



Perceived influence of GenAI on student engagement in online higher education

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Abstract

This paper analyses the perceived influence of Generative Artificial Intelligence (GenAI) on student engagement in online higher education using the Self-Determination Theory (SDT) framework. Drawing on qualitative data from 27 experienced academics across the Australian tertiary sector, the study investigates the perspectives of online educators on how GenAI may influence three core psychological needs that are considered central to student engagement: autonomy, competence, and relatedness. The findings reveal that GenAI can enhance student autonomy through personalised learning opportunities, improve competence through real-time feedback and writing support, and support relatedness by enabling inclusive participation for linguistically diverse learners. Nevertheless, the study also identifies key risks, including over-reliance on GenAI, diminished critical thinking, reduced interaction with peers and instructors, reduced collaboration, and concerns around academic integrity. The paper argues that to harness GenAI's pedagogical potential, higher education institutions must integrate GenAI literacy, student-centred instructional design, and actionable ethical frameworks. With such measures in place, GenAI can evolve from an emerging tool into a major driver of engagement, inclusion, and transformational learning in higher education.

Introduction

In recent years, the landscape of education has undergone a profound transformation, largely driven by advancements in technology. One of the most significant developments in this era is the rise of Artificial Intelligence (AI) and its increasing integration into the classroom. Among the various types of AI, Generative Artificial Intelligence (GenAI) stands out for its ability to create content, engage in conversation, and facilitate personalised learning experiences (Giannakos et al., 2023; Ruiz-Rojas et al., 2023). As educational institutions strive to enhance student engagement, the role of GenAI has become a focal point for research and innovation. The emergence of GenAI has catalysed a fundamental shift in educational paradigms, particularly in enhancing student engagement. As AI-driven applications become more integrated into educational practices, they present both opportunities and challenges that necessitate careful examination. The adoption of GenAI is not just about introducing new technologies; it is reshaping the dynamics of teaching and learning. This transformation is marked by personalised learning experiences that adapt to individual student needs, potentially supporting engagement and motivation (Sauder, 2024). Moreover, these tools prompt students to engage in metacognitive processes, encouraging critical reflection on their interactions with GenAI, which in turn cultivates a deeper understanding of the subject matter (Chen, 2023).

Though a limited number of empirical studies focus on how GenAI influences the motivational basis of student engagement (Cao et al., 2023; Chiu et al., 2025), there is a lack of empirical research on the perspective of online educators. Existing studies have largely examined GenAI's role from the learner perspective or have focused on specific functional affordances of GenAI tools such as writing assistance and adaptive feedback without critically synthesising how these intersect with established core psychological needs frameworks such as SDT. Moreover, while prior research acknowledges both the benefits and risks of GenAI (Aghaziarati et al., 2023; Rasul et al., 2023), few studies have integrated these insights into a theoretically grounded and context-specific analysis of how GenAI shapes the three core psychological needs, namely autonomy, competence, and relatedness in online higher education. This gap is significant because online educators play a central role in mediating online educational technologies and shaping the conditions for student engagement, yet their voices remain underrepresented in the discourse. In this study, SDT is applied not as a direct measure of students' lived experiences, but as an interpretive framework to examine how educators perceive GenAI's influence on the core psychological needs of autonomy, competence, and relatedness. This approach acknowledges that the findings reflect educators' interpretations, which may differ from students' own accounts. Accordingly, the study offers insights into how experienced online academics conceptualise GenAI's potential to support or hinder these psychological needs.

The integration of GenAI into educational contexts signifies more than a passing trend; it represents a profound shift in pedagogical approaches and offers many opportunities

to enhance performance both for students and educators. Recent studies underscore the potential of AI to support and enhance learning, particularly in promoting student autonomy. Tools like ChatGPT, Gemini, Anthropic's Claude, Perplexity, and the Chinese GenAI tools (e.g., Doubao, DeepSeek, Ernie Bot and Kimi Moonshot) assist students in generating ideas, improving writing skills, and conducting independent research, thus promoting a self-directed learning environment. Abbas et al. (2023) emphasise that this personalised support, tailored to individual learning needs, can significantly enhance educational performance. GenAI tools not only respond to students' queries but also provide them with the tools to think critically and independently, making them active participants in the learning process.

GenAI's role extends beyond mere content delivery; it actively supports the writing and creative processes, an area that has generated considerable debate in the educational community. Barrett (2023) highlights the benefits of using GenAI as a writing tool, noting its ability to facilitate brainstorming and cognitive offloading, which students and educators have found beneficial. The efficiency and effectiveness of these tools in aiding writing and research tasks can help students refine their ideas and improve their academic work.

GenAI also promotes deeper engagement by creating interactive, personalised learning experiences. AI-driven chatbots and virtual assistants can engage students in real-time conversations, helping them with homework, explaining difficult concepts, or encouraging exploration beyond the curriculum (Chan & Hu, 2023; Oliveira, 2023). These tools create a dynamic learning environment where students are not passive recipients of information but active participants. Furthermore, GenAI platforms can be used to generate quizzes, simulations, and study guides that adapt to students' specific learning needs, ensuring they remain engaged and challenged at an appropriate level (Oliveira, 2023). This personalised approach is especially beneficial in large classrooms, where individual student needs are often overlooked.

Despite the numerous advantages of GenAI in educational settings, there are also significant drawbacks and ethical concerns that need to be addressed. One of the primary concerns is the potential for over-reliance on GenAI, which can lead to a decline in critical thinking and independent learning. As noted by Asad et al. (2024) and Thüs et al. (2024), excessive use of GenAI tools may cause students to bypass critical thinking and may even lead to misinformation, especially if the outputs are not rigorously vetted. This raises concerns about the authenticity of student work and the risk of GenAI-generated content being used to complete assignments without proper analysis or reflection.

The issue of academic integrity is another significant challenge. The potential for students to simply cut and paste GenAI-generated content into their assignments raises critical questions about the authenticity of student work. As discussed by Barrett (2023), while GenAI can facilitate brainstorming and content creation, there is a danger that it could be misused, especially if students are not guided to engage meaningfully with the content.

Given these opportunities and challenges and the role played by the educators, this paper seeks to address the following research question:

- RQ: How do online academics perceive the influence of GenAI on student engagement through the lens of students' psychological needs of autonomy, competence and relatedness?

By exploring this question, this paper aims to contribute to the ongoing discourse on how best to harness the potential of GenAI in education, ensuring that its integration leads to meaningful and ethical learning experiences.

Literature review

This section reviews existing research on how the integration of GenAI into education is perceived to have influenced core dimensions of student learning, particularly student engagement. The theoretical framework of Self-Determination Theory is applied to examine research on how GenAI can possibly impact students' psychological needs of autonomy, competence, and relatedness in an online learning environment. The review highlights both the opportunities and challenges of using GenAI to create more personalised, responsive, and motivating learning experiences. It also considers important ethical and pedagogical implications.

The relationship between student engagement and GenAI

Artificial Intelligence (AI) is progressively redesigning the educational landscape, offering new pathways to enhance student engagement (Nguyen et al., 2024). Student engagement, a multidimensional concept involving behavioural, emotional, and cognitive involvement in learning, is a strong predictor of academic success and persistence (Bonet & Walter, 2016). AI proposes a favourable avenue for assisting and improving this engagement through personalisation, real-time feedback, and dynamic learning conditions that adapt to students' needs (Bhatia et al., 2024). One of the most substantial ways AI advances engagements is through personalised learning (Ayeni et al., 2024). Traditionally, educational models often struggle to address diverse student needs, and AI-integrated adaptive learning approaches propose a solution by investigating student data and tailoring content accordingly. For example, platforms like Squirrel AI in China use algorithms to assess individual student performance and adjust the difficulty and pacing of learning materials. This level of personalisation helps to keep learners within their zone of proximal development, which increases motivation and sustained attention. As Holmes et al. (2019) note, personalisation through AI can significantly enhance learners' sense of autonomy and competence, both of which are critical to intrinsic motivation.

In addition to personalisation, AI technologies can provide real-time feedback, which is critical for maintaining student engagement. Feedback allows learners to understand

where they are in the learning process, what they need to improve, and how they can progress. This rapid feedback loop supports a growth mindset by showing students that mistake provides opportunities for learning and growth rather than fixed failures. Luckin et al. (2022) highlight that timely, actionable feedback is a core indicator of student engagement and academic achievement. AI provides more interactive and responsive learning environments. Chatbots, virtual tutors, and conversational agents can simulate peer or instructor interaction, offering on-demand support and clarification. These tools are particularly effective for students who may be hesitant to ask questions in class or who require additional explanation outside normal teaching hours. AI systems capable of natural language processing can enhance learner engagement by enabling more exploratory and dialogic forms of learning (Zawacki-Richter et al., 2019). For instance, students interacting with AI writing assistants often experiment with different ways of communicating and articulating their ideas, which can lead to deeper understanding and increased investment in the writing process. Saliu (2024) emphasised the importance of engagement with GenAI as it becomes a critical factor of modern media literacy. Learners must be trained not only to understand AI as a non-human media actor, but also to significantly pilot its role in defining online communication and participation.

Research highlights the role of AI in developing students' academic skills, particularly in writing. Lee and Kwon (2024) found that students who engaged actively with GenAI produced essays with greater verbal sophistication and complexity than those who used the tool inactive. This indicates that meaningful engagement with AI tools can persuade higher order thinking especially when students are steered to comment and build upon the AI's suggestions rather than simply accept them. Similarly, Sullivan et al. (2024) emphasised that engaging students through targeted GenAI workshops enhances their self-confidence, intentional use, and critical knowledge of AI tools in academic contexts, emphasising the growing importance of AI literacy in education. Student engagement with GenAI is needed for developing the AI literacy and critical thinking skills needed to thrive in a workforce progressively shaped by emerging technologies (Damaševičius, 2024).

Despite these advantages, the integration of AI in education is not without problems. Ethical concerns such as data privacy, algorithmic bias, and over-reliance on automation need to be addressed to ensure that AI use supports, rather than undermines, equitable student engagement (Akgun & Greenhow, 2022). AI indeed presents a powerful tool for improving student engagement when used thoughtfully and ethically (Ghotbi et al., 2022). Its role to personalise learning, deliver real-time feedback, and create responsive, interactive learning environments aligns well with modern pedagogical objectives (Diaz & Nussbaum, 2024). While challenges remain, specifically around ethics and fairness, the capability for AI to advance more meaningful, inclusive, and motivating learning experiences is substantial. As educators, researchers, and policymakers continue to investigate AI's role in education, continuing a focus on student engagement will be critical to realising its full potential. Engaging students with GenAI must go beyond tool usage to include critical

AI literacy that challenges prevailing myths, directs ethical concerns, and steers learners to navigate the social and educational impacts of these technologies in a responsible manner (Rudolph et al., 2025).

Self-determination theory and student engagement

Student engagement is essential to academic accomplishment, involving the emotional, cognitive, and behavioural capabilities that students develop in their learning processes (Kimbark et al., 2017). A pronounced framework for understanding engagement is Deci and Ryan's Self-Determination Theory (SDT), which signifies three core psychological needs: autonomy, competence, and relatedness (Chiu, 2022). These needs are necessary for fostering intrinsic motivation and positive engagement in educational contexts (Sergis et al., 2018). When students feel independent, competent and connected (with peers and instructors), they are more likely to be deeply engaged in their learning (Sun et al., 2017). This theoretical framework provides a useful lens to examine the influence of GenAI on the motivational foundation of student engagement from an online educator's perspective.

Autonomy: Empowering student choice

Autonomy refers to the capability of students to feel that they are in charge of their learning processes. Autonomy is an essential factor in intrinsic motivation and when students have the freedom to make choices about their learning, they are more likely to engage deeply and take ownership of their academic journeys (Al-Shboul et al., 2023). Autonomy in an education setting could be reflected in numerous ways such as through freedom to select and complete study topics, engage with academic content in a personalised manner and design projects to complete main assessment activities. When the student's learning is in line with their values, it results in a sense of ownership and control that drives engagement.

In the classroom, autonomy can manifest in various ways, such as through the freedom to select topics, design projects, and engage with content in personalised ways. When students perceive that their learning aligns with their interests and values, they experience a sense of ownership and control, which drives engagement (Jungert et al., 2023). GenAI can support autonomy through personalised learning experiences that allow students to investigate topics of interest at their own pace (Chiu, 2024). AI-driven adaptive learning platforms can adapt the complexity of tasks and provide students with resources that match their learning preferences. Tools like GPT-4, for instance, can assist students in brainstorming ideas, and even extending tailored feedback on their work. This level of personalisation enables students to make decisions about their learning process, enhancing their sense of autonomy (Xie et al., 2024). However, other researchers (Asad et al., 2024; Hou et al., 2025; Larson et al., 2024) caution that such excessive use of GenAI may adversely impact student learning as critical thinking is bypassed. This undermines genuine autonomy in students as they delegate critical thinking to GenAI.

Competence: Building mastery through feedback and challenge

Competence, the second core psychological construct within SDT, involves students feeling efficient in their learning and refers to the need to experience mastery and success in achieving challenging tasks (Sanchez-De Miguel et al., 2023). When students believe they can succeed in their academic interests, they are more likely to continue in their efforts and remain engaged. Competence is often developed through constructive feedback, achievable encounters, and opportunities to apply competencies in meaningful perspectives.

GenAI has the capacity to substantially improve the progress of competence. One of the ways this occurs is through immediate, personalised feedback. AI systems can evaluate student work and provide feedback, help students recognise where they are excelling and where they need upgrading (Song et al., 2025). AI-powered writing assistants can help students refine their writing by suggesting edits for grammar, structure, and clarity, allowing students to learn and improve their academic writing skills (Kim et al., 2025). This kind of feedback helps build competence by guiding students toward mastery in a supportive manner. Adaptive learning platforms developed by AI can present students with tasks that are neither too easy nor too difficult, but just right to facilitate learning without overwhelming them (Hess et al., 2024). By providing challenges that match a student's current competence level, GenAI can support their learning and growth and enhance student engagement. However, researchers have raised concerns about the depth of the competence with a recent study finding that the learning outcomes were lower for students who used "GenAI in a procedural and regurgitative approach" (Pallant et al., 2025, p.9).

Relatedness: Promoting connections with peers and instructors

Relatedness, the third psychological need drawn from SDT, involves students feeling connected to others and experiencing a sense of belonging in the learning setting. Social connections with peers and instructors contribute significantly to engagement, as they promote collaboration, emotional support, and a sense of community. Being involved in a supportive learning community fosters motivation and persistence to achieve higher learning outcomes (Dung et al., 2024).

AI can improve communication between students and instructors by providing platforms for personalised interactions and feedback. AI-driven virtual assistants can support instructors in managing their communication load, offering timely responses to student inquiries and creating more opportunities for meaningful and individualised communications. By facilitating more responsive communication, GenAI helps students feel more connected to their mentors and instructors, promoting a sense of relatedness (Liu et al., 2024). Furthermore, AI can support peer collaboration through platforms that boost group work, idea sharing, and collective problem-solving (Baskara,

2024). AI tools can help students collaborate on projects by organising discussions, suggesting resources, and providing feedback on group contributions. These tools can also facilitate students connect with peers who share similar interests, fostering a sense of belonging within a broader academic community. Conversely, students express concern that the use of GenAI can limit opportunities to interact and socialise with others (Chan & Hu, 2023).

The literature suggests that while GenAI has the potential to support students' psychological needs of autonomy, competence and relatedness, it poses challenges such as a lack of genuine autonomy and competence and limiting social interaction. The effectiveness of GenAI in supporting the motivational foundation of student engagement appears to need intentional pedagogical design.

Methodology

This study used a qualitative research design to examine the perception of academics in online learning about the influence of GenAI on student engagement through the lens of Self-Determination Theory (SDT). In this study, SDT is applied as an interpretive framework for analysing educators' accounts rather than as a direct measure of students' psychological experiences. This framing recognises that lecturers' insights provide an informed but indirect view of students' lived experiences, consistent with research recognising the value of educators' situated expertise in identifying engagement patterns and shaping need supportive learning environments (Kember, 2004; Manninen et al., 2022). Given that educators play a central role in shaping supportive learning environments that nurture student learner motivation (Manninen et al., 2022), the interviewees were well-positioned to offer in-depth context-specific insights into how GenAI may influence students' psychological needs, namely autonomy, competence, and relatedness. The qualitative research design was deemed appropriate to investigate the strategies employed by educators to enhance adult learners' engagement, support their autonomy, improve their competence, and promote their sense of belonging in the context of online higher education. The study followed a structured approach to ensure the reliability and validity of the data collected (Azungah, 2018). It targeted academics working in the Australian tertiary education sector with at least two years of experience in online teaching. Previous experience in online teaching is essential, as these academics have taught online courses several times and have shown an interest in developing student engagement strategies (Friedrichsen et al., 2009).

A purposive sampling technique was employed to select participants with experience and expertise in online higher education. The inclusion criteria for participants were based on their involvement in teaching online courses and their willingness to share insights on student engagement in this context. Most academics were contacted using the social media platform LinkedIn and through referrals. Several other academics were then recruited through snowball sampling to ensure sample diversity (Noy, 2008). In total, 27 academics agreed to participate in the research project, all with at least

ten years of teaching experience in the Australian higher education sector and more than two years of experience in online learning. The respondents represented five higher education institutions and taught across eight distinct disciplines, including business, education, psychology, information technology, and humanities. The sample size of 27 participants was considered appropriate as data saturation was reached and the group reflected a diverse cross-section of academic roles and institutional contexts, enhancing the transferability of findings through varied, context-rich insights into how GenAI is perceived across institutions and disciplines.

Data collection

Data were collected over three months (September to November 2023) through semi-structured interviews conducted with the participants. Ethical approval was granted by the Ethics Committee at the Australian Institute of Business. Before the interviews, participants were provided with informed consent forms outlining the study's purpose, confidentiality measures, and their rights as participants. The interviews were conducted online via Zoom, recorded with the participants' consent, and then fully transcribed. The interviews, lasting 60 minutes each, allowed for a detailed exploration of the topic. The interview questions were derived from a comprehensive review of existing literature. The interview protocol consisted of 15 open-ended questions designed to explore academics' perceptions, experiences, and strategies related to student engagement in online higher education. Following general questions about student engagement and the challenges in online education, the academics were asked to share strategies they use to enhance student engagement by providing autonomy and control over their learning, improving the competence of adult learners in online higher education, and promoting the involvement of adult learners (Abayadeera et al., 2019; Harbour et al., 2015). This approach enabled the researchers to lead the discussion flexibly while allowing new research avenues to emerge (Merriam & Tisdell, 2016).

Data analysis

Credibility of the findings was supported through member checking with participants being provided an opportunity to review their transcripts and provide feedback (Birt et al., 2016). Respondents were de-identified in the dataset, and the transcripts were stored securely according to the ethics approval requirements. The qualitative data were coded using NVivo 11 and analysed using a general inductive approach (Thomas, 2006). This approach is common in various types of educational research studies (Liu, 2016). As suggested by Maxwell (2009) and Liu (2016), data coding was carried out concurrently with data collection whenever feasible, which supported the collection of rich data until no new insights could be gained. Recurring data patterns were identified by comparing data, coding, and interpretation (Chenail, 2012; Merriam & Tisdell, 2016). Initially, we established preliminary categories through an iterative process of open coding (Miles et al., 2020; Thomas, 2006). After coding 25

interviews, data reached saturation, and interviewing ceased after 27 interviews. To improve inter-coder reliability, two researchers independently coded the data using preliminary categories (Campbell et al., 2013). After the initial round of coding, the codes were refined and organised into groups based on engagement strategies (Miles et al., 2020). The research team collaboratively discussed and resolved the coding discrepancies and refined themes. This process supported consistent interpretation of the interview data and strengthened the analytical rigour of the study (Miles et al., 2020).

Results

The thematic analysis focused on the perceptions of study participants on the influence of GenAI on the core psychological needs identified by self-determination theory – autonomy, competence, and relatedness. Interview data were coded for first-order concepts and then into second-order themes. The second-order themes were mapped to each core psychological need. Collectively, findings suggest a complex dialectic relationship in the influence of GenAI use and student engagement. The tensions are reflected in the potential of GenAI to support and conversely hinder student engagement.

The influence of GenAI on student autonomy

The participants were asked to share their opinions regarding the influence of GenAI on student autonomy. Their perceptions were complex and with some opposing views. Three second order themes (as shown in Table 1) were identified, namely, technological limitations of GenAI and its integration challenges, its negative impact on learning and cognitive development, and its potential for supporting learning. Many interviewees mentioned that the development of GenAI is still at an early stage and that many people still do not know how to use it properly. Both academics and students face complexities and hurdles in effectively utilising GenAI as a learning tool.

Table 1. The influence of GenAI on student autonomy.

1 st order concepts	2 nd order themes
Absence of personal touch	Technological limitations and integration challenges
Just a supporting tool not to help autonomy	
Less helpful for some subjects	
Impair students' critical thinking skills	Negative impact on learning and cognitive development
Decreased engagement and attentiveness	
Reduced sense of responsibility	
Students struggle during exams due to reliance on GenAI	
May facilitate academic dishonesty if misused	
Good start for generating ideas and/or information	Potential for supporting learning
May help in grammar and sentence structure	
Tool for independent research	

Technological limitations and integration challenges

Lack of personal touch in the learning process was noted by several participants as a major limitation of GenAI. They expressed concern that while GenAI can provide valuable information, it cannot replace the tailored feedback that students receive from human instructors. This absence of a personalised learning experience can hinder students' deeper understanding and engagement with the subject matter. As an academic noted:

They are just relying on technology for quite a lot, many things. They are losing that personal touch and communication and the learnings from the real-world scenarios which they might have got from our experiences. (Participant 11)

Applicability across different subjects varies for GenAI. Some disciplines benefit more from GenAI tools, while others find them less useful. For example, an academic teaching information technology for business found that GenAI significantly enhances student autonomy by enabling them to explore beyond the classroom content. However, for some subjects, GenAI is not a credible source, as it often provides inaccurate information, which negatively impacts learning. An academic explained:

For other things like coding, it is accurate most of the time, and it gives them that ability or that resource to learn more than what we can cover in a two-hour lecture. But for subjects like Tax Law, it's very inaccurate. (Participant 16)

Negative impact on learning and cognitive development

Impairment of critical thinking skills due to the misuse of GenAI tools by students can diminish their ability to think independently and solve problems creatively. The findings align with recent studies that found frequent use of AI tools reduced critical thinking skills in students with cognitive offloading (Gerlich, 2025). A common theme among participants was that GenAI tools, such as ChatGPT, Gemini, Anthropic's Claude, Perplexity, and the Chinese GenAI tools (e.g., Doubao, DeepSeek, Ernie Bot and Kimi Moonsho) often provide students with theoretical answers. Many students often misuse GenAI to produce work without genuine understanding or effort; rather than engaging with the material themselves, they use AI-generated content in their assignments without critically processing the information. From an SDT perspective, students' reliance on GenAI to do the critical thinking undermines autonomy as the sense of agency is eroded. The convenience of AI tools also compromises academic integrity. The following comment echoes the sentiment of many participants.

They just put the questions directly into ChatGPT, and it provided a very theoretical answer. They just copy-paste the answer. (Participant 3)

This reliance on GenAI can result in students becoming less attentive and less engaged in active learning, as they depend on GenAI to provide answers instead of participating in discussions and problem-solving activities. The reduction

in self-regulated learning negatively impacts a student's intrinsic motivation to learn. As one academic observed:

I had a student in the classroom recently who very brazenly was using ChatGPT right in front of me. He would literally type it into ChatGPT and read from the screen. (Participant 5)

The reduced sense of responsibility is another significant concern. GenAI tools can make students complacent, as they may feel less accountable for their learning. According to one participant:intrinsic motivation to learn. As one academic observed:

Students have become lazy and just use whatever AI gives them. (Participant 8)

This attitude hinders the development of autonomy and self-regulation, which are essential components of effective learning. Dependence on GenAI can also have adverse effects on students during exams, as they are unprepared to tackle questions without its aid. One participant noted:

Some students rely on GenAI to get ideas about a concept and then try to build on that, but when it comes to exams, they struggle because they have not developed a deep understanding. (Participant 6)

Potential for supporting learning

Many participants believed that GenAI tools can be instrumental in the initial stages of idea generation and information gathering, thus serving as a useful tool for gaining a broader understanding of topics. One academic noted:

I am not against AI, I like it. And sometimes I use it myself. I think there's obviously a lack of constructive guidance for students on how to use GenAI to support learning. For instance, in practical subjects like global business, if they can't find information on a certain company, I say, 'use AI as professional Google'. It's a tool that's very helpful for them. (Participant 1)

GenAI tools can also play a significant role in improving students' academic writing by assisting with grammar and sentence structure and produce more polished and professional work. One participant shared:

On the positive side, GenAI helps a lot with grammar checks and sentence structuring. It's so easy to have someone helping you do that, resulting in better quality writing. (Participant 16)

Several participants noted that GenAI can facilitate independent research by helping students access and process information more efficiently, emphasising its potential to support deep learning by making research more accessible. One academic mentioned:

GenAI has definitely helped students enhance their autonomy in research and learning. For instance, GenAI processes information efficiently and combines different ideas, providing a holistic view. (Participant 12)

Collectively, while interviewees are concerned about the widespread misuse of GenAI tools, they agree that their potential to support learning is undeniable. When used correctly, GenAI enhances student autonomy and contributes to superior learning outcomes.

The influence of GenAI on students' critical thinking and competence

Participants offered diverse perspectives on the influence of GenAI on students' critical thinking and competence, expressing both optimism and concern. Our findings underscore a fundamental challenge in contemporary education, whether GenAI is used as a tool to support inquiry-driven learning or surface-level engagement. The surface-level or deep-level processing a learner is engaged in (Marton & Säljö, 1976) depends on how GenAI is used by students. The data revealed two second-order themes (as shown in Table 2), namely challenges and limitations of GenAI as a barrier to critical thinking, and GenAI as catalyst for critical thinking and learning.

Table 2. The influence of GenAI on students' critical thinking and competence.

1 st order concepts	2 nd order themes
Still at the infancy stage to realise its impact on critical thinking	GenAI as a barrier to critical thinking and learning
GenAI is not built to help the user think critically	
Depending on GenAI without relying on own research may lead to a superficial understanding of concepts	
Excessive dependence on GenAI can hinder creativity	
GenAI may provide misleading information	
Impact is dependent on the context (e.g., topic, field of study, etc.)	GenAI as catalyst for critical thinking and learning
GenAI may serve as a catalyst for creative thinking and learning	
Stimulate ideas to think outside of the box	
May be useful if the correct prompts are used	

GenAI as a barrier to critical thinking and learning

Many participants emphasised that the GenAI technology is still in its infancy; while GenAI provides quick answers, it may not contribute to deeper cognitive development. A recurring view was that GenAI is not inherently designed to promote critical thinking. Instead, its use often results in broad, superficial outputs that may not help students to engage in deeper analysis. Another issue participants identified is the risk of students relying too heavily on GenAI without conducting their own research, which may lead to a shallow understanding of the subject matter. Two participants remarked:

It is actually making work easier for most students, they tend to do less research on their own to understand the concept. (Participant 6)

All the students who rely more on GenAI are the ones who are running short of time...They are not prepared in advance and they just rely on GenAI just to finish the assignments. (Participant 13)

This resonates with other studies that found only a small proportion of students use GenAI to improve critical thinking (Fischer et al., 2024). Several participants also cautioned that GenAI can produce misleading information, which students often fail to verify. As two interviewees observed:

Sometimes GenAI produce references which don't even exist or might be incorrect. But students just pick the information and submit it. (Participant 6)

It definitely gives you a lot of information... but at the same time, it also gives information which is not relevant. That's the problem. (Participant 24)

Many interviewees also believed that the impact of GenAI on critical thinking is highly dependent on the context – it varies across different fields of study.

GenAI as a catalyst for critical thinking and learning

Several educators highlighted that it could serve a catalyst for creative thinking and learning when used effectively. They observed that while some students rely too heavily on GenAI, others thoughtfully use it to brainstorm, explore new ideas, analyse situations, synthesise diverse perspectives and obtain additional insights. Three academics commented:

Some students use GenAI very wisely. They use AI to help them understand concepts from different perspective, analyse a situation from different angles. (Participant 12)

It has enabled some of them to think outside the box. For those who like to know more, they look at what GenAI is presenting, compare it with what they've learned. (Participant 6)

AI helps them to see both sides of an issue... it allows them see both sides of an issue. I think from that sense it helps them to be more creative. I think it facilitates their critical thinking. (Participant 8)

However, many interviewees shared that whether the use of GenAI would promote critical thinking largely depends on the quality of the prompts used as the output is highly dependent on the thoughtful engagement with the tool. The following comments supports this view:

GenAI's outcome depends upon what type of prompts you are using. If you are using the right prompts, then only you will get the right result. The prompts are also related with critical thinking. You have to critically think about the prompts,

otherwise, it will come up with a standard answer. (Participant 7)

Competent students create prompts in a creative way. It's not just give me an answer. In fact, this is an art in itself. (Participant 10)

Collectively, interviews highlight that GenAI can stimulate critical thinking, but only when students engage deeply with the tool by asking precise and thoughtful questions.

The influence of GenAI on students' collaboration and sense of belonging

Perspectives of online academics reveal a dialectical tension: while GenAI can support collaboration between students, it also risks contributing to social isolation and weakening their sense of belonging. The findings suggest that the influence of GenAI on social connectedness is context-dependent on how GenAI is integrated into the learning environment. Two second-order themes (as shown in Table 3) were identified, namely GenAI as an enabler of collaboration and sense of belonging and risks of isolation and reduced collaboration.

Table 3. The influence of GenAI on students' collaboration and sense of belonging.

1 st order concepts	2 nd order themes
Helps students with language barriers to communicate	GenAI as an enabler of collaboration and sense of belonging
Promotes peer to peer connection	
Supports inclusive learning across language and cultural backgrounds	
Many students becoming overly dependent on GenAI	Risks of isolation and reduced collaboration
Diminished interpersonal interaction and social engagement	
May hinder teamwork	

Some educators observed that GenAI tools can assist students with language barriers (especially non-native speakers) by helping them understand the content, articulate ideas more effectively, and communicate better with peers, contributing to a more inclusive learning environment. One participant commented:

In terms of a positive, you can think of it as a tool where you can connect with students beyond boundaries. A student who has poor English communication skills can still connect with students from an English background. Google Translate and other things can just change the meaning. They can be completely misleading. GenAI makes it better. (Participant 10)

However, many academics cautioned that while GenAI tools can support the connectedness of students with language barriers, there is a risk of students becoming overly reliant on GenAI, possibly reducing collaborative efforts. They also have the potential to make students more isolated,

diminish interpersonal interactions and weaken the sense of community among peers. Below are some comments from academics that echo the sentiments of others.

There is a potential for making students more of loners because you have a support system, you have a friend. So, why do I have to talk to someone else? (Participant 16)

Some students have stopped communicating to their friends...they are just focused on their laptops...Before ChatGPT, people had to talk to their group members, work together to find answers, or collaborate as a team. So, I do feel that ChatGPT has hindered students' sense of belonging. (Participant 3)

I think if GenAI alienates them from their class....I think this is a way of getting out of having to socialise with their peers. (Participant 5)

These insights highlight that for some students, particularly those prone to social withdrawal, GenAI may become a way to avoid interaction altogether, limiting opportunities to develop vital interpersonal and teamwork skills. This shift has broader implications for educational settings, where belonging and social connection are essential to deep learning and student well-being. These insights align with the social constructivist framework (Vgotsky, 1978) that considers collaboration as central to the shared construction of knowledge.

Discussion

This study examined how GenAI influences student engagement in online higher education through the lens of Self-Determination Theory (SDT), using it as a framework to interpret educators' perceptions of its impact on the psychological needs of autonomy, competence, and relatedness. These perspectives offer an informed, though indirect, view of students' experiences. The complex dialectical relationship between the use of GenAI and student engagement was evident in the perspectives of participants in this study. It also highlights key tensions such as autonomy versus dependence, competence versus superficial learning, and relatedness versus isolation. The findings reveal that while GenAI presents opportunities to personalise and enhance learning, its impact is context-dependent, shaped by user intent, digital literacy, and ethical integration within pedagogical practice. Although this study is situated in the Australian higher education context, many of the participating academics teach in institutions with significant international student populations. This diversity enhances the transferability of the findings, making them relevant to broader global contexts. The challenges identified are not culturally isolated, but indicative of wider shifts in how GenAI is reshaping student engagement in online learning environments.

Autonomy versus technological dependence

With regard to autonomy, participants recognised GenAI tools as useful for supporting independent learning, especially through idea generation, grammar enhancement, and preliminary research. This aligns with previous research (Abbas et al., 2023; Nazari et al., 2021) indicating that GenAI can provide tailored, learner-driven support. Many academics acknowledged that when students use GenAI purposefully by selecting relevant prompts or critically engaging with feedback, their sense of control and ownership over their learning improves. However, these benefits were balanced by concerns about misuse such as over-reliance, diminished cognitive effort and academic misconduct, a theme flagged in recent studies (Chugh et al., 2025; Foltynnek et al., 2023; Sullivan et al., 2023). This paradox where students are offered more choice through GenAI but often relinquish critical agency to the tool raises questions about whether such autonomy is authentic. From an SDT perspective, this blurring of autonomy and dependence complicates the notion of learner agency, suggesting that externally supported freedom without meaningful self-direction may not truly satisfy the psychological need for autonomy. The surface-level learning engaged in by most students using GenAI is an impediment to deeper learning that supports cognitive development and authentic student engagement (Fischer et al., 2024). Consistent with Yang et al. (2024), this study emphasises the need to promote student agency and argues that SDT and constructivist learning theory should inform pedagogical practices. Participants noted that GenAI is still at an early developmental stage and lacks the nuance needed to support deep cognitive autonomy. This reflects a broader issue raised by Chan and Hu (2023), Foltynnek et al. (2023), Lo (2023), Sullivan et al. (2023), and Yu and Yu (2023): that institutions must embed GenAI literacy and ethical training to unlock its full pedagogical potential.

Competence versus the risk of superficial understanding

On the dimension of competence, the findings indicate that GenAI can assist in providing real-time feedback, scaffold academic writing and improve analytical capacity essential in research tasks. Such features are identified as core drivers of perceived competence under SDT. Nevertheless, these benefits were counterbalanced by concerns regarding students' passive use of GenAI, misinformation, superficial understanding of subject content, and a lack of genuine engagement or effort, often driven by the desire to complete assignments. From an SDT perspective, this disconnect may lead to a false sense of competence, where students feel efficient through GenAI-generated responses, but lack mastery, which is likely to disrupt the feedback loop necessary for genuine self-efficacy and intrinsic motivation. This compromise of meaningful learning practices risk undermining deep learning and critical thinking, a concern substantiated by recent studies (Daniel et al., 2025; Han et al., 2025; Sullivan et al., 2023; Wu et al., 2024; Zeb et al., 2024). Importantly, this suggests that effective use of GenAI requires clear usage policies, prompt literacy and academic training in how to embed GenAI meaningfully within curriculum design (Aithal & Aithal, 2024; Chugh et al., 2025; Duah & McGivern, 2024; Farrelly & Baker, 2023; Rodriguez-

Donaire, 2024). Following Biggs (2003), constructive alignment in pedagogical practice is important to support deep learning in AI-supported educational contexts.

Relatedness versus isolation

The dimension of relatedness presents divergent perspectives on the role of GenAI in promoting or inhibiting social connections and sense of belonging. On one hand, GenAI was perceived as an equalising tool that can assist students with language barriers to engage more fully in academic discourse, thereby contributing to a more inclusive learning environment. On the other hand, it was critiqued for potentially reducing interpersonal interactions and peer collaboration. This contradiction suggests that inclusivity achieved through GenAI may be functionally different from social inclusion achieved through interpersonal interaction, raising important questions about the authenticity of connection in GenAI-supported learning environments. Increasingly, students are turning to GenAI rather than classmates for discussion and clarification, which may weaken peer-to-peer social cohesion. These concerns reflect broader apprehensions that, although GenAI can facilitate communication, it may inadvertently erode students' sense of community and belonging if learning environments are not intentionally designed to support rather than substitute authentic human connection (Alasadi & Baiz, 2023; Khlaif et al., 2024; Liu, 2024; Liu et al., 2024). These findings highlight the importance of intentional pedagogical design in online learning environments that aligns with social constructivist theory (Vygotsky, 1978) and Community of Inquiry framework (Garrison & Arbaugh, 2007), both of which emphasise learning as a collaborative social process.

To address the tensions identified in the use of GenAI in higher education, the study proposes applying constructive alignment (Biggs, 2003) as a pedagogical framework, one that ensures GenAI is not used in isolation, but purposefully integrated into learning outcomes, teaching methods and assessment. Framed this way, GenAI can be used as a supportive tool to promote deeper learning, real autonomy, and meaningful student engagement.

Ethical implications and institutional responsibilities

Interviewees in this study raised concerns about academic integrity given the convenience of GenAI tools. Students can cut and paste responses from GenAI tools in their assessments. The need to provide guidelines for the ethical use of GenAI tools has been raised previously (Sullivan et al., 2023; Taylor, 2023; Watts, 2023). GenAI tools serve as an all-in-one student learning assistant that offers intelligent grading and language support for teachers, thereby creating a more enriched, interactive, and adaptive learning experience. However, to ensure proper implementation without overstepping any ethical boundaries, and acknowledging that these tools may carry embedded bias, GenAI should complement rather than replace traditional teaching methods (AlAli & Wardat, 2024; Nguyen et al., 2022).

To mitigate ethical risks, institutions should adopt clear policies on GenAI use, covering academic honesty, disclosure requirements, and acceptable boundaries in assessments. Educators can reduce misuse by designing assessments that emphasise process over product, such as scaffolded tasks, oral defences, and reflections on tool usage. Effective integration into teaching and learning also requires the development of appropriate pedagogic strategies focused on fact-checking, source validation, and critical thinking.

As GenAI technologies become increasingly prevalent, the lines between human and machine-generated content are becoming more blurred. This poses a challenge and places an onus on the educators to establish clear ethical guidelines and frameworks to govern the use of GenAI in education (Seo et al., 2021). This necessitates a heightened focus on GenAI ethics within curriculum design, preparing students to become informed users and future developers of GenAI technology (Zhang et al., 2022). This includes equipping them with the ability to evaluate GenAI outputs, understand data privacy risks, identify bias, and use GenAI responsibly. Educators have a critical role to play in guiding students toward ethical engagement with these technologies. Institutions must also ensure that the GenAI platforms they adopt are transparent, secure, and include mechanisms for accountability when errors or misuse occur.

Conclusion and future directions

This study demonstrates that the influence of GenAI on student engagement in online higher education is a complex dialectical relationship. When effectively integrated into pedagogical practice with clear instructional goals, GenAI has the capacity to support the core dimensions of engagement, namely autonomy, competence, and relatedness, through personalised learning, delivering timely and constructive feedback, creating an inclusive learning environment, and supporting communication. However, these benefits depend on thoughtful instructional design, strong GenAI literacy among educators and students, and clear ethical guidelines. To realise GenAI's full potential, institutions need to adopt a strategic approach that aligns technological innovation with educational values and learning outcomes. Rather than viewing GenAI as a replacement for traditional instruction, it should be treated as a pedagogical tool that enhances student-centred learning, deepens engagement, and supports the broader goals of higher education in a digitally mediated environment. As suggested in this study, to ensure this, pedagogical practice should be grounded in robust theoretical frameworks, particularly self-determination theory and constructivist learning theory, which can guide the meaningful integration of GenAI in higher education.

These insights highlight the need for institutional policies that govern ethical GenAI use and provide infrastructure for GenAI literacy, including faculty training and curriculum design support. At the policy level, national education authorities and accreditation bodies should establish sector-wide standards and accountability frameworks to ensure the responsible, transparent, and equitable integration of GenAI in higher education.

As GenAI continues to advance, educators must adapt their teaching strategies to effectively incorporate these tools into their curricula. This requires ongoing professional development and training to ensure that educators are equipped with the knowledge and skills necessary to navigate the complexities of GenAI in education (Lo, 2023). Furthermore, the relationship between students and GenAI is dynamic, requiring continuous reflection and adaptation to maximise its benefits while mitigating its risks (Lodge, 2023).

Future research directions emerging from this study include the following. First, further empirical studies are needed to explore how GenAI literacy and prompt-engineering skills shape students' ability to use GenAI critically and meaningfully, in ways that support autonomy and higher-order thinking. Second, given the diversity of student experiences across disciplines, research should investigate how GenAI affects engagement and learning outcomes in subject-specific contexts, particularly in fields that demand high levels of factual accuracy, such as law, medicine, or engineering, where misinformation can have significant consequences. Third, there is a need to explore newer strategies for leveraging GenAI as a tool to promote a sense of community and enhance peer collaboration in online learning environments. Fourth, future research should also examine the extent to which AI-mediated experiences of autonomy, competence and relatedness are experientially equivalent to those cultivated through human interaction, or whether SDT requires adaptation to account for the complexities of GenAI-driven learning.

References

- Abayadeera, N., Mihret, D., & Hewa Dulige, J. (2019). Acculturation of non-native English-speaking teachers in accounting: An ethnographic study. *Accounting Research Journal*, 33(1), 1-15.
- Abbas, N., Imran, A., Manzoor, R., Hussain, T., & Hussain, M. (2023). Role of artificial intelligence tools in enhancing students' educational performance at higher levels. *Journal of Artificial Intelligence Machine Learning and Neural Network*, 35, 36-49.
- Aghaziarati, A., Nejatifar, S., & Abedi, A. (2023). Artificial intelligence in education: Investigating teacher attitudes. *AI and Tech in Behavioral and Social Sciences*, 1(1), 35-42.
- Aithal, P. S., & Aithal, S. (2023). Application of ChatGPT in higher education and research—a futuristic analysis. *International Journal of Applied Engineering and Management Letters (IJAEML)*, 7(3), 168-194.
- Akgun, S., & Greenhow, C. (2022). Artificial intelligence in education: Addressing ethical challenges in K-12 settings. *AI and Ethics*, 2(3), 431-440.
- AlAli, R., & Wardat, Y. (2024). Opportunities and challenges of integrating generative artificial intelligence in education. *International Journal of Religion*, 5(7), 784-793.
- Alasadi, E. A., & Baiz, C. R. (2023). Generative AI in education and research: Opportunities, concerns, and solutions. *Journal of Chemical Education*, 100(8), 2965-2971.
- Al-Shboul, O. K., Rababah, L. M., Banikalef, A. E. A., & Mehawesh, M. I. (2023). Role of learner autonomy in intrinsic motivation in EFL writing. *International Journal of English Language and Literature Studies*, 12(2), 107-116.
- Asad, M. M., Shahzad, S., Shah, S. H. A., Sherwani, F., & Almusharraf, N. M. (2024). ChatGPT as artificial intelligence-based generative multimedia for English writing pedagogy: Challenges and opportunities from an educator's perspective. *International Journal of Information and Learning Technology*, 41(5), 490-506.
- Ayeni, O. O., Al Hamad, N. M., Chisom, O. N., Osawaru, B., & Adewusi, O. E. (2024). AI in education: A review of personalized learning and educational technology. *GSC Advanced Research and Reviews*, 18(2), 261-271.
- Azungah, T. (2018). Qualitative research: Deductive and inductive approaches to data analysis. *Qualitative Research Journal*, 18(4), 383-400.
- Barrett, A. (2023). Not quite eye to A.I.: Student and teacher perspectives on the use of generative artificial intelligence in the writing process. *International Journal of Educational Technology in Higher Education*, 20(1).
- Baskara, R. (2024). From AI to we: Harnessing generative AI tools to cultivate collaborative learning ecosystems in universities. In *Proceedings of the International Conference on Learning Community (ICLC)* (Vol. 1, No. 1). <https://core.ac.uk/download/pdf/622686335.pdf>
- Bhatia, A., Bhatia, P., & Sood, D. (2024). Leveraging AI to transform online higher education: Focusing on personalized learning, assessment, and student engagement. *International Journal of Management and Humanities*, 11(1). <https://ssrn.com/abstract=4959186>
- Biggs, J. B. (2003). Constructing learning by aligning teaching: Constructive alignment. In *Teaching for quality learning at university: What the student does* (2nd ed., pp. 11-25). Society for Research into Higher Education & Open University Press.
- Birt, L., Scott, S., Cavers, D., Campbell, C., & Walter, F. (2016). Member checking: A tool to enhance trustworthiness or merely a nod to validation? *Qualitative Health Research*, 26(13), 1802-1811.
- Bonet, G., & Walters, B. R. (2016). High impact practices: Student engagement and retention. *College Student Journal*, 50(2), 224-235.
- Cao, C. C., Ding, Z., Lin, J., & Hopfgartner, F. (2023). *AI chatbots as multi-role pedagogical agents: transforming engagement in CS education*. arXiv preprint arXiv:2308.03992. <https://doi.org/10.48550/arXiv.2308.03992>
- Campbell, J. L., Quincy, C., Osserman, J., & Pedersen, O. K. (2013). Coding in-depth semistructured interviews: Problems

of unitization and intercoder reliability. *Sociological Methods & Research*, 42(3), 294–320.

Chan, C., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education*, 20(1), 43. <https://link.springer.com/content/pdf/10.1186/s41239-023-00411-8.pdf>

Chen, B. (2023). *Integrating generative AI in knowledge building*. Open Science Framework Preprints. <https://www.sciencedirect.com/science/article/pii/S2666920X23000632>

Chenail, R. J. (2012). Conducting qualitative data analysis: Qualitative data analysis as a metaphoric process. *The Qualitative Report*, 17(1), 248–253.

Chiu, T. K. (2022). Applying the self-determination theory (SDT) to explain student engagement in online learning during the COVID-19 pandemic. *Journal of Research on Technology in Education*, 54(Sup1), S14–S30. <https://doi.org/10.1080/15391523.2021.1891998>

Chu, H. C., Lu, Y. C., & Tu, Y. F. (2025). How GenAI-supported multi-modal presentations benefit students with different motivation levels. *Educational Technology & Society*, 28(1), 250–269.

Chugh, R., Turnbull, D., Morshed, A., Sabrina, F., Azad, S., Md Mamunur, R., ... & Subramani, S. (2025). The promise and pitfalls: A literature review of generative artificial intelligence as a learning assistant in ICT education. *Computer Applications in Engineering Education*, 33(2), e70002. <https://onlinelibrary.wiley.com/doi/pdf/10.1002/cae.70002>

Damaševičius, R. (2024). Commentary on artificial intelligence and graduate employability: What should we teach Generation AI?. *Journal of Applied Learning and Teaching*, 7(2), 22–27. <https://doi.org/10.37074/jalt.2024.7.2.39>

Daniel, K., Msambwa, M. M., & Wen, Z. (2025). Can generative AI revolutionise academic skills development in higher education? A systematic literature review. *European Journal of Education*, 60(1), e70036. <https://doi.org/10.1111/ejed.70036>

Díaz, B., & Nussbaum, M. (2024). Artificial intelligence for teaching and learning in schools: The need for pedagogical intelligence. *Computers & Education*, 105071. <https://doi.org/10.1016/j.compedu.2024.105071>

Duah, J. E., & McGivern, P. (2024). How generative artificial intelligence has blurred notions of authorial identity and academic norms in higher education, necessitating clear university usage policies. *The International Journal of Information and Learning Technology*, 41(2), 180–193.

Dung, N. T. M., Hieu, P. N. V., Linh, N. T., Han, N. T. N., & Trong, H. (2024, November). The impact of students' using generative AI for learning on self-learning motivation: A study based on self-determination theory. In *The 2nd International Conference: Resiliency by Technology and Design (RTD 2024)* (pp. 362–382). Atlantis Press.

Farrelly, T., & Baker, N. (2023). Generative artificial intelligence: Implications and considerations for higher education practice. *Education Sciences*, 13(11), 1109.

Fischer, I., Sweeney, S., Lucas, M., & Gupta, N. (2024). Making sense of generative AI for assessments: Contrasting student claims and assessor evaluations. *The International Journal of Management Education*, 22(3), 10108.

Foltynek, T., Bjelobaba, S., Glendinning, I., Khan, Z. R., Santos, R., Pavletic, P., & Kravjar, J. (2023). ENAI recommendations on the ethical use of artificial intelligence in education. *International Journal for Educational Integrity*, 19(1), 1–4. https://link.springer.com/article/10.1007/s40979-023-00133-4?trk=public_post_comment-text

Friedrichsen, P. J., Abell, S. K., Pareja, E. M., Brown, P. L., Lankford, D. M., & Volkmann, M. J. (2009). Does teaching experience matter? Examining biology teachers' prior knowledge for teaching in an alternative certification program. *Journal of Research in Science Teaching*, 46(4), 357–383.

Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. *The Internet and Higher Education*, 10(3), 157–172.

Gerlich, M. (2025). AI tools in society: Impacts on cognitive offloading and the future of critical thinking. *Societies*, 15(1), 6. <https://doi.org/10.3390/soc15010006>

Ghotbi, N., Ho, M. T., & Mantello, P. (2022). Attitude of college students towards ethical issues of artificial intelligence in an international university in Japan. *AI & Society*, 1–8. <https://doi.org/10.1007/s00146-021-01168-2>

Giannakos, M., Azevedo, R., Brusilovsky, P., Cukurova, M., Dimitriadis, Y., Hernandez-Leo, D., Järvelä, S., Mavrikis, M., & Rienties, B. (2024). The promise and challenges of generative AI in education. *Behaviour & Information Technology*, 1–27. <https://doi.org/10.1080/0144929X.2024.2394886>

Harbour, K. E., Evanovich, L. L., Sweigart, C. A., & Hughes, L. E. (2015). A brief review of effective teaching practices that maximise student engagement. *Preventing School Failure: Alternative Education for Children and Youth*, 59(1), 5–13.

Hess, B. J., Cupido, N., Ross, S., & Kvern, B. (2024). Becoming adaptive experts in an era of rapid advances in generative artificial intelligence. *Medical Teacher*, 46(3), 300–303.

Hou, C., Zhu, G., & Sudarshan, V. (2025). The role of critical thinking on undergraduates' reliance behaviours on generative AI in problem-solving. *British Journal of Educational Technology*, 56, 1919–1941.

Jungert, T., Schattke, K., Proulx, F. A., Taylor, G., & Koestner, R. (2021). Whose autonomy support is more effective? Managers' or co-workers'? An experimental comparison of source and occupational context on intrinsic motivation. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, 38(2), 209–223.

- Kember, D. (2004). Interpreting student workload and the factors which shape students' perceptions of their workload. *Studies in Higher Education*, 29(2), 165–184.
- Khlaif, Z. N., Ayyoub, A. A., Hamamra, B., Bensalem, E., Mitwally, M. A. A., Ayyoub, A., & Shadid, F. (2024). University teachers' views on the adoption and integration of generative AI tools for student assessment in higher education. *Education Sciences*, 14(10), 1090.
- Kim, J., Yu, S., Detrick, R., & Li, N. (2025). Exploring students' perspectives on generative AI-assisted academic writing. *Education and Information Technologies*, 30(1), 1265–1300.
- Kimbark, K., Peters, M. L., & Richardson, T. (2017). Effectiveness of the student success course on persistence, retention, academic achievement, and student engagement. *Community College Journal of Research and Practice*, 41(2), 124–138.
- Larson, B. Z., Moser, C., Caza, A., Muehlfeld, K., & Colombo, L. A. (2024). Critical thinking in the age of generative AI. *Academy of Management Learning & Education*, 23(3), 373–378.
- Lee, S. J., & Kwon, K. (2024). A systematic review of AI education in K–12 classrooms from 2018 to 2023: Topics, strategies, and learning outcomes. *Computers and Education: Artificial Intelligence*, 6, 100211. <https://doi.org/10.1016/j.caeai.2024.100211>
- Li, Y., & Chiu, T. (2025). The mediating effects of needs satisfaction on the relationship between teacher support and student engagement with generative artificial intelligence (GenAI) chatbots from a self-determination theory (SDT) perspective. *Education and Information Technologies*, 30(5), 1–16. <https://doi.org/10.1007/s10639-025-13574-w>
- Liu, L. (2016). Using generic inductive approach in qualitative educational research: A case study analysis. *Journal of Education and Learning*, 5(2), 129–135.
- Liu, H. (2024). Applicability of ChatGPT in online collaborative learning: Evidence based on learning outcomes. *Proceedings of the International Academic Conference on Education*, 1(1), 33–43. <https://doi.org/10.33422/iaceducation.v1i1.656>
- Liu, Y., Park, J., & McMinn, S. (2024). Using generative artificial intelligence/ChatGPT for academic communication: Students' perspectives. *International Journal of Applied Linguistics*, 34(4), 1437–1461.
- Lo, C. (2023). What is the impact of ChatGPT on education? A rapid review of the literature. *Education Sciences*, 13(4), 410.
- Lodge, J. (2023). It's not like a calculator, so what is the relationship between learners and generative artificial intelligence? *Learning Research and Practice*, 9(2), 117–124.
- Luckin, R., Cukurova, M., Kent, C., & Du Boulay, B. (2022). Empowering educators to be AI-ready. *Computers and Education: Artificial Intelligence*, 3, 100076. <https://doi.org/10.1016/j.caeai.2022.100076>
- Manninen, M., Dishman, R. K., Hwang, Y., Magrum, E. D., Deng, Y., & Yli Piipari, S. (2022). Self Determination Theory based instructional interventions and motivational regulations in organized physical activity: A systematic review and multivariate meta analysis. *Psychology of Sport and Exercise*, 62, Article 102248. <https://doi.org/10.1016/j.psychsport.2022.102248>
- Mamlok, D. (2024). Landscapes of sociotechnical imaginaries in education: A theoretical examination of integrating artificial intelligence in education. *Foundations of Science*, 30, 529–540.
- Marton, F., & Säljö, R. (1976). On qualitative differences in learning: I—outcome and process. *British Journal of Educational Psychology*, 46(1), 4–11.
- Maxwell, J. A. (2009). Designing a qualitative study. In L. Beckman & D. J. Rog (Eds.), *The SAGE handbook of applied social research methods* (2nd ed., pp. 214–253). Sage.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation*. Jossey-Bass Wiley.
- Miles, M. B., Huberman, A. M., & Saldaña, J. (2020). *Qualitative data analysis: A methods sourcebook* (4th ed.). Sage.
- Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of artificial intelligence powered digital writing assistant in higher education: Randomized controlled trial. *Heliyon*, 7(5), e07028. [https://www.cell.com/heliyon/pdf/S2405-8440\(21\)01117-8.pdf](https://www.cell.com/heliyon/pdf/S2405-8440(21)01117-8.pdf)
- Nguyen, A., Ngo, H. N., Hong, Y., Dang, B., & Nguyen, B. T. (2022). Ethical principles for artificial intelligence in education. *Education and Information Technologies*, 28(4), 4221–4241.
- Nguyen, A., Kremantzis, M., Essien, A., Petrounias, I., & Hosseini, S. (2024). Enhancing student engagement through artificial intelligence (AI): Understanding the basics, opportunities, and challenges. *Journal of University Teaching and Learning Practice*, 21(6), 1–13.
- Noy, C. (2008). Sampling knowledge: The hermeneutics of snowball sampling in qualitative research. *International Journal of Social Research Methodology*, 11(4), 327–344.
- Oliveira, E. (2023). AI-powered peer review process. *Ascilite Publications*, 184–194.
- Pallant, J. L., Blijlevens, J., Campbell, A., & Jopp, R. (2025). Mastering knowledge: The impact of generative AI on student learning outcomes. *Studies in Higher Education*. Advance online publication. <https://doi.org/10.1080/030>
- Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., ... & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning and Teaching*, 6(1), 41–56. <https://doi.org/10.37074/jalt.2023.6.1.29>
- Rodriguez-Donaire, S. (2024). Influence of prompts structure

on the perception and enhancement of learning through LLMs in online educational contexts. *Massive Open Online Courses-Learning Frontiers and Novel Innovations*, 2024. <http://doi.org/10.5772/intechopen.1006481>

Ruiz-Rojas, L. I., Acosta-Vargas, P., De-Moreta-Llovet, J., & Gonzalez-Rodriguez, M. (2023). Empowering education with generative artificial intelligence tools: Approach with an instructional design matrix. *Sustainability*, 15(15), 11524.

Rudolph, J., Ismail, F., Tan, S., & Seah, P. (2025). Don't believe the hype. AI myths and the need for a critical approach in higher education. *Journal of Applied Learning and Teaching*, 8(1), 06-27. <https://doi.org/10.37074/jalt.2025.8.1.1>

Sanchez-De Miguel, M., Orkaizagirre-Gomara, A., Izagirre-Otaegi, A., Badiola, I., Ortiz de Elguea-Díaz, F. J., Gomez-Gastiasoro, A., & Goudas, M. (2023). Association among university students' motivation, resilience, perceived competence, and classroom climate from the perspective of self-determination theory. *Education Sciences*, 13(2), 147.

Sauder, M. (2024). Exploring generative artificial intelligence-assisted medical education: Assessing case-based learning for medical students. *Cureus*, 16(1). <http://doi.org/10.7759/cureus.51961>

Saliu, H. (2024). Navigating media literacy in the AI era: Analyzing gaps in two classic media literacy books. *Journal of Applied Learning and Teaching*, 7(2), 1-12.

Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021). The impact of artificial intelligence on learner-instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, 18(1). <https://doi.org/10.1186/s41239-021-00292-9>

Sergis, S., Sampson, D. G., & Pelliccione, L. (2018). Investigating the impact of flipped classroom on students' learning experiences: A self-determination theory approach. *Computers in Human Behavior*, 78, 368–378.

Song, Y., Huang, L., Zheng, L., Fan, M., & Liu, Z. (2025). Interactions with generative AI chatbots: Unveiling dialogic dynamics, students' perceptions, and practical competencies in creative problem-solving. *International Journal of Educational Technology in Higher Education*, 22(1), 12. <https://doi.org/10.1186/s41239-025-00508-2>

Sullivan, M., Kelly, A., & McLaughlan, P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. *Journal of Applied Learning and Teaching*, 6(1), 31–40. <https://doi.org/10.37074/jalt.2023.6.1.17>

Sullivan, M., McAuley, M., Degiorgio, D., & McLaughlan, P. (2024). Improving students' generative AI literacy: A single workshop can improve confidence and understanding. *Journal of Applied Learning and Teaching*, 7(2), 88-97. <https://doi.org/10.37074/jalt.2024.7.2.7>

Sun, H., Li, W., & Shen, B. (2017). Learning in physical education: A self-determination theory perspective. *Journal of Teaching in Physical Education*, 36(3), 277–291.

Thomas, D. R. (2006). A general inductive approach for analyzing qualitative evaluation data. *American Journal of Evaluation*, 27(2), 237–246.

Thüs, D., Malone, S., & Brünken, R. (2024). Exploring generative AI in higher education: A RAG system to enhance student engagement with scientific literature. *Frontiers in Psychology*, 15, 1474892. <https://doi.org/10.3389/fpsyg.2024.1474892>

Wu, C., Wang, X., Carroll, J., & Rajtmajer, S. (2024). Reacting to generative AI: Insights from student and faculty discussions on Reddit. In *Proceedings of the 16th ACM Web Science Conference (WebSci '24)* (pp. 103–113). Association for Computing Machinery. <https://doi.org/10.1145/3614419.3644014>

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes* (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman, Eds.). Harvard University Press.

Xie, Z., Wu, X., & Xie, Y. (2024). Can interaction with generative artificial intelligence enhance learning autonomy? A longitudinal study from comparative perspectives of virtual companionship and knowledge acquisition preferences. *Journal of Computer Assisted Learning*, 40(5), 2369–2384. <https://doi.org/10.1111/jcal.13032>

Yang, Y., Luo, J., Yang, M., Yang, R., & Chen, J. (2024). From surface to deep learning approaches with Generative AI in higher education: An analytical framework of student agency. *Studies in Higher Education*, 49(5), 817–830.

Yu, L., & Yu, Z. (2023). Qualitative and quantitative analyses of artificial intelligence ethics in education using VOSviewer and CitNetExplorer. *Frontiers in Psychology*, 14, 1061778. <https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2023.1061778/full>

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education: Where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1–27.

Zeb, A., Ullah, R., & Karim, R. (2024). Exploring the role of ChatGPT in higher education: Opportunities, challenges and ethical considerations. *The International Journal of Information and Learning Technology*, 41(1), 99–111.

Zhang, H., Lee, I., Ali, S., DiPaola, D., Cheng, Y., & Breazeal, C. (2022). Integrating ethics and career futures with technical learning to promote AI literacy for middle school students: An exploratory study. *International Journal of Artificial Intelligence in Education*, 33(2), 290–324.