direct implications for students, who must have access to stable internet connectivity and appropriate devices to benefit from AI-based solutions (Slegers et al., 2025). The University of South Africa provides a telling example. Many students were unable to use ChatGPT-4 because of its monthly subscription fee of USD 42, a sum that may be negligible for students in highly-developed contexts but constitutes a significant barrier elsewhere (van Wyk et al., 2023). Similarly, Kouam and Muchowe (2025) identify "the high cost of premium AI platforms, internet accessibility issues, and potential social skills deficits" as major obstacles to "mitigating the equity gap in educational access in Zimbabwe" (p. 154). Taken together with the continuing and substantial financial demands placed on universities, these realities raise a critical question: are AI-enabled personalization, automation, and virtual learning environments genuinely cost-effective approaches to widening access to quality higher education?

Conclusion

The imperative to fundamentally rethink the relationship between education and technology

Can AI cure higher education "illnesses"? In terms of educational quality, despite the rapid and widespread adoption of AI across higher education, "our comprehension of how these tools should be effectively integrated remains limited, and their impact is still insufficiently explored and mapped. This shortfall in understanding poses inherent risks to their implementation in higher education" (Noroozi et al., 2025, p. 1425). Put simply, the jury remains out on whether AI can meaningfully enhance higher education quality. Moreover, like all technologies, AI is a double-edged instrument. While it may address certain problems, it is also likely to introduce new ones. For example, tools such as ChatGPT are promoted as a means of automating the marking and commenting on written assignments and reducing teachers' workloads, yet they simultaneously function as powerful instruments for plagiarism. More broadly, the use of AI in higher education is associated with a wide range of risks, contested practices, and unresolved grey areas. This calls for caution regarding when, how, and at what scale AI should be deployed (Xiao et al., 2025). Given that education shapes the future of humanity, its transformation demands careful and responsible deliberation. Unless AI is used for the right purpose, in the right way, and in the right context, the damage done to higher education may be difficult, if not impossible, to undo.

In terms of widening access, AI is far from inexpensive, particularly when effective deployment requires customization to address the complexity, diversity, and contextual specificity of higher education. To date, there is little, if any, rigorous research examining whether and how AI can make higher education more cost-effective

and, by extension, more affordable and accessible. Determining whether AI can break the iron triangle of access, quality, and cost should therefore be a central focus of future research and praxis, much as open universities worldwide did from the 1970s to the 1990s when they sought to justify the use of technology to deliver distance education at scale (Daniel et al., 2009).

For decades, almost every new generation of technology, even when not developed with education in mind, has generated renewed hype about its capacity to disrupt and transform higher education by curing long-standing educational "illnesses". The arrival of a new technology is frequently treated, explicitly or implicitly, as a once-and-for-all solution to whatever problems are perceived to be afflicting education at the time. As a result, education is often reshaped to fit technology, rather than the other way around, so that technology can be seen to deliver its purported curative effects. Put differently, innovation is framed as the imperative to ensure that a new technology is used, often by identifying, exaggerating, or even manufacturing problems for it to solve in order to demonstrate its educational value. This is what Selwyn (2012) famously described as a "solution in search of a problem". Under such conditions, more attention is paid to sustaining hype around new technologies than to assessing whether they actually live up to their promises. Otherwise, it would be difficult to explain why the repeatedly lamented dystopia of higher education has yet to be transformed into the utopia so confidently promised by successive technological waves, or why greater realism has not emerged regarding the limits of technology in addressing deep-seated educational problems.

Many higher education stakeholders appear not to have moved beyond the fantasy sustained by recurring technological hype. As Selwyn (2025b) sharply observes, a prevailing "sense of digital resignation" characterizes dominant narratives, grounded in the belief "that there are no feasible alternatives to current dominant forms of digitization, and that education simply needs to respond to any new technology (such as Generative AI) as best as possible" (p. 6). Digital resignation is, in effect, another expression of technological determinism. As argued earlier, cutting-edge technologies are not inevitable for higher education, not least because they have yet to demonstrate an ability to break the iron triangle of access, quality, and cost. Indeed, many educational problems "are often non-technological in nature and require no technological fixes", given that "students' lack of privileged access to frontier technologies is no barrier to learning success", as educators from open universities committed to widening access to quality higher education attest convincingly (Lim et al., 2024, p. 282). At the same time, digital resignation reinforces a logic in which educational innovation becomes a race toward ever newer technologies, creating a self-perpetuating cycle of addressing old problems while generating new ones. This dynamic may help explain why the educational transformations repeatedly promised by successive technological waves have yet to materialize.

AI will, in time, be superseded by newer technologies, much as it has itself outperformed its predecessors. This raises a fundamental question: what is gained by entering yet another "digital revolution", namely the AI revolution, when we have yet "to come to terms with the sweeping social and educational implications of these earlier revolutions, which are still unfolding" (Giannini, 2023, p. 2)? At what point might the race toward ever newer technologies reach its limits? How can higher education problems be foregrounded over technological advancement in efforts to widen access to quality education? And how might emerging technological affordances be harnessed in ways that genuinely serve the purposes of higher education? These questions are far from exhausted and point to a broader agenda for sustained inquiry.

The relationship between education and technology, therefore, requires fundamental rethinking. Technology should serve education, not the reverse. Technology does not, in itself, empower higher education; rather, it is the education stakeholders who must exercise agency in directing technology toward the goals of quality and access. Technology is never the determining driver of higher education outcomes. Put differently, expanded access to quality higher education does not automatically follow from the adoption of new technologies. What ultimately matters is not the affordances of technology per se, but whether and how a particular technology is educationally beneficial within a given context. When reform is driven primarily by technological affordances, technology-led or technology-centric approaches risk doing more harm than good. A salient example is the use of AI, which may, in practice, reduce access to higher education by re-marginalizing learners who already struggle to afford tuition, let alone those who are excluded from higher education altogether.

Towards a technology-agnostic, future-proof approach

For the betterment of higher education, a technology-agnostic, future-proof approach is needed to address its persistent "illnesses". Higher education should remain open to technological innovation, but its future should not

hinge on any particular technology, regardless of how advanced or intelligent it may appear. In this regard, minimal computing offers useful insights into how technology might be deployed to ameliorate structural weaknesses in higher education. Minimal computing is described as "a mode of thinking about digital humanities praxis that resists the idea that 'innovation' is defined by newness, scale, or scope" (Risam & Gil, 2022, para. 3). Instead, it emphasizes contextualized decision-making, whereby "only the technologies that are necessary and sufficient for developing digital humanities scholarship in such constrained environments" are adopted (Risam & Gil, 2022, para. 4).

Informed by minimal computing thinking, we propose a fundamental principle to guide the choice and use of technology in higher education: new technology should be adopted only when it can do what educators are incapable of doing, or when it can do better than educators at an affordable cost, or when it can perform as well as educators at a lower cost. This principle can be operationalized through a set of heuristic questions to support decision-making. What problems within the current higher education system require attention? What are the underlying causes of these problems? Can they be addressed by educators alone? Where this is not the case, which technologies, if any, are capable of addressing them? If multiple technological options are available, which is preferable in terms of effectiveness, affordability, and accessibility? Where both educators and technology are capable of addressing a problem, which intervention offers greater educational benefit across these same criteria? In short, problem-solving should be centered on higher education itself, rather than on reshaping higher education to fit a particular new technology (Xiao & Bozkurt, 2025).

"Successful technology-based learning cannot be guaranteed, and when it does occur results from careful planning and sustained teacher support (not all of which can be computerized)" (Selwyn, 2025a, p. 37). From pedagogical and contextual perspectives, no technology is inherently outmoded; what matters instead is fitness for purpose. By adopting a technology-agnostic approach, higher education can avoid being driven by the hype surrounding successive waves of emerging technologies. Technology should be employed only "where it demonstrably supports student learning and development" without compromising "academic integrity or sound pedagogy" (Rudolph et al., 2025b, p. 6). Ultimately, higher education should be defined by what universities are intended to do, rather than by what any particular technology is claimed to enable. Without such restraint, the sector risks remaining trapped in an endless race toward ever newer technologies, often at the expense of its own educational purposes.

Key takeaways for policymakers and institutional leaders

1. AI is not a cure for structural problems in higher education.
The two persistent "illnesses" of higher education remain uneven quality and inequitable access. These challenges are rooted primarily in structural underfunding rather than technological absence. AI cannot compensate for chronic investment gaps in infrastructure, staffing, and institutional capacity.

2. The "iron triangle" remains unbroken.
There is currently no robust evidence that AI simultaneously improves quality, expands access, and reduces cost at scale. Claims that AI can break the iron triangle of access, quality, and cost remain largely aspirational rather than empirically demonstrated.

3. Personalization is not synonymous with educational quality.
AI-enabled personalization amounts largely to mass customization based on data patterns, not genuine relational tutoring. Evidence that one-on-one AI tutoring produces durable learning gains in higher education is inconclusive. Policymakers should avoid equating algorithmic optimization with meaningful learning.

4. Efficiency should not be mistaken for effectiveness.
Automation may increase short-term productivity, but efficiency does not automatically enhance educational quality. In some cases, automation risks:

- cognitive offloading and long-term "cognitive debt" in students;
- over-reliance on algorithmic outputs;
- erosion of teachers' professional expertise and judgement.

5. Automation may deprofessionalize teaching.
Tasks often targeted for automation, such as assessment and lesson planning, are integral to teachers' professional growth and pedagogical insight. Removing these functions without careful evaluation risks undermining academic professionalism and educational quality.

6. Virtual environments show promise but are resource-intensive.
AI-enabled virtual learning environments can enhance experiential learning, particularly where physical access is constrained. However, their effectiveness varies significantly by discipline and implementation, and they require substantial upfront and ongoing investment.

7. AI deployment is rarely cost-neutral.
Contrary to policy rhetoric, advanced AI systems are expensive to customize, maintain, and scale. Costs include:

- software development and licensing;
- infrastructure and technical support;
- continuous updates and maintenance;
- student access to devices and stable connectivity.

In lower-income contexts, subscription fees alone may constitute a barrier to access.

8. Technological hype risks policy capture.
Higher education repeatedly encounters waves of technological determinism in which each new innovation is framed as transformative. Policymakers should resist "digital resignation", namely the belief that institutions must adapt uncritically to every emerging technology.

9. Many higher education challenges are non-technological.
Access gaps, quality disparities, and funding inequities are fundamentally socio-economic and political issu--es. Technological solutions cannot substitute for structural reform, sustained investment, and institutional agency.

10. Technology should serve education, not define it.
The future of higher education should not be contingent on any single technology, however advanced. Reform must remain problem-driven rather than technology-driven.

Strategic implications for decision-making

The transformation of higher education requires prudence, not technological accelerationism. Technology may contribute to reform, but it cannot substitute for institutional agency, sustained investment, and principled governance. Therefore, the proposed technology-agnostic, future-proof approach offers a more sustainable path forward. This approach carries several implications for making strategic decisions:

- Consider adopting a technology only if it meets at least one of the following conditions: (a) enabling educators to do what they otherwise cannot do, (b) performing demonstrably better than educators at an affordable cost, in other words, doing as well as educators while reducing costs.
- Invest first in structural capacity: funding, staffing, and infrastructure.
- Demand rigorous, long-term evidence before scaling technological solutions.
- Evaluate technology initiatives against educational purpose, not novelty.
- Protect academic professionalism and pedagogical integrity.
- Prioritize contextual, minimal, and sufficient technological use.

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Book review of Catherine J. Denial (2024). A pedagogy of kindness. University of Oklahoma Press, Norman.

Fiona Xiaofei Tang[A] [A]*Kaplan Business School, Australia* **DOI:** https://doi.org/10.37074/jalt.2026.9.1.4

Introduction

I came to *A Pedagogy of Kindness* (see Figure 1) not through an abstract interest in affective approaches to teaching, but through a moment of professional recognition. While reviewing a draft of my teaching philosophy statement for my HERDSA (Higher Education Research and Development Society of Australasia) Fellowship portfolio, my mentor observed that much of my teaching and mentoring practice appeared to be grounded in what she depicted as a pedagogy of kindness. At the time, I had not articulated my work in these terms. The comment prompted both curiosity and reflection. I was curious as to whether such a pedagogy had been expressed with conceptual clarity and scholarly rigour, and reflective about why I had long enacted these practices without clearly theorising them.

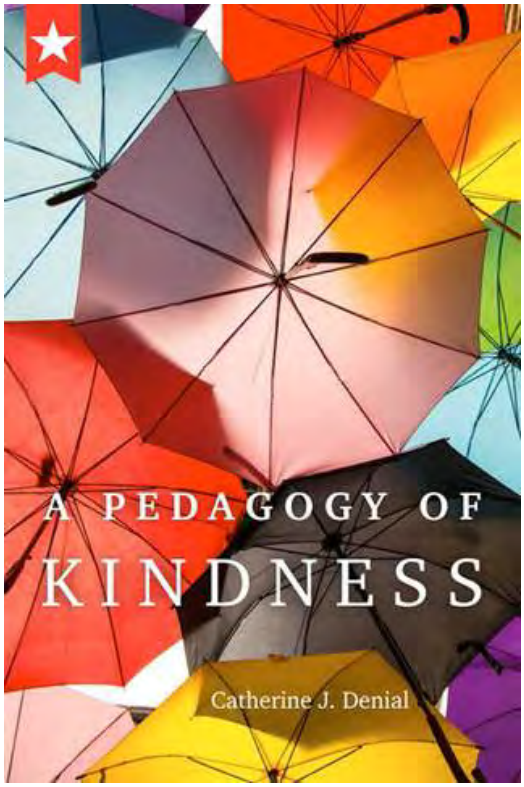

Figure 1: The book cover of *A Pedagogy of Kindness*.

Catherine J. Denial's book responds directly to this tension. She insists that kindness in higher education is intentional, ethical, and intellectually serious. Kindness, as Denial conceptualises it, is not sentimental softness, but a deliberate pedagogical stance that shapes how educators relate to students, colleagues, and themselves. This positioning is consistent with recent higher education scholarship that argues kindness deserves clearer conceptual definition and stronger empirical attention, as opposed to being treated as an intuitive personal trait (Fox & Aspland, 2024).

My own educational practice spans language teaching, TESOL scholarship, and academic development work coaching educators across multiple campuses and disciplines. I often describe myself as a bridge builder in higher education, connecting cultures, disciplines, and levels of expertise through equity, collaboration, and scholarly inquiry, shaped by a career across varied institutional contexts. Reading Denial's book helped me recognise that what I have framed as bridge building also carries a more precise pedagogical identity, namely, kindness as an enacted ethic, expressed through design choices, discourse practices, and the everyday ways we make learning possible.

Organisation

The book is organised into an introduction, four thematic chapters, and a concluding reflection. This structure reflects Denial's core claim that kindness must be implemented holistically, beginning with the educator and extending into curriculum, assessment, and classroom interaction.

The introductory chapter establishes kindness as a rigorous pedagogical ethic instead of an optional disposition. Denial draws her own experiences in higher education to critique norms that prioritise control, surveillance, and compliance at the expense of trust and relationship. She reflects on how academic cultures can train educators into suspicion, especially through assumptions about student motivation and academic integrity. She also traces how her teaching changed when she began to regard trust, dialogue, and shared responsibility as the starting points for learning. In this way, the introduction reads as both reflective narrative and ethical argument. Besides, it complements the claim in Fox and Aspland's systematic review that kindness in higher education is commonly discussed implicitly yet rarely defined with sufficient precision, even though it is increasingly visible across teaching and learning discourses (Fox & Aspland, 2024).

Chapter 1, *Kindness toward the Self*, turns inward. Denial contends that pedagogical kindness cannot be sustained by educators who are exhausted, isolated, and pressured to treat overwork as virtue. She offers constructive strategies for self-directed kindness, including investing in pedagogical development, placing boundaries around email, taking time away from work, scheduling rest and nourishment, protecting one's capacity to say no, and refusing to go it alone through forms of pedagogical mutual aid (Denial, 2024, pp. 26-35). This chapter is consonant with my work experience of supporting academic colleagues through communities of practice and mentoring relationships, where professional learning and emotional sustainability are inseparable.

Chapter 2 then reframes the syllabus as an ethical document rather than a bureaucratic artefact. Denial interrogates punitive language and hidden expectations that can intensify student anxiety and erode trust. She argues for clarity, transparency, flexibility, and invitational language that respects students as capable partners in learning. This argument intersects with student-centred leadership narratives within my current institutional context. In a previous interview with the Academic Dean of Kaplan Business School, Professor James Adonopoulos, the emphasis on discourse-based workshops instead of conventional knowledge-transmission lectures, and on cultivating an inclusive and psychologically safe academic culture, provides a concrete institutional example of how student-centred values can be operationalised through academic staff development and teaching culture (Vojinovikj et al., 2024).

The third thematic chapter confronts a common fear that kindness undermines standards. Denial rejects this dichotomy, articulating that rigorous learning can coexist with humane assessment when educators foreground feedback, transparency, opportunities for revision, and assessment design that supports growth rather than merely sorting. Her stance aligns with longstanding assessment for learning principles that position feedback as a driver of

learning and agency as distinct from a post hoc judgement (Black & Wiliam, 2009).

Chapter 4, *Kindness in the Classroom*, focuses on daily pedagogical interaction. Denial accentuates listening, responsiveness, and acknowledgement of students as whole persons with complex lives beyond the classroom. Importantly, she distinguishes kindness from permissiveness. Kindness in her representation involves clarity and ethical judgement, including boundaries that protect both students and educators.

The concluding chapter synthesises these strands and reiterates kindness as a sustainable practice in contrast to a set of isolated techniques. Denial positions kindness as both individual and collective work, shaped by institutional cultures and professional norms. She also challenges educators to extend kindness into policy, leadership, and collegial relationships, maintaining that pedagogical choices always situate within broader structures.

Critical evaluation

A *Pedagogy of Kindness* makes a substantive contribution to contemporary discussions of teaching through establishing kindness as a legitimate and intellectually grounded pedagogical ethic. Denial refuses to reduce kindness to a personality trait or a 'feel good' gesture. Instead, she considers it as an intentional practice that informs how educators design learning, exercise judgement, and sustain their work over time. This conceptualisation enables educators to recognise forms of relational and emotional labour not as peripheral to academic work, but as central to pedagogical responsibility.

One of the book's strengths is its careful integration of reflective narrative and pedagogical reasoning. Denial's use of her personal journey demonstrates how teaching practices are shaped by ongoing reflection, professional learning, and ethical reconsiderations. This approach invites readers to examine their own assumptions about authority, care, and responsibility in teaching, while allowing space for diverse disciplinary and institutional interpretations.

Noteworthily, the book is persuasive in its insistence that kindness is compatible with rigour and professional boundaries. Denial resists the notion that compassionate pedagogy entails lowered expectations or unstructured conduct. She presents kindness as requiring clarity, consistency, and ethical judgement. This distinction is particularly valuable in higher education contexts where educators may experience tension between care for learners and accountability demands.

A limitation, however, is that Denial's examples are primarily contextualised in the North American higher education sector. Readers working within different regulatory settings may need to translate her practices into their local constraints and professional expectations. But this limitation does not diminish the book's overall contribution. Rather, it draws our attention to the importance of contextual interpretation and reflective adaptation when engaging with pedagogical scholarship.

For me, the most lasting value of *A Pedagogy of Kindness* lies in the clarity it brings to practices I had previously undertaken without naming them. The book presented a vocabulary through which my work as an educator and professional development mentor could be understood not simply as supportive or relational, but as underpinned in an explicit pedagogical framework. In this sense, Denial's contribution is not only descriptive but enabling, giving an opportunity to educators to claim kindness as a legitimate foundation for rigorous, reflective, and sustainable academic practice.

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Book Review of Jasper Roe (2025). How to use Generative AI in educational research. Cambridge Elements. Research Methods in Education.

Shannon Tan[A] [A]*Amity Global Institute, Singapore*

DOI: https://doi.org/10.37074/jalt.2026.9.1.7

Introduction

Jasper Roe's *How to Use Generative AI in Educational Research* offers a clear and well-structured examination of GenAI's growing presence in academic work. Across nine chapters, he develops a careful argument: GenAI is neither a dramatic revolution nor a neutral tool. Instead, it is a context-dependent technology whose outputs can be helpful, misleading, or incomplete depending on how researchers approach it. Roe encourages critical literacy, transparency, and deliberate use—qualities he believes are essential for any meaningful integration of GenAI into scholarly practice.

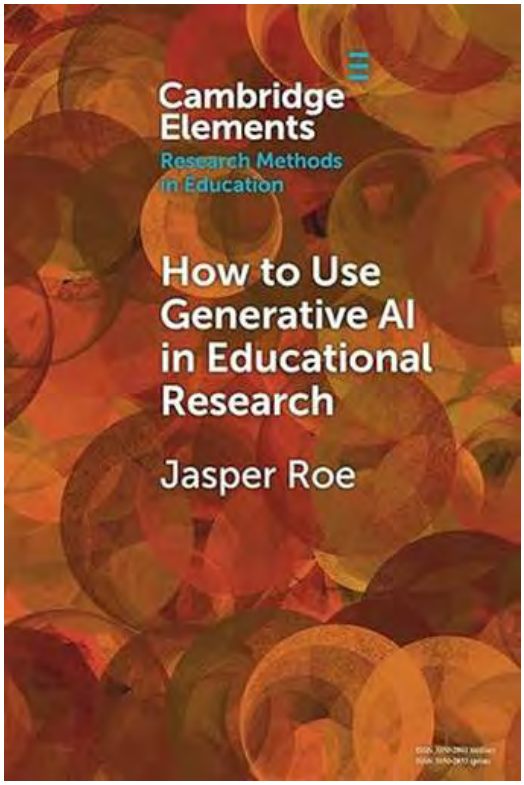

Figure 1. The book cover of *How to Use Generative AI in Educational Research.*

The book opens with an important clarification of terminology. Roe distinguishes between artificial intelligence (the broader field), generative AI (systems that produce content), large language models (the underlying architectures), and branded interfaces such as ChatGPT (user-facing applications). While this may seem basic, Roe demonstrates how conceptual slippage leads to inflated expectations or misplaced fears. For him, precise language anchors responsible research design and prevents scholars from attributing capabilities to GenAI that it simply does not possess.

From there, Roe positions GenAI as both familiar and unsettling. Its convenience makes it easy to adopt, yet its influence on academic thinking is far from straightforward. Roe avoids framing GenAI as inherently positive or negative; instead, he describes it as a cognitive accelerator that alters—not replaces—research labour. Productivity may improve, but this gain comes with heightened responsibility for checking accuracy, tracking sources, and disclosing the tool's involvement.

Roe then situates GenAI historically. Rather than emerging from pedagogical innovation, GenAI entered higher education through broader social and technological shifts: post-pandemic digital adoption, the expansion of commercial EdTech, and increasing pressure to manage academic workload. Roe notes that these tools were built with fluency and speed in mind, not with educational integrity or epistemic accuracy as core design features. This historical context lays the foundation for later warnings about misplaced trust.

The book continues with a theoretical mapping of how GenAI relates to educational perspectives such as social constructivism, connectivism, and critical pedagogy. Roe argues that while GenAI can support idea generation, drafting, and organisation, it cannot interpret meaning, negotiate understanding, or exercise judgement. He cautions against the common tendency to anthropomorphise AI outputs simply because they appear confident or coherent.
Roe then outlines several potential benefits: increased productivity, enhanced creative ideation, support for multilingual scholars, and opportunities for studying GenAI itself. These advantages, however, do not automatically elevate scholarly quality. Roe stresses that efficiency does not guarantee depth, and that cognitive shortcuts can obscure genuine understanding.

He follows this with a detailed discussion of risks, including hallucinations, fabricated sources, and the illusion of coherence that may mislead inexperienced researchers. He also highlights a practical paradox: GenAI makes early drafting faster, but increases the time needed to verify whether those drafts are accurate or conceptually sound. Additional concerns include the reproduction of biases embedded in training data and issues of privacy when users unknowingly share sensitive material.

One of the book's most practical contributions is its walkthrough of how GenAI can support the research process. Roe provides examples of how the technology can help refine research questions, structure literature reviews, draft methodological sections, offer preliminary coding suggestions in qualitative work, and improve clarity in writing. His emphasis, however, remains consistent: these outputs are starting points, not finished products, and must be examined critically.

The final chapters turn toward future developments. Roe anticipates that GenAI will become increasingly integrated into scholarly infrastructure—through automated summarisation tools, AI-assisted peer reviews, and more formal expectations around disclosure statements. At the same time, he warns that overreliance may hinder the development of scholarly identity, especially among early-career researchers. He argues that the long-term value of research will depend less on technical proficiency with AI tools and more on evaluative judgement.

The book concludes by returning to its central theme: intentionality. Roe does not provide rigid rules for using GenAI but instead urges researchers to remain reflective and accountable. GenAI is neither inherently democratising nor inherently dangerous. Its impact depends on how scholars choose to incorporate it into their work, and how they maintain responsibility for the knowledge they produce.

Critical appraisal and reflections

Roe does a great job of striking a balance—his account of GenAI is grounded in theory but avoids both hype and pa-

-nic. That is refreshing in a space often dominated by extremes. His writing resonates with educators who are navigating the complex middle ground between innovation and integrity. The book also feels timely, especially as institutions rush to create GenAI policies without fully grasping their pedagogical impact.

One of Roe's biggest strengths is his insistence on precision—both linguistic and epistemic. Too often, GenAI is discussed as if it were a single, monolithic entity, when it is a complex mix of layered architectures, commercial agendas, and varied capabilities. Roe's push to define terms clearly is not pedantic; it mirrors ongoing debates in higher education about hype and overpromising (Rudolph et al., 2023a; 2023b). His reminder that fluency does not equal truth really hit home for me, because AI's confidence often hides conceptual errors.

Another strong point is his focus on researcher positionality. Roe argues that judgment, responsibility, and meaning cannot be outsourced—and that's not just philosophy, it's practical reality. In a world where students ask, "What does the AI think?" Roe brings us back to basics: AI doesn't think. It predicts patterns based on prior data. This echoes recent critiques warning against attributing autonomy or consciousness to computational systems (Rudolph et al., 2024).

That said, Roe's lens is mostly methodological. While he flags issues like misinformation and surface-level coherence, he spends less time on the socio-economic and environmental costs of GenAI—topics that are gaining traction in current scholarship. Research now shows that GenAI relies on extractive labour, substantial computing resources, and centralised corporate control, shaping who benefits and who is left out (Rudolph et al., 2024). Roe nods to these concerns but does not dig deep.

Reflections on GenAI in educational practice

As a lecturer working with students who are learning to conduct research, some of Roe's observations align closely with my own lived experiences. Students increasingly turn to GenAI before peers or instructors, skipping dialogue and collaborative meaning-making. Yes, GenAI speeds up information retrieval, but it also short-circuits the discomfort and questioning that drive real learning. When answers come pre-packaged, students avoid uncertainty instead of wrestling with it.

In class, I notice fewer students sharing half-formed ideas or testing interpretations aloud. Some prefer polishing AI-generated text over debating perspectives. Roe's warning about flattening cognitive struggle feels spot-on. On the other hand, I also see the democratising potential that Roe mentions. For multilingual learners, GenAI is a game-changer. It helps refine phrasing, improve tone, and reorganise drafts—levelling the playing field where language barriers once overshadowed ability. I have watched students gain confidence in their writing when they use GenAI openly and critically.

But Roe's caution about verification is real. I often get beautifully written paragraphs filled with outdated or fabricated references. Students assume that if something sounds academic, it must be valid. Small errors snowball quickly. I now spend more time verifying sources and definitions than I did before. GenAI reduces visible labour but increases hidden labour for both students and educators.

This shift has changed how I assess work. Checks on rote knowledge no longer tell me much. Instead, I ask students to reflect on their AI use:

- What did you accept or reject from its output?
- What did you verify independently, and why?
- Where did AI mislead you?

These questions put accountability back on the learner. Rather than banning AI, I encourage students to develop epistemic agency—echoing Roe's call for intentionality over avoidance.

Finally, Roe's chapter, with its structured prompts and checklists, is gold for teaching. Many novice researchers stru-

-ggle to articulate questions or justify methods. His templates help scaffold thinking—not as shortcuts, but as starting points for further exploration. When used critically, they move students from "What should I write?" to "Why am I writing this?"

Conclusion

Overall, Roe's book is a valuable addition to the conversation on GenAI in education. It brings clarity where discourse is fuzzy and structure where practice is still emerging. While I wish he had explored the structural dimensions of GenAI more deeply, his strength lies in equipping educators and researchers to engage with complexity thoughtfully. That framing aligns well with what educators are experiencing—GenAI is neither the demise of academic work nor its saviour, but a catalyst for rethinking what meaningful scholarship requires.

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Book Review of S. Popenici, J. Rudolph, F. Ismail, & S. Tan (Eds., 2026). The Handbook of Artificial Intelligence in Higher Education. Edward Elgar.

Preman Chandranathan[A] [A]*Murdoch University, Singapore* **DOI:** https://doi.org/10.37074/jalt.2026.9.1.9

Introduction

Artificial Intelligence (AI) has undoubtedly had a transformative effect on many aspects of society, including in higher education (HE), and I therefore looked forward to the opportunity to read and comment on the book which is the subject of this brief review. The Handbook of Artificial Intelligence in Higher Education, edited by Stefan Popenici, Jürgen Rudolph, Fadhil Ismail and Shannon Tan, is perhaps best described as a 'tome'. The editors have managed to compile a comprehensive discussion of AI in higher education settings, examining intersecting currents in the form of six key areas – conceptual perspectives on AI in HE, critical AI literacy, issues pertaining to teaching, learning and assessment, issues pertaining to work and employability, and discipline and country-specific studies of AI in HE. The book spans across 39 chapters, with contributions from 79 authors working in HE settings across the world – Asia-Pacific, Europe, the United Kingdom, and North America. In this sense, the collection is not only thematic, aiming to appraise some of the major issues surrounding the adoption and implementation of AI in HE, but also international, contextualised, and nuanced in scope and orientation. This latter aspect of the book must be especially praised, as it foregrounds the experiences of academics from a variety of national or cultural backgrounds engaged in the very challenging task of integrating the technology into their professional circumstances. The fact that many of these circumstances have been and continue to be subjected to a range of social, economic, and/or political pressures makes the book's contributions all the more remarkable.

Accordingly, it must be noted that the expertise which underpins the book's contributions is significant. The editors themselves all have considerable expertise in the field, with some having published extensively on the subject in focus and all being involved in the Journal of Applied Learning and Teaching – which has and continues to publish extensively on the same. In the introductory chapter (p. 3), the editors state the book aims to provide "evidence-based analysis, critical reflection, courageous introspection and intellectual incursions that are vital for a rethink of higher education at a time when the entire world is reconsidering foundational models, values and the kind of education we need for our new societies, for the new existential challenges and our immediate future".Additionally, the editors state the book aims to provide readers with the "knowledge and strategies to critically engage with AI's transformative possibilities while confronting the risks it carries", and to "fill a vital gap in the literature by providing rigorous guidance, incisive analysis and thought-provoking critique on the ethical and social consequences of AI adoption in higher education". By and large, my view is that these aims are comprehensively attained, although I do tend to feel there is some room for 'critique' to be explored and sharpened – I return to this latter point towards the end of the review. The following section provides a review of all the main parts of the text, except the part on critical AI literacy, which I particularly highlight in the concluding section.

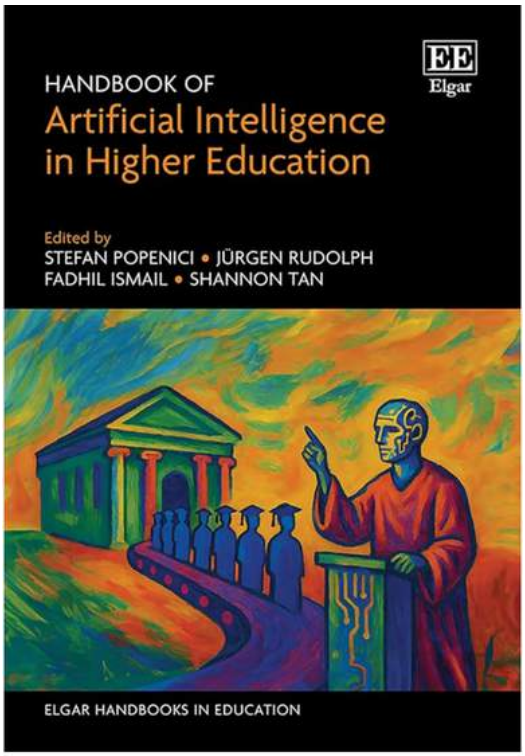

Figure 1. The book cover of *The Handbook of Artificial Intelligence in Higher Education..*

Review of the Handbook

Following the introductory chapter, Part 1 of the book is entitled "AI and Higher Education: The Big Picture". This draws together eight chapters that, in one way or another, provide the reader with broader frameworks for appreciating and navigating the impact of AI on HE. In the leading contribution of the book, Waring, for instance, discusses three different scenarios pertaining to how AI may be situated within the university of the future. This discussion is prefaced by an 'imaginary', or fictional story, that illustrates how AI may shape the future practice of HE in the form of networked interactions between human and non-human actors (the latter taking the form of AI systems). Waring's interrogation and analysis of the three different scenarios ultimately settle on what he refers to as the 'AI Embrace' scenario, wherein he anticipates that core activities in HE settings will be more extensively transformed by the technology, in part due to the pressure of needing to conform to market and sector-wide demands. Another notable chapter in this part of the book is by Luckin and Bagshaw, who outline a practical strategy for implementing AI in HE settings. This strategy, which the authors term 'The 4 Quadrant Framework', is detailed and appears to be informed by classical ideas in strategic planning and change management (e.g., Kotter's model). The inclusion of a stage in the framework that identifies AI use cases is especially interesting, as it highlights the potential for the framework to be flexibly applied across different settings in line with operational goals and needs.

Part 3 of the book includes nine chapters that focus on the impact of AI on teaching, learning and assessment – matters that are the 'bread and butter' of many academics and that have been subjected to considerable pressures by the impact of AI in HE. Topics covered in this part of the book include the pedagogical implications of AI in the "digital age", practical applications of AI in the classroom to enhance teaching and learning, and ethical and technological considerations for the use of AI in HE. Here, two chapters stood out. First, the chapter by Sullivan was interesting because it examines how our traditional understandings of academic misconduct, along with institutional policies and procedures in this area, are being transformed by learners' misuse of AI. Second, the chapter by Hassoulas valuably discusses how the critical matter of assessment is being transformed by AI. HE settings across the world, including my own, have indeed been forced to adapt to a 'moving target', given the rapid acceleration of the technology and wider uptake among the general population of learners. Hassoulas explores a r-

-ange of issues, including the opportunities and challenges associated with integrating AI into different modes of assessment. One particular theme that emerged from my reading of this part was the issue of academic work intensification wrought by the transformations imposed by AI. One does wish it had been explored more by contributors, especially as this issue is at odds with how the technology is often positioned by its advocates as being 'facilitative' or 'enabling'.

Part 4 of the book is relatively shorter compared to the others, comprising just four chapters, but explores the broader and important issue of how AI can shape employability outcomes of HE learners. In this part of the book, Bearman et al.'s chapter was especially interesting as one of the few empirical contributions. These authors report on a study which utilised survey data to understand how Australian professionals working in healthcare, education, and legal settings. Findings from this study were intriguing, with the authors describing similarities and differences across participant accounts from the different contexts. In particular, the authors draw attention to how broader discourses around AI, such as those perpetuated by governments and businesses, do not necessarily align with how people understand and use it. This, in turn, draws attention to the need for more fine-grained understandings of how people in a range of settings understand the technology as they use it in their respective work functions. Another chapter in this part, by Adarkwah, was notable for focusing on adult learners. Here, the key pillars for empowering adult learners to utilise AI are briefly discussed, with a focus on overcoming fear and resistance to the technology.

Part 6 presents discipline and country-specific contributions that discuss the use of AI in specific topical areas of geographical regions. As an academic specialising in leadership and management teaching and research, I was naturally interested to read the contribution by Noor and colleagues. This chapter provides overviews of how the authors have responded to AI in their respective disciplinary areas of marketing, business law, economics, and human resource management (HRM), along with a research agenda on the impact of AI on higher education for these topics. Utilising an autoethnographic approach, the authors describe how AI has been integrated into classroom teaching and learners' skill development, modes of assessment to develop students' critical thinking skills, and the creation of lesson content. The section on HRM was especially interesting to read, as the authors discuss how the teaching of AI in HRM subjects "should not only encompass technical skills related to managing AI but also emphasise the preservation of empathy, ethical values, and an understanding of the diverse human elements that characterise HR processes" (p. 509). Other chapters in this final part of the book explore the topic of teacher education or focus on the national contexts of China, Hong Kong, Japan, and Turkey.

Concluding thoughts

Overall, Part 2 of the book, which deals with critical AI literacy, stood out to me as the most compelling section, due to its focus on the social, economic, and political dimensions of the technology's use in HE settings. For instance, I found the chapter by Rudolph to be especially notable, with its discussions of 'hidden labour' and how corporate interests and 'big tech' have undergirded the development and diffusion of AI on a global scale. This discussion reminds us that the technology is not 'inevitable' as some corporate and political actors or institutions would have us believe, and that discursive formations premised on such inevitability can over-ascribe agency to the technology in ways that undermine our own as human actors (see Bareis & Katzenbach, 2022, for a discussion of this in relation to national AI strategies). This matter is also discussed in the book by Weber and Heidelmann (Chapter 18), who provide a Foucauldian analysis of discursive formations identifiable through national AI strategies across the United States, the European Union, and China. What emerges from this analysis is an interplay of market- and state-driven forces that shape HE governance and policies regarding AI. In another contribution in this part of the book, Ismail highlights an issue that has been discussed in scholarly circles – namely, the bias that can underpin AI algorithms. He discusses how this bias can be further perpetuated in higher education settings by AI, thereby reinforcing asymmetrical power relations and inequalities in a sector that is already rife with such issues.

Accordingly, Part 2 of the book especially emphasised for me the value of sociological analyses of the subject matter, although I was also left feeling that critique in the collection could potentially have been deepened. For instance, one theme that could have been explored more concerns the possibilities for exercising resistance against the technology in HE settings and the implications of this. Waring, in his contribution, touches on this in relation to the 'AI Avoidance' scenario, wherein some universities may attempt to distinguish themselves from others through

the principled refusal to adopt or support the technology. As highlighted previously, his overall thesis centres on the likelihood of institutions embracing the technology instead, in part due to competitive pressures in the sector. Beyond this book, some high-profile management researchers have taken a stance against AI and encouraged others to do the same, for instance, due to its failings, its capacity to transform our relationship with knowledge in detrimental ways, and the threat it poses to academic jobs (Lindebaum, 2023; Lindebaum & Fleming, 2024). In relation to education more broadly, some have highlighted the need to 'push back' against the technology or rethink how it can be used in more equitable ways, especially given critiques of AI posed by traditionally disadvantaged groups of individuals (Selwyn, 2024). Such perspectives – along with all that we already know concerning the issues with AI – raise questions concerning potentialities for how resistance against the technology may be enacted on a day-to-day basis by individuals and at an institutional level. These kinds of issues may have been touched on a little more within the book.

However, this foregoing observation should in no way detract from what is an accomplished collection of articles. The editors and contributors of The Handbook of Artificial Intelligence in Higher Education have done stellar work in compiling a book that addresses a myriad of themes in a considered manner. This book will no doubt be relevant to a wide range of HE stakeholders – from leaders and administrators to researchers and faculty, to graduate students and future academics, and to those working in Edtech. I anticipate it will warrant continued engagement and careful reading, and serve as an important reference for HE stakeholders as discussions on the impact of AI on HE settings continue to develop and evolve.

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Book Review of Sabbaghan, Soroush (Ed., 2025). Navigating Generative AI in Higher Education: Ethical, Theoretical and Practical Perspectives. Edward Elgar Publishing.

Ali Mikaeili [A]

[A]*University of Calgary, Canada*

DOI: https://doi.org/10.37074/jalt.2026.9.1.13

Introduction

Navigating Generative AI in Higher Education: Ethical, Theoretical and Practical Perspectives is a 278-page scholarly collection published in 2025, bringing together fifteen chapters written by international experts who explore how generative artificial intelligence (GenAI) is reshaping teaching, research, assessment, and governance across higher education. The book balances technical, ethical, and pedagogical insights, examining both the promises and perils of GenAI. It addresses bias, transparency, academic integrity, authorship, and human agency while offering frameworks for personalized learning and human-centered assessment.

Sabbaghan, Associate Professor at the Werklund School of Education, University of Calgary, curates the volume with remarkable coherence. His role as Generative AI Educational Leader in Residence at the Taylor Institute for Teaching and Learning and Chair of the Language and Literacy Specialization Area is reflected in the book's synthesis of conceptual depth and pedagogical practicality. The volume speaks to educators, instructional designers, researchers, and policymakers seeking responsible and inclusive pathways for AI integration. As a researcher observing higher education's rapid negotiation with generative AI, this collection offers a rare balance of urgency and reflection. It neither romanticizes technology nor fears it; instead, it urges academia to slow down, think deeply, and design ethically.

Framing the future of AI in academia

In Chapter 1 of *Navigating Generative AI in Higher Education*, Sabbaghan (2025a) opens with "Introduction to Artificial Intelligence and Its Relevance to Academia," establishing the intellectual and ethical foundation for the entire collection. He positions GenAI as more than a productivity tool, rather, as a collaborator in academic life that transforms how knowledge is produced, mediated, and evaluated. The chapter's clear structure, including definitions, historical trajectory, typologies of GenAI technologies, and ethical-pedagogical implications, provides a conceptual scaffold for readers new to AI. Using vivid metaphors and concrete case studies, Sabbaghan presents GenAI as both technological innovation and philosophical disruption, inviting educators to engage critically and reflectively with this emerging partner in scholarship.

Building on that foundation, Keyhani and Mohaghegh-Neyshabouri (2025) extend the discussion in "The Rise of Generative AI: Capabilities and Potential for Higher Education." They treat large-language models (LLMs) as cognitive partners capable of reasoning, creativity, and adaptive learning through retrieval-augmented generation (RAG) and few-shot prompting. Their analysis situates GenAI within a broader socio-ethical context, warning that training-data

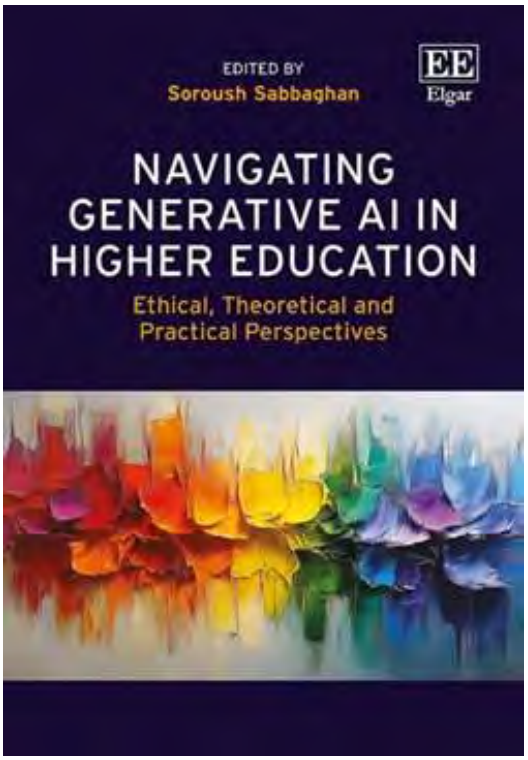

Figure 1. Book cover of Sabbaghan, Soroush (Ed., 2025).

bias can reproduce inequality while also highlighting inclusive possibilities such as adaptive tutoring and multilingual accessibility. They envision institutions where GenAI streamlines administration, strengthens research collaboration, and enables "citizen developers." By linking pedagogy, scholarship, and leadership, the authors call for systemic adaptation grounded in ethics and foresight.

Together, these two opening chapters establish the dual vision that drives the book: GenAI as an epistemic revolution and as a call for reflective stewardship within academia. What resonates with me here is the subtle insistence that stewardship is not a passive stance. It is an intellectual responsibility to reimagine academic authorship, pedagogy, and inquiry through partnership rather than dependence on AI.

Generative AI as transformative practice: Research, teaching, and design

In "Generative AI in Higher Education: Transformative Tools for Research, Teaching, and Assessment," Farrokhnia et al. (2025) position GenAI as a mediator between human cognition and machine intelligence. They show how AI tools support statistical analysis, qualitative coding, visualization, and writing assistance, easing researchers' cognitive load while accelerating inquiry. Yet they stress that automation requires informed oversight, since GenAI's capacity for statistical testing or coding interviews remains fallible without human validation. Their continuum of adoption, framed through the AI-TPACK (Technological Pedagogical Content Knowledge for AI) model, emphasizes a gradual integration that keeps pedagogy at the center. For educators, this chapter provides an operational map for moving from experimentation toward ethical normalization of AI in teaching and research.

Brown and Roberts (2025) advance the conversation in "Responsive Instructional Design Using GenAI and Digital Skill Development Framework." Drawing on Canadian post-secondary practice, they weave together experiential learning, open educational practices (OEP), and the Digital Skill Development (DSD) Framework to show how GenAI can enrich authentic learning. Six facets, Explore & Clarify, Select & Use, Evaluate & Reflect, Organize & Manage, Synthesize & Create, and Collaborate & Communicate, serve as design anchors. Through case-based examples such as the PEARL (Persona Emulating Adaptive Research and Learning Bot) simulation, the authors demonstrate how students can experiment with GenAI responsibly, reflecting on ethics and comfort levels. The integration of reflection and feedback in their design foregrounds agency and inclusivity rather than substitution.

Together, the chapters by Farrokhnia et al. (2025) and Brown and Roberts (2025) move the discussion from conceptual frameworks to lived pedagogy. I see in this framing a quiet provocation: if AI can extend human creativity, then teaching itself becomes an act of co-design. The educator is no longer the gatekeeper of knowledge but the architect of interaction learning alongside both students and algorithms. They portray GenAI as a co-designer that extends, rather than eclipses, the educator's creative role. This vision of human–AI collaboration is echoed in recent empirical research on learner trust and agency. Wang et al. (2025) found that students' willingness to engage with GenAI tools depends not only on usability or accuracy but also on perceived transparency, fairness, and pedagogical support. Their mixed-methods study reveals that when learners perceive GenAI as a trustworthy partner, supported by ethical framing and reflective dialogue, they are more likely to adopt it as a co-designer in learning processes. Such evidence underscores the book's argument that GenAI's educational promise rests on cultivating agency and calibrated trust, not automation.

Assessment and authorship in the age of AI

Assessment emerges as a focal point across the middle of the volume. Baidoo-Anu et al. (2025) conduct a sweeping scoping review in "Innovative Applications of Generative Artificial Intelligence in Classroom Assessment." Synthesizing 37 studies, they illustrate how ChatGPT and similar tools can generate inclusive, differentiated tasks, produce immediate feedback, and assist students in designing their own quizzes and rubrics. The chapter's framework connects formative, summative, and adaptive assessment, positioning GenAI as an engine of personalization. Yet they emphasize that human feedback remains superior in empathy and contextual sensitivity; therefore, AI must operate under informed supervision. This evidence-based synthesis gives the collection its empirical backbone. From my perspective, this raises an uncomfortable but necessary question for higher education: if we welcome AI into assessment, we also inherit the ethical responsibility to protect the parts of evaluation that are still profoundly human, such as care, trust, and recognition of student voice.

Lee (2025), in "The Double-Edged Sword of Generative AI for Assessment: Efficiency versus Homogenization," offers a philosophical counterpoint. He argues that while GenAI brings efficiency, it risks flattening originality by promoting standardized responses. His concept of retuning assessment invites educators to adapt existing models toward creativity, collaboration, and lifelong learning. Case studies in history, science, and literature classrooms illustrate retuned strategies such as hybrid presentations, portfolios, and multi-party projects. Lee's analysis underscores that the integrity of assessment lies not in resisting AI but in redesigning evaluation to capture the complexity of human thought. Lee emphasizes that retuning does not mean abandoning traditional assessments but rather enhancing them to better reflect diverse learning styles and higher-order thinking. He also highlights implementation challenges such as resource constraints, academic integrity concerns, and the need for institutional support. Ultimately, Lee underscores that assessment integrity lies not in resisting AI but in redesigning evaluation to capture the complexity of human thought.

Complementing these views, Tweedie and Sharmi (2025) tackle the long-standing opacity of grading in "Transparency, Assessment and the 'Black Box' Dilemma." They trace how unexplained grading has historically marginalized students and argue that GenAI, through Explainable AI (XAI) and contrastive explanations (CEs), can actually make assessment more transparent. Their fictional learner Maisha demonstrates how dialogic, human-centered AI can clarify reasoning behind evaluations, embodying a shift from "black box" to "glass box." This tension between opaque and explainable systems aligns with ongoing debates in AI governance. Gyevnar et al. (2023) argue that explainable AI (XAI) research often treats transparency as a technical end rather than a socio-legal means, creating a "transparency gap" between algorithmic design and regulatory accountability. Their analysis of the EU Artificial Intelligence Act underscores that meaningful transparency requires linking interpretability to human oversight and institutional responsibility, not merely algorithmic clarity.

The broader literature reinforces this multidimensional view of assessment transformation. In a scoping review of 32 empirical studies, Xia et al. (2024) demonstrate that generative AI reshapes assessment practices across student, educator, and institutional levels. At the student level, GenAI enables personalized and immediate feedback that fosters self-regulated learning. For educators, it calls for new forms of assessment literacy and authentic evaluation, while institutions face demands for policy redesign and AI-integrated quality assurance. Their findings echo the arguments advanced by Baidoo-Anu et al. (2025) and Tweedie and Sharmi (2025), illustrating that assessment innovation in the age of GenAI must balance personalization, transparency, and ethical accountability.

Meanwhile, Kumar (2025) in "Rethinking Authorship in a Generative AI-Driven Academic World" situates assessment ethics within the broader question of intellectual ownership. Building on Eaton's (2023) post-plagiarism model, Kumar reports survey data showing generational differences in openness toward AI-assisted writing and hybrid authorship. Younger academics tend to accept shared agency between human and machine, reflecting an evolving epistemology of creativity. The chapter calls for new conventions of citation and acknowledgement that sustain accountability without stifling innovation.

Collectively, these contributions redefine assessment and authorship as dynamic, participatory processes, an interplay of human insight, machine augmentation, and ethical awareness. From my perspective, this redefinition demands more than policy change; it requires a cultural shift in how we value intellectual effort. If authorship becomes distributed, then accountability, too, must become collaborative. The question is no longer who writes, but who takes responsibility for the meaning.

Ethics, integrity, and human agency

Ethics is the philosophical backbone of the collection. In many ways, ethics here functions as the narrative heart of higher education itself. The chapters remind us that integrity is not merely compliance but an act of intellectual honesty just like a willingness to confront what we do not yet understand about our tools. Al-Zahrani (2025), in "The Future Landscape: Predictions and Prospects for Generative AI in Academia," offers a visionary projection of personalized learning, AI-enhanced research, and automated assessment within Responsible AI (RAI) frameworks. His proposals for institutional roles, such as Chief GenAI Officer and for international collaboration on ethical guidelines extend the discourse beyond classroom practice to global governance. The chapter's emphasis on human–AI synergy highlights the importance of training and inclusion to prevent displacement and ensure coexistence.

Eaton and Keyhani (2025) continue this ethical inquiry in "The Pedagogical Ethics: Navigating Learning in a Generative AI-Augmented Environment in a Post-Plagiarism Era." They critique punitive models of academic integrity and advance a transformative ethic centered on agency. Their RRUYO rule, Read and Revise Until You Own, encourages learners to iteratively engage with AI outputs until personal understanding is achieved. Drawing from Messick (1989) on assessment validity and Alicke (2000) on culpable control, they link ethical reasoning to reflective pedagogy, proposing project-based and peer-review assessments that preserve ownership in an AI-mediated context. These theoretical insights are reinforced by recent empirical evidence. Hsiao and Tang (2025) combined the Technology Acceptance Model and the Norm Activation Model to examine how ethical, social, and personal factors influence students' adoption of GenAI-supported learning. Their survey of 336 university students revealed that while perceived usefulness and enjoyment enhance intention to use GenAI tools, heightened ethical awareness, such as concerns about plagiarism or academic misconduct, decreases that intention. This paradox highlights the moral negotiation students experience between integrity and innovation. The authors argue that fostering ethical agency requires institutions to integrate moral reflection into AI literacy and curriculum design, a conclusion that resonates with Eaton and Keyhani's (2025) call for learning ethics grounded in ownership rather than prohibition.

At the institutional scale, Abbas (2025) in "Challenges and Misuses of Generative AI and the Quest for Mitigation" identifies pedagogical, infrastructural, and societal obstacles. Overreliance on AI, lack of policy clarity, and digital inequity threaten both integrity and access. Abbas recommends multi-level interventions, including critical-thinking curricula, faculty development, ethics committees, and public–private partnerships, to mitigate misuse. His global perspective broadens the ethical debate into questions of justice and inclusion. Extending these ethical debates into the realm of design, Maity and Deroy (2024) advance the framework of Human-Centric eXplainable AI (HCXAI), which redefines transparency as an ethical rather than purely technical construct. They argue that explainability must serve human understanding, trust, and fairness, particularly in educational environments where AI mediates learning and evaluation. Their model bridges pedagogy and ethics by calling for systems that make reasoning interpretable and feedback accountable, echoing the book's commitment to transparency and human agency.

These tensions are not confined to theory; they are already playing out across global higher education systems. In a mixed-methods study of 1,217 students and instructors in 76 countries, Yusuf et al. (2024) found both widespread

uptake of generative AI for information retrieval, paraphrasing, and writing support, and deep anxiety about plagiarism, academic misconduct, over-reliance, and erosion of intellectual development. Participants simultaneously framed GenAI as a source of personalized learning and accessibility and as a direct threat to academic integrity, and many explicitly called for institutional regulation. Crucially, perceptions of "cheating," acceptable use, and the need for policy varied by cultural dimensions such as uncertainty avoidance and long-term orientation, suggesting that any ethical framework for GenAI in higher education must be attentive to context rather than assuming a universal standard. Viewed collectively, the chapters by Al-Zahrani, Eaton and Keyhani, and Abbas establish the book's ethical foundation. Ethics is not a constraint but the condition for sustainable innovation. Sustainable AI integration will depend less on regulation and more on the cultivation of moral imagination, the courage to align technological progress with human flourishing.

Policy, governance, and competency frameworks

Chiu (2025), in "From Student Artificial Intelligence (AI) Literacy to AI Competency," bridges the ethical and policy domains by focusing on learner capability. Through a co-design study with Hong Kong undergraduates, he develops an AI Competency Framework encompassing six interrelated aspects: AI knowledge and application, ethical principles, societal impact, learning with AI, AI for careers, and lifelong learning. Each unfolds across the cognitive continuum of understanding, applying, and creating, aligned with Bloom's taxonomy. Chiu's framework transforms static literacy into dynamic competency by including affective and behavioral components, such as confidence, self-regulation, and ethical judgment. His practical recommendations for institutional adoption, including foundation courses, interdisciplinary collaboration, and peer reflection, make the framework both scalable and inclusive.

Expanding the scope, Kowch (2025) in "An Innovation Policy Analysis of G10 Nations' Strategic Plans for Future AI Leaders and Researchers in Higher Education" analyzes the macro-policy environment shaping academic AI development. Drawing from innovation-systems and complex-adaptive-systems theory, he reviews national AI strategies across ten leading economies. Despite nearly one trillion USD in combined investment, he finds that most strategies privilege economic growth and industrial innovation over educational reform. Advisory bodies remain dominated by technologists, with minimal representation from humanities and education experts. Extending this macro-level analysis to a European context, Stracke et al. (2025) examine fifteen national and institutional AI policies across eight countries, identifying critical inconsistencies in how higher education systems address the ethical and pedagogical dimensions of AI. Their study reveals that while teachers and students are the most frequently targeted stakeholders, education managers and policymakers are often overlooked, resulting in fragmented implementation and limited alignment between institutional and national agendas. Few policies integrate "education about AI" (AI literacy) with "education through AI" (AI in teaching and learning), a gap the authors argue must be closed through harmonized, evidence-based frameworks grounded in the EU's Trustworthy AI principles, including human agency, transparency, fairness, and accountability. This European perspective reinforces the volume's call for coherent, multiliteracies-informed governance structures that link ethics, policy, and practice across educational levels. I would see this gap as more than administrative oversight — it reflects a deeper philosophical divide between knowing AI and living with AI. True competency will require universities to merge these dimensions into a single, human-centered literacy.

Kowch's comparative analysis reveals the urgent need for policy mixing, network governance, and inclusion of educational leadership in AI strategy formation. Read alongside Chiu (2025), this chapter situates micro-level competency development within the macro political economy of global AI.

Collaboration and co-design

Collaboration emerges as the mechanism through which the ethical and policy visions of previous chapters can materialize. Detrick and Kim (2025) in "Collaborative Approaches: Bridging the Gap Between Generative AI Developers and Educators" argue that intersectoral cooperation, among educators, developers, researchers, and communities, is essential for responsible GenAI integration. Their Student-AI Collaboration (SAC) model identifies three spheres: curriculum, human-AI interaction, and learning environment. Through case studies such as the University of Florida–NVIDIA partnership and Canva's educator co-design initiatives, they illustrate how participatory

processes align AI capabilities with pedagogical intent. They also diagnose barriers, including communication gaps, resource inequities, and the relentless pace of technological change, and propose governance structures that institutionalize dialogue and iterative design. Collaboration, they contend, is not a supplementary practice but the condition of meaningful innovation.

This emphasis on co-creation complements earlier pedagogical frameworks (Brown & Roberts, 2025; Chiu, 2025) by revealing that GenAI's success depends as much on social design as on technical architecture. The chapter stands as a blueprint for multi-stakeholder innovation cultures within universities.

Human-centered futures

The closing chapter, Sabbaghan (2025b) "Charting a Human-Centered Path for Generative AI in Higher Education," synthesizes the insights of all contributors into a Human-Centered Design (HCD) framework. Four principles, inclusivity, contextual awareness, adaptive processes, and collaborative participation, define this model. Through illustrative examples such as a GenAI-assisted academic-writing platform co-developed with graduate students, Sabbaghan demonstrates how these principles translate into practice. His framework unites ethical reflection, instructional design, and policy vision, emphasizing that AI innovation must always circle back to human well-being.

Sabbaghan's recommendations span the educational ecosystem. Educators should employ GenAI to personalize learning and nurture critical thinking; institutions must craft equitable policies and invest in literacy training; policymakers should design transparent, flexible regulations; and developers ought to embed empathy and feedback loops into their design processes. The chapter's humanistic stance redefines GenAI not as a threat but as an opportunity to reaffirm education's moral and social purposes. To me, this is where the book's vision transcends utility. It invites a renewal of purpose, a reminder that technology, however advanced, must remain accountable to the human stories it shapes.

Thematic integration across fifteen chapters

Read as a whole, the volume advances five interrelated themes that give it both coherence and cumulative power.

1. Epistemological and Pedagogical Transformation – Early chapters (Sabbaghan, Keyhani & Mohaghegh-Neyshabouri, Farrokhnia et al., Brown & Roberts) present GenAI as a cognitive and creative collaborator. They call for pedagogical redesign toward facilitation, reflection, and authentic practice.

2. Ethics, Integrity, and Human Agency – The middle chapters (Al-Zahrani, Eaton & Keyhani, Abbas, Kumar) construct an ethical infrastructure for AI in education, foregrounding transparency, responsibility, and the post-plagiarism ethos.

3. Assessment and Transparency – Chapters 5, 8, and 9 (Baidoo-Anu et al., Lee, Tweedie & Sharmi) collectively reimagine evaluation as dialogic, explainable, and creativity-driven.

4. Competency, Policy, and Governance – Chiu & Kowch bridge individual skill development and systemic reform, linking classroom literacy to national strategy.

5. Collaboration and Human-Centered Design – Detrick & Kim and Sabbaghan close the circle, demonstrating that ethical innovation ultimately depends on participatory, human-centered frameworks.

This progression, from micro-level classroom design to macro-level global policy, renders the collection both comprehensive and forward-looking. Rather than discrete essays, the chapters form a dynamic conversation that portrays GenAI as an evolving ecosystem in which ethics, pedagogy, and governance co-evolve.

Conclusion: A transformative blueprint for the AI university

Navigating Generative AI in Higher Education: Ethical, Theoretical and Practical Perspectives (Sabbaghan, Ed., 2025) stands as a landmark in educational scholarship. Across fifteen carefully interlinked chapters, the contributors collectively argue that GenAI, when guided by ethical, inclusive, and human-centered principles, can deepen rather than diminish higher education's intellectual mission. The book's coherence stems from its dialogic architecture: conceptual essays lead to empirical studies, which in turn generate applied frameworks. Sabbaghan's concluding Human-Centered Design model encapsulates this trajectory, uniting philosophical insight with pedagogical pragmatism and policy foresight. The result is a volume that is simultaneously theoretical, practical, and moral, a rare combination in the rapidly expanding literature on AI and education.

For educators, researchers, and policymakers, the collection offers not merely analysis but a direction: a call to design learning environments where humans and machines collaborate to expand creativity, criticality, and justice. It shows that when technological innovation is governed by empathy, transparency, and collective wisdom, higher education can fulfill its most enduring promise, to cultivate knowledge in the service of humanity. In that sense, this volume does not merely navigate generative AI, but it challenges higher education to navigate itself.

Personally, I found the emphasis on ethics and co-design most compelling; it reframes AI not as a threat but as an opportunity to renew education's moral purpose. The book challenged me to think beyond compliance and toward cultivating moral imagination in AI integration. I strongly recommend this volume as an indispensable resource for anyone shaping the future of higher education.

Disclosure statement

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Book Review of Max S. Bennett (2024). A Brief History of Intelligence: Why the Evolution of the Brain Holds the Key to the Future of AI. William Collins.

John Francis Hulpke [A] [A]*University of California, Berkeley, USA* **DOI:** https://doi.org/10.37074/jalt.2026.9.1.15

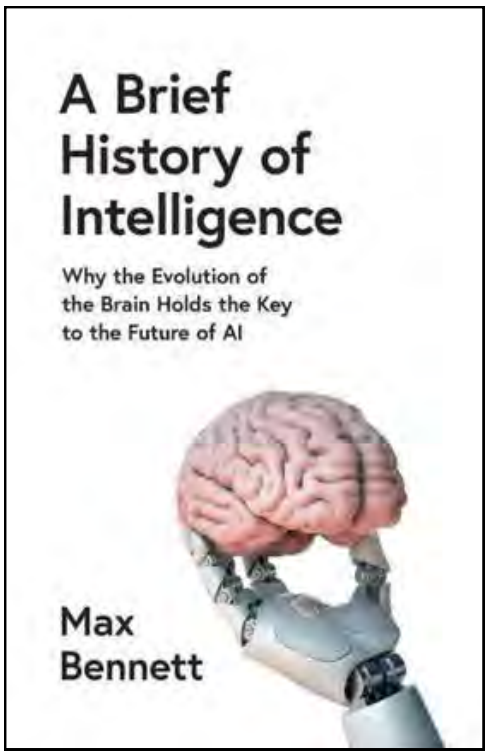

Figure 1. Book cover of A Brief History of Intelligence, Bennett (Ed., 2024)

The key to learning is the brain. *A Brief History of Intelligence* tells readers all that one needs to know about the evolution of the brain. The story is complex. Bennett tries to make it (almost) as simple as 1-2-3. Or, 1-2-3-4-5. First, the Earth existed before life. Then came life without intelligence. To make progress, the brain needed to enter the picture.

If the brain is key to learning and education, it would seem worthwhile to learn about it. But proceed with caution: This book is not an "easy read." Nobel prize-winning economist Daniel Kahneman says he has read it twice- first quickly because it was so interesting, then again to capture the details. And I read pages twice because I couldn't understand much during the first reading.

If this is not a book of tools which we educators can use tomorrow, why do I say to my colleagues, "You should read this." Because in the text, and also between the lines, there is important and sometimes surprising information. The inclusion of AI in the book title might be intended to catch today's hot topic. But no need: there is perhaps the best story one can find on human evolution in these pages, and that is enough. This is a history book, a history of the evolution of the brain, a solid, important story.

What is the main message? We, humans, are indeed gifted. Thanks to investigations by many scientists, we now know that the human brain has made all that we have accomplished possible. Only humans invented wheels. Some species seem to communicate, but only humans have conquered spoken language. As Bennett states, "every single group of humans ever discovered uses language" (Bennett, 2024, p. 298). I have seen three-year-old children around the world using language. Only humans do this. Sue Savage-Rumbaugh taught chimpanzee Kanzi to understand and use many "words", so the end of this story has not yet been written (Bennett, 2024, p. 300). But as of now, humans are the only species that truly have language. One cannot fathom learning and education without language.

Bennett gives a history of the brain and a history of life on Earth. Bennett reminds us that humans have been around for a long time, on a planet that has been around a really long time. "The first brain – the first collection of neurons in the head of an animal – appeared six hundred million years ago, in a worm the size of a grain of rice" (Bennett, 2024, p. 7). I have never felt comfortable with big numbers like a million. But this book has desensitized me a bit, numbers in the *millions* seem less formidable when the study of intelligence moves the conversations into *billions*. We move past millions when Bennett informs readers that "the human brain contains eighty-six billion neurons and over a hundred trillion connections" (Bennett, 2024, p.5). So, we set aside the hundred trillion connections and return to the planet Earth. If the first brain appeared six hundred million years ago, does that help us understand how old our planet is? Not exactly. This book is about the brain and intelligence, which came to be on Earth. The planet was lifeless for eons but then -

> "about four billion years ago, deep in the volcanic oceans of a lifeless earth, just the right soup of molecules were bouncing around the microscopic nooks and crannies of an unremarkable hydrothermal vent. As boiling water burst from the seafloor it smashed naturally occurring nucleotides together and transformed them into long molecular chains that resembled today's DNA. This new DNA-like molecule wasn't alive per se…" (Bennett, 2024, p. 17)

But it duplicated itself, and that began life. A mere 4 to 3 and a half billion years ago.

Then brains emerge. "Life existed on earth for a long time – and I mean a *long* time, over three billion years – before the first brain made an appearance" (p. 17). Part of my problem is difficulty comprehending "*long*" time or, for that matter, any big numbers. As we learned on page 5, the human brain contains 86 billion neurons. Then on page 47, we learn that a nematode gets along just fine with 302 neurons "compared to a human's 85 billion."

AI tool "Claude" volunteered a way to grasp the concept of a billion.

> The jump from a million to a billion is enormous - a million seconds is about 11.5 days, but a billion seconds is nearly 32 years.

The reason for spending so much time on numbers is that the history of the brain and the history of our planet, as described by Bennett, involves numbers in the millions and billions.

Bennett uses a story to reinforce the notion that humans are newcomers.

> "If we were to scrunch the six hundred million years of evolutionary time – from which the first brains emerged until today – into a single calendar year, then we would now find ourselves perched at Christmas Eve, the final seven days of December. Over the next "seven days" our ancestors will go from foraging fruits to flying Falcon 9 rockets" (Bennett, 2024, p. 291).

A quadrillion years, four billion years, 600 million years, none of the numbers really sink in. I do know that it is a really long time between the day the Christmas tree goes up and the day the kids can finally open the wrapped presents under the tree. That is a *really* long time.

How might this tie to the current topic of artificial intelligence? Bennett quotes Geoffrey Hinton: "…the only way to get artificial intelligence to work is to do the computation in a way similar to the human brain" (Bennett, 2024, p. 6). Making artificial intelligence work would be significant. But what we need is to better understand how *humans* think and learn. Fortunately, we can benefit from the work of "scientists… [who] use the fossilized skulls of ancient creatures to reverse-engineer the structure of their brains… we can begin to trace acquirement of each mental power by gradation" (Bennett, 2024, p.8).

Although it is difficult to chronicle the history of intelligence and of humanity in one book, Bennett does an admirable job. Readers learn about "our four-billion-year evolutionary story"… and "the emergence of the modern human brain in our ancestors around one hundred thousand years ago" (Bennett, 2024, p.358). A series of breakthroughs had to occur before we could reach today's amazingly capable brain. Bennett gives five such turning points.

First, after life developed "bilateral bodies," creatures with a front and a back and a right side and a left side, things learned to *steer*. Left looks good, right looks like painful, GO LEFT. Bennett's second breakthrough was *reinforcing*. If that worked, REPEAT. Reinforcement learning helped brains catch the notions of "time perception, curiosity, fear, excitement, disappointment, and relief" (p. 360). "Breakthrough number 3 was *simulating*…" which, in my mind, overlaps with number 4 mentalizing. But number 5 was the big one: *speaking*. I might call number 5 "language" instead of *speaking*, but Bennett shows how speech matters. Sue Savage-

Rumbaugh taught Kanzi to understand and even sign many "words" (p. 300), but only humans have the necessary equipment (vocal cords, etc.) to *speak*. I can imagine learning and education without *speaking* (recall the Anne Sullivan and Helen Keller story), but not without language. Breakthrough number 6? Not yet. Read the book for hints.

Many studies reported by Bennett are fascinating and unexpected. Caroline Delong watched as her fish learned to navigate the tricky maze and find food. One amazing twist to this story is what happened *a year later.* Delong put the fish back in the same tank and *bingo*! The fish remembered exactly how to get to the reward. This makes me think that my giving tiny packs of M&Ms to the first team with the correct answer might be more than just fun; it may be assisting *learning*. Amazingly, there is more to the story: Several other scientists found that it is not the reward that causes the dopamine release, which puts a smile on the face of the fish or monkey; it is the "surprise, aha, I did it" feeling, the reward itself seems not to matter much! This book is full of hundreds of such tidbits, for which I felt rewarded upon discovering (Bennett, 2024, p. 111, p. 139).

Here we humans are in what we call the 21st century, with remarkable brains. Bennett has done his homework and shares his findings. We can with confidence describe how the human brain evolved. The brief history of the evolution of intelligence makes the book worthwhile. But there are also important takeaways hidden *between the lines*. Consider two interesting-but-unwritten messages from this book, 1-2: first, the work of many scientists. Second, things change.

1. First, we must acknowledge the research that has gotten us this far.

Scientists have helped piece together the very complex story of the evolution of humans and the human brain. It took many brains to discover the pieces in this puzzle, which Bennett distils into this brief 400-page history of intelligence. Here are the names of scientists whose work is mentioned in the first 200 pages of the book:

George de Mestral [appears on page 4], Geoffrey Hinton, Theodosius Dobzhansky, Charles Darwin, Paul MacLean, Yann Lecun, Edgar Adrian, Santiago Ramon y Cajal, Charles Sherrington, Henry Dale, John Eccles, Rodney Brooks, Kent Berridge, Robert Heath, Ivan Pavlov, Edward Thorndike, B. F. Skinner, Marvin Minsky, Alan Turing, Richard Sutton, Andrew Barto, Gerald Tesauro, Ken Jennings, Petr Dayan, Read Montague, Wolfram Schultz, David Rumelhart, Ronald Williams, Neal Cohen, Michael McCloskey, David Hubel, Torsten Wiesel, Kunihiko Fukushima, Ca-

-roline DeLong, Vernon Mountcastle, Hermann von Helmholtz, Edward Tolman, David Redish, Adam Johnson, Adam Steiner [on page 193]

Many brains. I was struck by the scarcity of female brains, female names, in that list of names in the first 200 pages. I double-checked, and yes, that list above has only one female. (The number of females mentioned after page 200 increases slightly.) As a parent with both sons and daughters, I would hope my children, whatever gender, would play roles that might merit attention in future books. As described above, the history of the brain could not have been written if it were not for the work of many scientists. And the fact is, in the 21st century, the folks whose work helps us understand this are mostly male.

2. A second unwritten but important message in Bennett's book is this: things change.

This can be a hopeful thought or a frightening thought. Why hopeful? The fact is that today there are relatively fewer females than males in important future-oriented high-tech jobs. But it is also true that gender imbalance is lessening in many areas. Things do change. And "at the present rate of progress … we may expect to see gender equality in 467 years" (Schnall, 2023, p.1). After reading Bennett's book, 467 years seems instantaneous, not at all troublesome. An unwritten but clear message in this book is that things change.

One example sticks in my mind. The first class I taught was an MBA class with around 30 participants. Not one female. All males? That would be unthinkable today. And since few females studied business back then, it should not be surprising that few women taught business. Around the 1970s, a popular source of information about universities was the Lovejoy College Guide. One front-and-back page was all one needed to know about any school, for example, the University of California Berkeley business school. The names of each faculty member were printed out. In a full page of names, there was one female (Karlene Roberts) and about 50 males. Along with the faculty names was a sales pitch for the school. The San Francisco Bay area had many advantages, including a vibrant economy that would "provide many job opportunities for students' wives." One can simply not imagine such a phrase appearing in print today. Thankfully things can change, sometimes for the better, and sometimes relatively fast. Bennett's book helps us take a long view.

Picture the following. A proud-looking young woman is wearing a graduation gown, and the cap with the tassel. She and her group of six are standing at what looks like a university. She is at the right end next to her boyfriend. As we look left in the picture, we next see her mother and father, numbers 3 and 4 in the picture. The mother's parents, our graduate's grandmother and grandfather, are numbers 1 and 2 in the picture. All are smiling. In this one "photo", one can see evidence that things change, sometimes very fast. The graduation "photo" suggests that some things change so fast we can see change in one lifetime, as illustrated in one photo taken at a moment of time on one day. Humans are getting taller. The shortest person might well be number 1, the grandmother of the graduate. Perhaps almost imperceptibly, the group ranges from the shortest at the far left to the tallest at the right end. In one moment- today, we can see what we already know: humans are getting taller. Now, in that one graduation photo, we can see how fast things can change.

But there is also a frightening, potentially terrifying, angle to consider. Sometimes things change for the worse. Bennett's book helps us see that. Imagine a battle between a Stegosaurus and a Tyrannosaurus Rex. Who would win? But there could not have been such a battle. The stegosaurus became extinct around 150 million years ago. The Tyrannosaurus Rex did not even exist until some 80 million years after the Stegosaurus had become extinct.

These extinction "events" were not the first. One "event" happened around 2.4 billion years ago, and it occurred so rapidly (in geological terms) that Bennett calls it the Great Oxygenation "Event." Over the course of one hundred million years, oxygen levels skyrocketed… the rise of oxygen was followed by one of the deadliest extinction events in human Earth's history…" (Bennett, 2024, p. 21). The one hundred million years long Oxygenation extinction "event" was followed by other great extinctions and such as the what Bennett calls "the Permian-Triassic extinction which killed "over 70 percent of land-living vertebrates" (Bennett, 2024, p. 238).

There is no reason to think that extinctions are a thing of the past. What will come next? Could it be a global warming "event" occurring over perhaps a hundred million years or a thermonuclear holocaust requiring perhaps a

decade to wipe out many species, perhaps including humans? Both are "extremely unlikely." Analyses by experts are not much help in determining the "likelihood." One typical expert opinion assessed the danger from a meteor hitting the Earth as between one in a million and one in a billion. Both species extinction by global warming and nuclear holocaust are unthinkable. However, being unthinkable does not guarantee impossibility.

Climate change, slow and inexorable, would be bad but it would not bring human extinction. And climate change is potentially controllable (Cadez & Czerny, 2016). One Yucatan-peninsula-size meteor on top of ongoing global warming, sea level rise, etc., might be a threat. It is not likely, but if one does hit, yes, it would mess things up.

I had never thought about the possible extinction of humans until I read this book. But now I am forced to think. Extinction events of the past deserve attention. As Bennett writes, "perhaps we humans will end the grand four-billion-year experiment of life on Earth through ravaging the planet's climate or blowing our world into oblivion with nuclear warfare" (Bennett, 2024, p. 364). Thermonuclear war would bring the collapse of the entire social structure. How would humans eat without the giant agribusinesses requiring electricity at innumerable points? Trucks could not transport food without a working highway system and fuel stations, which depend on a long supply chain from oil wells to refineries to trucks to refill the tanks of each station. What would a gasoline infrastructure collapse be like today? Or tomorrow? Might truckers wait for hours or days to refill their rigs at the few stations which have supplies of fuel?

One might envision fewer gasoline-powered vehicles in the future. In transportation, electrification is happening very rapidly. However, the idea of all cars and trucks being electric can terrify us. If all electric power failed, how would vehicles move? The "Great Northeast Power Outage" of 1965 in the USA should be reviewed (Hines & Talukdar, 2007). News accounts of that very localized yet very brief disruption hint at how bad it might have been if there were no end in sight. Health, societal order, food distribution, economy based on "jobs," what would survive? What new systems, networks, customs would emerge? Would governments become local, even micro in nature? What about education?

The COVID-19 event has brought about an incredible societal response around the world. Thankfully, the events around 2020 never got as bad as the bubonic plague or even the "Spanish Flu" of around 1920. The Irish Potato Famine caused many deaths by starvation and resulted in millions more leaving the country, with the pre-famine population high of around 8 million in the 1840s dropping to around four million by 1900. Hitler killed six million Jews in the Holocaust (Bartov, 2022). Now, in the 21st century, famines still bring tragic loss of life. Wars take countless lives. If we were to face a breakdown of infrastructure which relies on electricity, what might happen? A "computer glitch" which hit one firm, Crowdstrike, on July 19th, 2024, caused air travel disruptions impacting millions. This one event caused more than eight million computer systems to crash (Santos-Reyes, 2025). Many people today are addicted to their mobile phones. What if all mobile networks stopped working as a result of a global EMP (Electro Magnetic Pulse) event, one element of a global thermonuclear disaster? (Gurevich, 2022). A hint can be seen when a mobile network collapses for whatever reason. Such disruptions to date have always been limited in scale and duration (Evans, 2024). What if my network ceased to exist? What disruptions might that bring to my safety, security, health, professional life and my university?

While there are certainly grounds for concern, as outlined above, things also change for the better. This book is basically optimistic, a story of the amazing growth of intelligence. Bennett reminds readers in every chapter that things change slowly, taking thousands, millions and even billions of years. The "graduation photo" suggests that things can sometimes change dramatically even within the short lifetime of one human. We are getting taller at a fast pace. We can see it in a wedding photo of an entire family standing or any graduation picture. Might this be significant in a story about the history of intelligence? Bennett plays with an interesting question, the size of the brain, in several parts of the book (Bennett, 2024, pages 239, 253, 254, 323, 330). Is brain size really important? Human brains have been getting larger. Bennett theorizes this growth in brain size.

> Every roundabout of this cycle made our ancestors' brains bigger and bigger. As social groups got bigger … it created more pressure for bigger brains to keep track of all the social relationships. As more ideas accumulated across generations, it created more pressure for bigger brains to increase the storage capacity of ideas… (Bennett, 2024, p. 339).

Brain size is not directly related to intelligence. The chimpanzee has a brain of similar size compared to the human, but chimpanzees have not created driverless taxis (which can be seen daily in San Francisco in the mid-2020s). On the other hand, chimpanzees have never formed armies nor committed genocide. The accomplishments of homo sapiens outweigh the failures, so far. Bennett implies that the increased brain size has been a good thing for the species. If so, will some noteworthy increase in brain size occur over the next hundred million or so years, some "event" lasting a mere hundred million years? Or, will brain size grow over the next 33 years, one human generation? Look again at that imaginary graduation photo, which shows a small but perceptible increase in human height, one generation to the next. And note what Bennett says, "the size of the spaces inside their skulls (good proxy for the size of the brain) …" (Bennett, 2024, p. 323). The spaces inside the skulls of today's grandchildren are bigger than the spaces inside the skulls of today's grandparents. This book will indelibly etch this fact into a reader's intelligence: things do change.

Bennett's book is a history of evolution, yes. But to me, it is more. A Brief History of Intelligence forces one to think. Bennett does not answer all my questions. But reading this book forces me and will force a reader to think. I recommend this book. Read it fast and think about it slowly (Kahneman, 2011).

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