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Integrating Generative AI into Pedagogy: A Catalyst for Transformative Learning in Higher Education

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Abstract

This journal article explores the transformative potential of integrating generative AI into pedagogy, aligning with Mezirow's themes of Transformative Learning. The discussed headings encompass the manifold ways in which generative AI can revolutionize university education: Personalized Learning Experiences, Immediate Targeted Feedback, Interactive and Experiential Learning Activities, Support for Research Design and Development, Development and Enhancement of Critical Thinking Skills, and the Empowerment of Students. A conceptual framework diagram illustrates the intricate interconnectedness between Transformative Learning and the catalytic role of generative AI. Addressing ethical concerns and upholding academic integrity, the article emphasizes the importance of effective educational AI usage policies and the need to educate students about the ethical, efficient, and transparent use of AI. By fostering responsible AI practices, the integration of generative AI aligns with the principles of academic integrity and ethical considerations. In conclusion, this article asserts that generative AI has the potential to act as a catalyst for Transformative Learning in higher education. It calls for further research to provide empirical evidence supporting this transformative role, paving the way for a clear understanding of how generative AI can reshape the landscape of learning experiences for university students.

Keywords: Generative Artificial Intelligence (GenAI), Transformative Learning (TL), Students, Higher Education, Critical Reflection, Mezirow

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Introduction

In today's rapidly evolving technological landscape, artificial intelligence (AI) is constantly pushing limits and transforming various industries and of particular interest in education is Generative AI (GenAI). Traditional AI functions within predefined rules, whereas GenAI possesses the capacity to autonomously learn from data and create original content, including text, artwork, code, and other forms of output. GenAI is a natural language processing (NLP) artificial intelligence (AI) system, a machine-learning system that uses algorithms to access its data set, make predictions about how to string words together, and put one word in front of another based on statistical probability, much like an enhanced predictive text. Since its launch in November 2022, ChatGPT has caused a furore across many areas of education, OpenAI released GPT-4, an advanced version of the original GPT-3 model, offering improved performance and capabilities, and DALL-E 2 which generates images from textual descriptions, enhancing creative workflows. Microsoft’s integration of generative AI into its Bing search engine provides enhanced search capabilities and conversational interactions. Google has developed Bard, a conversational AI designed to compete with ChatGPT, and integrated into various Google services like Docs and Gmail, and Vertex AI, a suite of generative AI tools for cloud services, including Vertex AI and Generative AI App Builder. Claude, created by Anthropic, is another conversational AI model, MidJourney is an AI tool for generating high-quality images based on text prompts, and Stable Diffusion

is an open-source image generation model. These platforms and apps have significantly expanded the capabilities and applications of generative AI, making it more accessible and useful across various domains.

The initial response favoured banning generative AI and finding other ways of preventing students from using GenAI to cheat or plagiarise, which highlights the very real ethical considerations and concern about maintaining academic integrity in the light of GenAI use. Many Higher Education Institutions (HEIs) around the world have now introduced policies for the ethical and transparent use of AI and this essay will consider the issues related to academic integrity if HEIs are to integrate GenAI into pedagogy. It is important that university students are educated about the effective, efficient and transparent use of ChatGPT and other generative AI and if educators integrate AI into pedagogy and actively encourage its use for teaching and learning, generative AI can have a transformational impact on education.

Generative Artificial Intelligence

A well-known example of generative artificial intelligence (GenAI) is ChatGPT. The acronym "GPT" in ChatGPT stands for Generative Pre-trained Transformer, a natural language processing (NLP) artificial intelligence (AI) system, a machine-learning system trained on more than 175 million parameters of text from the internet, including books, articles, and websites (Bessette, 2023). ChatGPT is a large language model (LLM) that uses machine learning algorithms to analyse this data and learn the patterns and characteristics of how words and phrases relate to each other to enable it to process and generate new content (Fitzpatrick et al., 2023). Using these algorithms, GenAI will access its data set, make predictions about how to string words together, and put one word in front of another based on statistical probability, like an enhanced predictive text, or the autocomplete function of a search engine (Floridi, 2023). GenAI can be regarded as participating in a rudimentary conversation with the user because of the way it will locate information and attempt to answer a question replicating natural language in coherent and contextually appropriate responses, replying to prompts in a conversational way (Rospigliosi, 2023).

Transformative Learning

Transformative Learning (TL) is an approach to adult teaching based on promoting change, whereby educators challenge students to critically question and assess the validity of the assumptions they hold about their relation to the world around them (Mezirow, 1997). This requires a learner-centred approach to teaching whereby the teacher acts as facilitator, guiding and supporting students, providing feedback, and answering questions when needed. Students take responsibility for their own learning, which helps development of a deeper understanding of the material and allows students to become autonomous.

Mezirow's TL is based on three main themes (see Figure 1):

- Experience of Life: This refers to the experiences that shape an individual's worldview. These experiences can be anything from personal events to academic learnings.
- Critical Reflection: This involves questioning one's own beliefs, assumptions, and perspectives. It is through this process of critical reflection that individuals often develop the ability to reflect on things that they may have taken for granted or were not quite aware of in the past.
- Rational Discourse: This is the dialogue that occurs when people face a "disorienting dilemma," which are experiences that do not fit into a person's current beliefs about the world. When faced with a disorienting dilemma, people are forced to reconsider their beliefs in a way that will fit this new experience into the rest of their worldview.

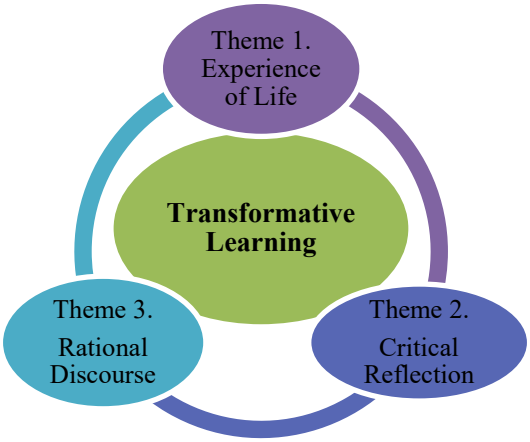

Figure 1: Framework depicting Generative AI as a Catalyst for Transformational Learning

Higher Education Institutions are often the context for students to experience disorienting dilemmas when they are confronted with new ideas and different points of view. This provides the ideal opportunity for Transformative Learning to take place and university educators who want to utilise this can provide opportunities for university students to engage in critical thinking; relate to others also going through the transformative process; and act on a new perspective (Kegan, 2009).

GenAI and Transformative Learning

Generative AI can act as a catalyst for this transformational learning by providing personalised learning experiences that are tailored to each student's individual needs and providing students with immediate targeted feedback on their work; creating interactive and experiential learning activities that encourage students to challenge their assumptions and promotes critical reflection; developing critical thinking skills by providing students with opportunities to question assumptions and analyse information and enhance these skills by providing students with new tools and resources to support their learning (see Table 1). GenAI can support research design and development and empower students to take control of their learning by offering choices, setting goals, and guiding them in self-directed exploration.

Table 1: Application of Generative AI in relation to the themes of Transformative Learning

Providing personalised learning experiences	**Providing immediate targeted feedback**	**Creating interactive and experiential learning activities**	**Supporting research design and development**	**Developing and enhancing critical thinking skills**	**Empowering students**
Perception of education as meeting their needs (Theme 2)	Critical reflection and self-examination (Theme 2)	Increase student engagement and facilitate group activities (Theme 3)	Development of research skills by providing students with information and resources on a particular topic (Theme 1)	Question assumptions, analyse information (Theme 2)	Challenge and clarify information (Theme 2)
Increase student engagement and collaboration (Theme 3)	Confront and revise beliefs, perspectives, and attitudes (Theme 2)	Analyse and synthesize information in innovative ways (Theme 1)	Increase confidence and productivity (All)	Engage in thoughtful inquiry (Theme 1)	Encouraging integration with existing knowledge (Theme 1)
Facilitate a deeper understanding	Develop metacognitive skills of	Enhanced problem-solving and	Inspire discussion (Theme 3)	Question pre-existing beliefs and	Promoting a deeper understanding of

Providing personalised learning experiences	Providing immediate targeted feedback	Creating interactive and experiential learning activities	Supporting research design and development	Developing and enhancing critical thinking skills	Empowering students
of the content (Theme 1)	thinking about one's own thinking and learning processes (Theme 2)	logical reasoning skills (All)		assumptions (Theme 2)	multiple meanings and concepts (All)
Acknowledging individual experience (Theme 1)	Diverse needs and experience acknowledged (Theme 1)	Encouraging discussion and dialogue (Theme 3)	Changes in perspectives, beliefs, and behaviours (Theme 3)	Creates opportunities for critical thinking (Theme 2)	Prepared with arguments and counterarguments for debates (Theme 3)
Engage in dialogue with GenAI (Theme 3)	Increased student engagement (Theme 1)	Students are empowered to assess their own learning (All)	Prompts critical reflection (Theme 2)	Need to be critical of the GenAI-generated responses (Theme 2)	Reflect on the responses generated (Theme 2)
Reflect on own interactions with GenAI (Theme 2)	Frequent and repeated testing and retrieval of knowledge help students retain information in the long term (Theme 1)	Develop approaches to addressing problems and promote independent thinking (Theme 1)	Encourage students to carry out scholarly research (All)		Encourages self-directed learning (Theme 1)
Unique learning preferences, abilities, and needs of individual students met (Theme 1)	Adaptability of GenAI promotes mastery learning (All)	Reflect on the implications of immersive experience (Theme 2)	Challenge perspectives, beliefs, and behaviours (Theme 2)		Improved understanding following multiple examples (Theme 1)
Ensures consistent challenge without being overwhelming (Theme 1)	Students adjust own strategies (Theme 1)	Challenge assumptions (Theme 2)	Enhanced quality of academic writing (Theme 1)		
Constant availability as most convenient (Theme 1)	Students confront and revise existing beliefs (Theme 2)	Engage in critical inquiry (Theme 3)			
Ask multiple and numerous questions (Theme 2)	Increased self-awareness (Theme 1) results in self-reflection (Theme 2)	Foster reflective dialogues (Theme 2) & (Theme 3)			

This article will explore each of these potential opportunities for GenAI to have a transformational impact on learning and will demonstrate how the integration of GenAI into pedagogy can act as a catalyst for Transformative Learning (TL) experiences among university students to be more self-motivated, self-governing, rational, collaborative, and empathetic. The article will consider the ethical considerations around the integration of GenAI and the associated concerns about academic integrity and will identify areas for further research and development before concluding that now is the time to embrace the education revolution that is generative AI.

Generative AI as a Catalyst for Transformative Learning

Provide Personalised Learning Experiences

Personalized learning connects the student's previous knowledge, experience, and abilities, with training materials that link that understanding to new information (Edula et al., 2023; Raashika et al, 2023). An opportunity to provide personalised and effective learning experiences is offered by GenAI to meet the unique learning preferences, abilities, and needs of individual students (Kasneci et al., 2023; Ray, 2023; Su and Yang, 2023). ChatGPT can collect and analyse individual student's learning patterns, preferences, and strengths to customise learning and enable students to focus on the subject matter and critical thinking (Javaid et al., 2023). For example: An AI-driven language app tailors vocabulary and grammar exercises to a student's proficiency level, adapting to each individual learner's needs and pace of progression (Chang & Kidman, 2023). This ability to provide personalised content on demand marks a significant shift from a 'one-size-fits-all' approach to a bespoke 'tailored-fit' method of teaching and learning (Weisz et al., 2023). This tailored approach offers an immersive and efficient learning experience (Baskara, 2023) that can ensure learners are consistently challenged without becoming overwhelmed. This learning experience facilitates a transformative shift in students' perception of education as a dynamic, adaptable process that meets their needs.

This proposed opportunity provided by GenAI highlights a reconceptualization of the role of educators from didactic distributors of knowledge to being facilitators of learning who can focus more on supporting students and their holistic development (Kim et al., 2022; Qadir, 2023; Queiroz et al., 2022). GenAI-powered tutoring systems can further supplement the work of teachers by offering online tutor assistance to students, answering questions, providing explanations, and guiding them through problems (Ray, 2023). This tutoring support is available constantly and so can be offered at a time most convenient for the student, in addition, students can ask multiple and numerous questions without the GAI becoming tired (Singer, 2023). This ability to provide a platform for asynchronous communication has been found to increase student engagement and collaboration, as it allows students to post questions and discuss topics without having to be present at the same time (Li & Xing, 2021).

As part of the personalised learning experience, GenAI produces accurate and meaningful conversations that are realistic and engaging (Deng and Lin, 2022). This enables students to enter into an actual discussion, enquiring about aspects of the response they have received that they are not fully comprehending of and so engaging in the turn-taking strategy of dialogue (Schäfer, 2023), one of the core elements of TL. Mezirow (1997) argues that students must participate effectively in discourse to facilitate transformative learning (p. 7). Students can also reflect on their interactions with GenAI, considering the quality of the information they have received, the effectiveness of their inquiries, and the process of critical evaluation. This reflective practice aligns with Transformative Learning's focus on self-awareness and ongoing self-reflection.

The provision of these tailored learning experiences based on individual students' needs, strengths, and preferences aligns with Mezirow's emphasis on the importance of individual experience in transformative learning (Calleja, 2014). By providing learning materials that resonate with the student's experiences and interests, GenAI can enhance the student's engagement and facilitate a deeper understanding of the content. This in turn empowers students to take ownership of their education, following TL's principle of autonomous and self-directed growth (see Table 1 above).

Provide Immediate Targeted Feedback

Educational feedback has been widely acknowledged as an effective approach to improving student learning (Dai et al., 2023). ChatGPT is capable of providing students with immediate detailed feedback on their work that has high agreement with the instructor and offering recommendations for development and task completion (Dai, et al., 2023; Javaid et al., 2023). During lessons, class participation is often encouraged, however, many students are reluctant to engage fully because of concern about judgment from their peers. Constructive feedback provided by GenAI in privacy and without class participation does not cause the same self-consciousness, so students may be more willing

to engage, take risks and be vulnerable (Chen, 2023). This self-paced learning and real-time feedback enables students to identify and correct mistakes promptly, which in turn benefits students developing learning skills and accelerates the learning process (Sok & Heng, 2024). AI-generated feedback on student work can be a powerful tool to facilitate the process of students' changing their beliefs, perspectives, and attitudes through critical reflection and self-examination required by TL. In addition, AI-generated feedback can help students develop the metacognitive skills of thinking about one's own thinking and learning processes, a key component of transformative learning.

GenAI can provide further support for transforming learning by creating adaptive assessments rather than simply providing feedback on work submitted and can be used as an interactive study guide that can generate practice exams and provide immediate feedback (Meyer et al., 2023). Low-stakes frequent tests are an effective teaching strategy across educational levels and settings and repeated testing and retrieval of knowledge help students retain information in the long term (Mollick & Mollick, 2023). GenAI-powered assessments can adapt in real-time based on a student's responses, providing immediate feedback and adjusting the difficulty level to match the student's abilities, promoting mastery learning and reducing frustration (Cotton et al., 2023).

This personalised approach recognises TL's core element of acknowledging students' diverse needs and experiences, creating a more inclusive learning environment. Based on the feedback provided, students can analyse their work, explore alternative ways of approaching the problem, and adjust their strategies as appropriate, following TL's requirement to confront and revise one's existing beliefs. As a result, students become more aware of their learning process, strengths, and areas requiring improvement, and this increased self-awareness encourages them to reflect on their learning strategies, aligning with Transformative Learning's focus on self-reflection and self-awareness (see Table 1 above).

Create Interactive and Experiential Learning Activities

Educators can use GenAI models like ChatGPT to create a range of stimulating activities that can increase student engagement (Sok & Heng, 2024). By presenting students with complex problems and scenarios that require critical thinking, problem-solving, and decision-making, GenAI can increase student engagement and facilitate group activities (Meyer et al., 2023). Engaging with these scenarios encourages transformative growth by challenging students to analyse and synthesize information in innovative ways. For example: Educators can allocate students to work in teams and carry out research using ChatGPT during the lesson by entering prompts and follow-up queries appropriate to the generated responses, the groups then present their findings to their peers (Sabzalieva & Valentini, 2023). This collaborative learning approach allows students to lead class activities whilst teachers facilitate the discussion, thereby enhancing the students' problem-solving and logical reasoning skills as well as encouraging discussion and dialogue to foster TL. Transformative learning is further encouraged because students are empowered to assess their own learning and develop their approaches to addressing problems (Rudolph et al., 2023).

Interactive GenAI-powered content can captivate students by simulating real-world scenarios, virtual labs, and dynamic visualisations, making learning more engaging and enhancing understanding. GenAI-driven simulations can also facilitate "what if" scenarios that encourage students to explore hypothetical situations and observe the outcomes. This transformative learning experience prompts students to consider various possibilities, encouraging critical thinking and complex decision-making. For example: Qadir (2023) points out that engineering education is significantly enhanced by ChatGPT creating realistic virtual simulations for hands-on learning. This direct involvement encourages transformative insights and connections between theoretical knowledge and practical applications. Experiential learning also emphasises learning by doing and engaging with real-world contexts, which fosters TL by encouraging students to immerse themselves in GAI-mediated experiences and reflect on their implications. Interactive and experiential learning activities can encourage students to challenge assumptions, engage in critical inquiry, foster reflective dialogues, and promote independent thinking, all of which aligns with TL principles and allows students to undergo transformative shifts in their cognitive processes (see Table 1 above).

Support for Research Design and Development

Research design is complex and GenAI is able to support this process by streamlining research elements and pinpointing relevant results, generating ideas for research topics, and summarizing lengthy texts (Cox & Tzoc, 2023; Rahman et al., 2023), as well as by outlining articles and generating references (Khan et al., 2023). Students can find resources and supporting materials with ease because GenAI can recommend books and articles relevant to the topics or projects that students are working on (Cooper, 2023; Fauzi et al., 2023). GenAI can also assist in the development of research skills by providing students with information and resources on a particular topic, clarifying current research topics and making suggestions about unexplored aspects of the topics being covered (Kasneci et al., 2023). This assistance in research design and development means that GenAI can enhance flexibility, increase consistency and improve the speed of student researchers as well as reinforcing objectivity (Alshater, 2022). As such, the integration of GenAI could encourage students to carry out scholarly research and to do so with more confidence and productivity (Sok & Heng, 2024), in turn increasing their experience of transformative learning by inspiring discussion and reflective practice. The support offered by GenAI in research design and development fosters a culture of inquiry and critical thinking among learners, in line with Mezirow's emphasis on rational discourse and critical reflection as key components of transformative learning (Calleja, 2014).

In addition to this support for research design and development, GenAI can enhance the quality of academic writing when used as a writing and editing tool rather than for prompt-based text generation, which can provide further benefits to students in their research endeavours, especially for non-native English speakers (Meyer et al., 2023). This assistance can support students with confidence in their own ability and encourage completion of the tasks at hand (Sok & Heng, 2024), which in turn promotes TL by fostering deep, transformative changes in their perspectives, beliefs, and behaviours (see Table 1 above).

Develop and Enhance Critical Thinking Skills

GenAI can create opportunities for critical thinking through providing content that introduces new ideas and by generating multiple explanations from a variety of perspectives and different viewpoints. GenAI can use a step-by-step approach and add details to any existing explanations, which it can then adapt to be a simpler summary or build on the complexity of the explanations and examples provided (Fido & Wallace, 2023; Mollick & Mollick, 2023). This can facilitate the development of critical thinking skills among students by providing them with opportunities to question assumptions, analyse information, and engage in thoughtful inquiry. This follows the TL core elements of encouraging students to challenge their existing beliefs, consider multiple perspectives, and undergo shifts in their understanding and worldview. To facilitate transformative learning, students must become aware and critical of their own and others' assumptions (Mezirow, 1997).

Critical thinking skills will be further enhanced because GenAI is not able to assess the value or accuracy of the information it provides, and so students will need to be critical of the GenAI-generated responses and content (Dobrin, 2023). All of these opportunities to develop and enhance critical thinking align with the principles of TL (see Table 1 above), as Mezirow claims that transformative learning is a route to the development of critical thinking (Mezirow, 1997). By challenging learners to question their assumptions and engage in rational discourse, GenAI can facilitate transformative learning (Calleja, 2014). In addition, enhancing creativity and critical thinking skills can help prepare university students to thrive in an uncertain future and changing economy.

Promote Student Empowerment

GenAI can empower students to take control of their learning by offering choices, setting goals, and guiding them in self-directed exploration. The conversation with GenAI is initiated and controlled by the student, which empowers the students as they are not passive recipients of notifications or tasks (Dai et al., 2023). Successful conversations are reliant on student input, in line with student-centred learning and encouraging the students to take ownership of their own learning, playing a key role in planning,

organising and indeed personalising their own learning journey (Lee & Hannafin, 2016), thereby aligning with TL principle of self-directed learning and autonomy (see Table 1 above).

GenAI can generate summaries and outlines of texts, helping students to quickly understand the main points of a text and to organise their thoughts for writing (Kasneci et al., 2023). Students can challenge and clarify information by asking GenAI to respond to follow-up questions, encouraging integration with existing knowledge and promoting a deeper understanding of multiple meanings and concepts (Rospigliosi, 2023). Students better understand complicated concepts when provided with many and varied examples because they can decontextualize the idea from the example, leading to better recall and understanding (Mollick & Mollick, 2023). GenAI is capable of providing numerous examples and thereby helping students move knowledge from surface to deep learning. To facilitate transformative learning, students need practice in recognizing frames of reference and using their imaginations to redefine problems from a different perspective (Mezirow, 1997, p. 7).

Integration of GenAI into pedagogy may result in students no longer requiring mastery of proficiency in basic skills, but will raise the expectation, for example students will be required to edit and curate information, question the validity of the results, and so be forced to engage deeper than they have previously (Chen, 2023). Furthermore, students' writing abilities may be enhanced by using text completion, translation, and text summarising tools (Javaid et al., 2023). GenAI can inspire creativity by assisting students in generating ideas, prompts, and even co-authoring stories or essays, which can be particularly useful in language arts and creative writing classes (Ray, 2023; Su and Yang, 2023). GenAI can produce plausible arguments and counterarguments on a particular subject to help prepare students for debates (Javaid et al., 2023), which involves students in active dialogue and so facilitates TL. Students can reflect on the responses generated and ask follow-up questions, which promotes learning autonomy and improves critical thinking skills (Sok & Heng, 2024), requisites for TL to effectively transpire. Engaging GenAI in this way encourages self-directed learning whereby students take control of their learning journey, seeking information and guidance as needed - a transformative shift towards autonomy and metacognition (see Table 1 above).

The interconnectedness of the three themes of Mezirow's Transformational Learning along with the various ways in which generative AI can act as a catalyst for transformative learning have been described in this article and are illustrated in the framework below (Figure 1 and Table 1, both above). Figure 1 highlights the three themes of Transformative Learning: experience of life, critical reflection, and rational discourse and Table 1 depicts GenAI's role in providing personalized learning experiences, immediate targeted feedback, creating interactive and experiential learning activities, supporting research design and development, and developing/enhancing critical thinking skills in relation to each of these themes. The overarching framework emphasizes the transformative nature of learning and the facilitating role of generative AI within this context.

Ethical Considerations and Academic Integrity

The potential of GenAI to assist university students is multifaceted and varied, but there are concerns about academic integrity such as plagiarism and cheating (Foltynek et al., 2023; Lambert & Stevens, 2023; Stokel-Walker, 2022), for example if students use AI generated text or essays unaltered as their own work. This challenge is heightened by the fact that it can be hard to detect generative text using traditional anti-plagiarism software because GenAI generates a brand-new answer for questions asked (Eke, 2023). There are also currently no requirements of transparency or that the work generated is watermarked or tagged as synthetic, and this can be further problematic for university educators who may not recognise work as AI generated. In addition, although there are GenAI detectors and plagiarism checking software available, it is difficult to determine when a written submission has been created by generative AI because rather than relying on copying and pasting from existing sources, GenAI generates a brand-new response every time a prompt request is entered and this could lead to ethical concerns about the use of machine-generated content (Fitzpatrick et al., 2023).

The response to these academic integrity concerns and ethical challenges is two-fold, firstly educational institutions must ensure that they have clear policies and guidance on GenAI use that provide

a framework specifying the acceptable and unacceptable uses of AI tools as well as the protocols for reporting AI usage in a transparent and accountable manner; and secondly, students must be trained and offered guidance on effective interactions with GenAI (Pham et al., 2023). University students should clearly attribute the AI's contribution in their work when they use AI tools to generate content, including specifying the AI model used, the dataset, and any parameters or modifications applied. Students should be taught how to cite AI-generated content appropriately to maintain transparency and give credit where it is due. Students might not be aware of the ethical issues associated with incorporating AI into academic endeavours, so it is the role of the university educator to educate students about these issues and the importance of maintaining academic integrity, to understand why it is important to produce original work, give credit to sources, and follow ethical guidelines in academic pursuits. Educators should teach students on the responsible utilisation of AI tools, emphasizing that AI should serve as an additional resource to enrich their learning, rather than a shortcut to academic achievement. When students have a complete understanding of the significance of academic integrity, the likelihood of them breaching the set expectations diminishes. and if they are offered a choice in how they learn and how they are assessed, this too could reduce academic misconduct in general (Kumar et al., 2023; Perkins et al., 2020).

Recommendations

The relatively recent and very rapid arrival of GenAI in educational settings means that there is limited research and literature available on student perceptions of the use of GenAI and its effectiveness with regard to impacting on and transforming learning. Studies have found that students generally have a positive perception of using GenAI in education (Chan & Lee, 2023; Limna et al. 2023; Malik et al., 2023). Limna et al. (2023) state that students find it a helpful tool for providing immediate feedback, answering questions, and providing support and Chan and Lee (2023) found that students perceived enhanced productivity, efficiency, and personalized learning, and expressed intentions to use GenAI for various educational purposes. According to research carried out by Malik et al. (2023), students acknowledged the benefits of GenAI in grammar checks, plagiarism detection, language translation, and essay outlines. The potential for GenAI to transform the learning of university students means that there is a need for further research into student perceptions of GenAI, and its effectiveness as well as student use and the efficacy of GenAI to successfully act as a catalyst for transformative learning in support of the proposals put forward in this article.

Conclusion

Integrating GenAI into pedagogy can foster TL by creating dynamic, personalized, and interactive learning experiences that challenge assumptions, encourage critical thinking, and promote self-directed growth. By leveraging the capabilities of generative AI, education can shift from a one-size-fits-all approach to a dynamic, adaptive, and learner-centred model that empowers students to reach their full potential.

Considering the rapidity with which AI has infiltrated our daily lives, the integration of GenAI into pedagogy will encourage students to embrace technology as a tool for empowerment, becoming adaptable to technological advancements, a transformative process that prepares them for the evolving information landscape. Mezirow suggested that transformational learning produces more extensive behaviour change in the person and has a more considerable impact than other kinds of learning. He argued that the combination of reflection and discourse encourages the learner to transform their views, which in turn makes them more inclusive and compassionate of others (Mezirow, 2009). These surely are skills necessary for the citizens of the Twenty-first Century and for future employment, whatever that might look like.

This article has considered some of the ways in which GenAI can be integrated into pedagogy to provide opportunities for transformational learning experiences for university students. The need for further research to collect data and results with regard to the effectiveness of student learning with the use of GenAI has been highlighted by the considerations provided in this paper. In conclusion, GenAI integration promotes a culture of lifelong learning in which students understand that education is an

ongoing process of growth and transformation, aligning with the core principles of Transformational Learning and preparing the students of today to become lifelong learners.

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