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The implications of Critical Impact Factors (CIFs) on engagement using ChatGPT

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Critical impact factors (CIFs) of learners' engagement using prompt engineering (PE) with ChatGPT have been revealed in the literature. However, this has not enhanced understanding or resolved the misunderstanding surrounding learners' engagement. Thus, this study furthered the discourse by examining the implications the CIFs could have for learners' engagement by using PE with ChatGPT for academic purposes. A theoretical framework based on structuration theory concepts: recursivity, transformative, and power, underpins the study within which the CIFs were analysed. The analysis reveals quality of engagement, intellectual stimulation, continuous simplification, new reality, deepened engagement, and collaborative effort as the implications for learners' engagement using PE with ChatGPT for academic activities. A better understanding of the implications of CIFs enhances both learners' and educators' credibility and integrity in applying PE with ChatGPT in their engagement for academic purposes.

Keywords: ChatGPT, Critical Impact Factors, learners' engagement, prompt engineering, structuration theory

Introduction

The rise in the use of Artificial Intelligence (AI) tools in Higher Education (HE) remains a relevant discourse for academic integrity and reputational purposes. The debate focuses on students' engagement in many institutions in a technologically advanced era (Mehrvarz et al., 2025). Since its launch in late November 2022, the AI chatbot ChatGPT has intensified debates about academic integrity and the conditions under which technology supports or weakens learning. However, literature suggests that tools, such as ChatGPT, can enhance behavioural, cognitive, and emotional engagement when it is used for personalised tutoring, technical assistance, and collaborative content generation (Cronjé, 2023; Anjarani et al., 2024; Allehyani et al., 2025). Conversely, studies have warned about the perils of over-reliance on these types of technologies because of their negative effects on critical thinking and richer learning engagements (Mohebi, 2024; Yan et al., 2024).

Consequently, preliminary research has revealed evidence of reduced cognitive engagement and weaker brain activity following the sustained reliance on ChatGPT during tasks (Kosmyna et al., 2025). This contributes to the motivation for Hamman and Iyamu's (2025) study, which conceptualised the critical impact factors on students' engagement using ChatGPT. In the study, four CIFs were revealed, but without explanation of their implications, which this study seeks to address. The CIFs include providing a conceptual foundation through four critical factors of influence: "rules of engagement, use of language, contextualisation, and intentionality". For this study, these components will be referred to as Critical Impact Factors (CIFs). CIFs are inextricably linked to how students engage with ChatGPT and how Prompt Engineering (PE) can shape these interactions into educational engagements. The implications can help to

gain a deeper understanding of how CIFs shape and influence the ways students apply PE with ChatGPT in academic activities, and whether it strengthens or weakens meaningful engagement.

This is fundamental because CIFs can be used as a set of indicators for assessing behaviour and learning outcomes where AI is applied as assistive technology (Mzwri & Turcsányi-Szabo, 2025). This is consistent with Turkkila et al.'s (2022) argument that the indicators reflect measurable outcomes, such as engagement and the various experiences shaped by the entanglement of humans, nonhumans, and learning contexts. The impacts which the factors have on engagement using PE with ChatGPT include critical thinking. However, the implications were unknown. Additionally, the indicators can be used as a foundational premise for developing policy for ethical considerations, if known. Thus, the objective of this study was to examine the implications of CIFs for learners' engagement using ChatGPT with PE. Based on the importance of CIF, a fresh perspective was sought by applying a sociotechnical theory, structuration theory, to examine the implications that the CIFs can have on students' engagement using prompt engineering with ChatGPT for academic activities.

Structuration theory focuses on agency and structure within social systems (Giddens, 1984). The theory is often used to explain connections between situated interactions and social structures of meaning, recursive, and transformative of social systems, norms, and power (Iyamu, 2024). Thus, we apply the theory through the interaction of meanings, standards, and values to examine the academic environment, to gain an understanding of the implications of CIFs on students' engagement using prompt engineering with ChatGPT. This includes gaining insights into the dynamic relationships that exist between learners and the technology (ChatGPT) that they interact with to carry out their academic activities.

The remainder of this paper is organised into six main sections. It presents a review of the literature in the first section. This is followed by a discussion about the underpinning theory. In the third section, the methodology as applied in the study is covered. The implications of the CIF for students' engagement using prompt engineering with ChatGPT are discussed in the fourth section. The fifth section discusses the limitations of the study and highlights areas for further research. Finally, a conclusion is drawn.

Literature review

Student Engagement

Student engagement is often described as the energy and effort students apply to their learning. However, engagement is a multidimensional and complex construct that encompasses behavioural, cognitive, emotional, and social dimensions (Bond & Bedenlier, 2019; Bergdahl et al., 2024). This view is important because student engagement extends beyond attendance, visible participation, and the submission of assessments (Bond et al., 2020). It also includes the less visible but equally important dimensions of how deeply students think about learning tasks, how persistently they work through challenges, and how meaningfully they connect with academic activities (Barlow & Brown, 2020). In this regard, student engagement should not be reduced to surface indicators of involvement alone, because it also includes commitment, meaning making, and the quality of students' interactions with learning environments (Trowler, 2010; Schindler et al., 2017). In technology-enhanced contexts, this becomes even more important, since engagement is shaped not only by students themselves, but also by the relationships, activities, tools, and conditions through which learning takes place (Ní Shé et al., 2023).

In an AI-mediated learning context, this broader interpretation of student engagement becomes even more fundamental. Research by Lo et al. (2024) and Heung and Chiu (2025) found that ChatGPT-based learning had a positive effect on overall engagement. Likewise, Dogaru et al. (2025) and Mehrvarz et al. (2025)

found that students' perceptions of ChatGPT significantly shaped learning engagement, including having a positive effect on motivation, fostering interactive engagement, and improving learning outcomes. This is further supported by studies by Fell Kurban and Şahin (2024), Haidar (2024), and Sandu et al. (2024), which indicate that AI tools such as ChatGPT may enhance engagement through more interactive, responsive, and personalised forms of learning, while also requiring careful teaching intervention and academic guidance. These studies highlight that, in the age of AI, student engagement must not only be understood as student effort, but as a pedagogical practice shaped by how technologies are introduced, mediated, and used within educational environments.

The Challenges with Using ChatGPT

While ChatGPT may appear to improve student engagement through efficiency, faster task completion, and more polished outputs, these benefits do not necessarily reflect meaningful learning (Zhao et al., 2023). A central challenge is that students may confuse productivity with understanding. In such cases, ChatGPT can support task completion without ensuring that students have engaged in the critical thinking, analytical problem-solving, and reflection required for deeper learning (Fauzi et al., 2023; Ravšelj et al., 2025). This is why the challenge is not merely whether students use ChatGPT, but whether that use contributes to genuine knowledge construction or only creates the appearance of engagement (Shuhaiber et al., 2025). Existing research similarly cautions that over-reliance on ChatGPT can weaken critical thinking and encourage superficial learning practices (Eke, 2023; Sokhulu et al., 2025).

A further challenge is that productive use of ChatGPT requires more than access to the tool (Michel-Villarreal et al., 2023). It requires pedagogical guidance, digital literacy, and the ability to prompt with purpose. Hamman and Iyamu (2025) demonstrate that factors such as rules of engagement, language use, contextualisation, and intentionality shape how PE is used with ChatGPT, and that these factors influence engagement, inquiry, critical thinking, and prompt timing.

This suggests that PE should be understood as a practical academic competence rather than a superficial technical action. However, where institutional guidance is inconsistent, students may rely on ChatGPT uncritically, struggle to evaluate outputs, or use it in ethically uncertain ways. García-López et al. (2025) identify broader implementation challenges related to technological integration, equity, data quality and security, and ethics in human-AI collaboration. Sokhulu et al. (2025) show that, in South Africa, these issues are compounded by uneven access, variable digital literacy, and unresolved concerns about over-reliance and academic integrity. Therefore, the major challenge students face in using ChatGPT is not the tool itself, but the absence of the critical, contextual, and ethical competencies and guidance needed to use it meaningfully in academic engagement.

Critical Impact Factors

The Critical Impact Factors (CIFs) matter in AI-mediated learning because they shape whether ChatGPT is positioned as a support for learning or as a substitute for learning. When students use clear language, provide adequate context, and operate within appropriate rules of engagement, ChatGPT is more likely to function as a scaffold for inquiry, clarification, feedback, and iterative thinking. In this sense, CIFs influence AI-use as well as the quality, depth, and direction of the engagement. Hamman and Iyamu (2025) argue that these factors can guide the use of PE with ChatGPT and affect engagement through critical thinking, inquiry, prompt timing, and interaction in learning environments.

Where CIFs are weak, the opposite may occur. Poor prompting, limited contextualisation, vague intent, and insufficient curricular guidance can reduce the use of AI tools to rapid response production rather than meaningful academic engagement (Chan & Colloton, 2024; Granström & Oppi, 2025). While this may improve efficiency, it narrows the space for reflection, evaluation, and critical participation in learning (Isiaku et al., 2024). This is especially important in AI-mediated environments because the educational

value of ChatGPT does not lie in the speed with which outputs are generated (Mehrvarz et al., 2025). More specifically, the extent to which its use supports thoughtful, inquiry-driven, and contextually grounded engagement is where tools like ChatGPT hold their most value (Crompton & Burke, 2024).

Theoretical framework

Structuration Theory (ST) is a social theory that is concerned with the reproduction of social systems through interaction between agents and structures (Giddens, 1984). In structuration, structures are rules and resources. Orlikowski (1992) explains from the perspective of ST how human actions are enabled and at the same time constrained by structures but also emphasises that structures are the result of previous actions. Iyamu (2024: 11) states that "the rules and resources do not exist independently of human action, nor are they material entities". Giddens (1984) describes them as 'traces in the mind' and argues that they exist only through the actions of human beings. According to Loureiro-Koechlin (2008), the agents in an organisation learn how to exercise their power as is expected in the social system they are in.

ST was used to underpin the study to gain a better understanding of how Critical Impact Factors (CIFs) can shape and inform Prompt Engineering (PE) practices with AI tools like ChatGPT. ST was chosen to underpin this study because of its appropriateness for understanding the CIFs. PE with ChatGPT is shaped by rules, resources, knowledge, and power, which are some of the key attributes of ST. Furthermore, recursivity is another characteristic of ST which demonstrates how PE practices reproduce or transform through iterative use.

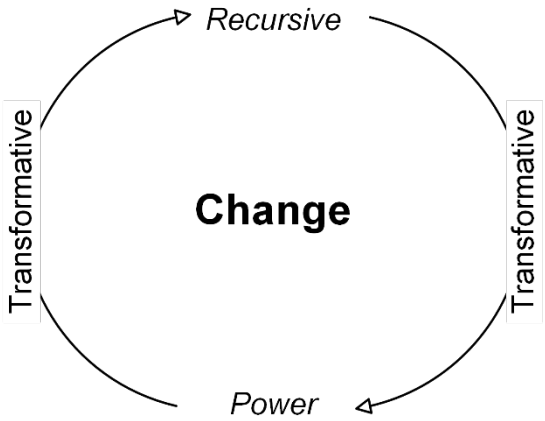


Figure 1. Structuration-based Theoretical Framework

From an ST perspective, PE with ChatGPT can be understood as a recursive social practice in which users draw on their existing knowledge to exercise power as transformative capacity through PE. The response generated by ChatGPT does not end the interaction, it feeds back into the user's thinking and shapes subsequent prompts. This makes PE an iterative and recursive process through which knowledge is continually refined. The quality of this transformation depends on the conditions under which PE occurs. CIFs become those conditions. Strong enforcement of the CIFs can support critical engagement and deeper learning, while weaker enforcement may reproduce generic or shallow forms of engagement.

Hamman and Iyamu (2025) identify rules of engagement, use of language, contextualisation, and intentionality as the key categories shaping the use of PE with ChatGPT. These categories lead to

identifying the CIFs. In this study, the CIFs are understood as *critical thinking*, *prompt time*, *engagement*, and *inquiry*.

The concept of Power from structuration theory perspective

In ST, power refers to the capacity to act and make a difference using rules and resources in practice (Giddens, 1984). In this study, power becomes visible in how students and lecturers use PE with ChatGPT to direct, refine, and evaluate academic interactions. Their engagement with ChatGPT is therefore not passive, because users draw on prior knowledge, judgement, and intention when deciding how to frame prompts, interpret responses, and proceed with a task (Yang et al., 2025). CIFs become significant in the practice of PE because they reflect the key areas in which this capacity is exercised and made visible. Where critical thinking is strengthened, prompt time is used more deliberately, engagement is more sustained, and inquiry is more meaningful (Hamman & Iyamu, 2025). This is a better position for students to direct their interactions with ChatGPT towards more relevant, reflective, and educationally meaningful engagements. Conversely, where the CIFs are weak, this capacity is constrained, and the use of ChatGPT is more likely to drift towards genericism, uncritical acceptance of outputs, and weakened engagement (Lo et al., 2024).

Recursivity

Recursivity in ST refers to the continual production and reproduction of social practices through repeated action over time (Iyamu, 2024). In this study, PE with ChatGPT can be understood as a recursive sociotechnical practice because each prompt and response becomes part of a continuing cycle of evaluation and reformulation (Lee & Palmer, 2025). Through repetition, these interactions can develop into patterned ways of engaging with academic tasks that gradually stabilise as routine practice (Carrasco-Sáez et al., 2025). Repeated PE therefore produces and reproduces the CIFs over time through ongoing interaction with ChatGPT. In this sense, recursive and purposeful use of PE can strengthen critical thinking, support more intentional prompt timing, deepen engagement, and encourage inquiry. As these factors reinforce one another, PE becomes more likely to reproduce habits of reflection, refinement, and critical participation in academic tasks. On the other hand, where these CIFs are weakly expressed in practice, the same recursive process may normalise generic prompting, superficial interrogation of outputs, and diminished forms of educational participation (Bond & Bedenlier, 2019; Bond et al., 2020).

Transformative

The concept of transformative in structuration theory is concerned with how action produces change through practice (Giddens, 1984; Iyamu, 2024). In the context of this study, transformation is evident in how PE with ChatGPT can affect the direction, depth, and quality of student engagement. Through PE, students are not only seeking responses, but also reworking ideas, refining understanding, and redirecting academic activity (Leung, 2024; Carrasco-Sáez et al., 2025). PE therefore functions as a pedagogically significant sociotechnical practice with the potential to change how users engage with learning (Crompton & Burke, 2024). When shaped by CIFs, PE can contribute to more focused inquiry, critical reflection, and deeper engagement with knowledge (Hamman & Iyamu, 2025). However, the educational value of such transformation depends on the quality of engagement and pedagogical guidance, because superficiality encourages passive acceptance rather than reflective learning (Deng et al., 2025; Nasr et al., 2025). Even where CIFs are inadequate, transformation will still occur, but it is more likely to yield vague output and surface-level participation (Lo et al., 2024).

Research methodology

The study used qualitative methods to examine the implications of Critical Impact Factors on student engagement. Qualitative methods are best suited to understanding the experiences of social practices in information technology (IT) and information systems (IS) studies (Iyamu, 2018). Furthermore, the reflexive nature of qualitative approaches was deemed most beneficial to understanding the nuanced intricacies of student engagement in IS studies (Denzin & Lincoln, 2011). As such, qualitative methods were considered more appropriate in the context of this study.

Based on the research objective, qualitative data were collected using the document analysis technique. The technique was appropriate because it allows us to broadly examine the implications of Critical Impact Factors on student engagement when using prompt engineering with ChatGPT. Due to the newness of the phenomenon, there were not too many materials to access. A set of criteria, which includes relevance, date range (period of publication), and source, was applied in gathering the data. The documents were purposively selected for their relevance to the focus of the study: prompt engineering, ChatGPT, student engagement, and AI-mediated academic engagement. The date of publication ranged from the year 2023 to 2026. This was to account for the freshness and balance of terms like "prompt engineering" and "AI-mediated learning" in the context of higher education. Iyamu, Nehemia-Maletzky and Shaanika (2016) argued that a date range helps to gain a better understanding of the spread of historical perspectives, in terms of the consistency of the meaning that has been associated with the concepts. Furthermore, credible academic databases were consulted, which included EBSCO Host, IEEE, and AIS.

Thus, only a total of 31 documents were collected and analysed, comprising 29 peer-reviewed journal articles and 2 scholarly books. Table 1 presents a sample of the selected sources. Although research on artificial intelligence in higher education has expanded rapidly in recent years, studies on the factors impacting engagement remain limited. The selected documents were therefore chosen for their relevance to how CIFs shape the use of PE with ChatGPT in educational settings.

The analysis of the data followed the subjective approach from the interpretive paradigm perspective. This is primarily because the approach allows us to associate meanings with the material properties of the phenomenon being studied. The subjective approach was guarded by using three (power, recursivity, and transformative) concepts from structuration theory as presented in the theoretical framework (Figure 1).

Table 1. Existing materials

Focus	Article
Prompt engineering	Allehyani, F., Saleem, M., Jamshed, M., & Warda, W. U. (2025). Incorporating ChatGPT in EFL Classrooms: An Examination of the Impact on Learners' Motivation and Engagement. *Forum for Linguistic Studies*, *7*(10), 757–767. https://doi.org/10.30564/fls.v7i10.10493
ChatGPT	Carrasco-Sáez, J. L., Contreras-Saavedra, C., San-Martín-Quiroga, S., Contreras-Saavedra, C. E., & Viveros-Muñoz, R. (2025). Analyzing Higher Education Students' Prompting Techniques and Their Impact on ChatGPT's Performance: An Exploratory Study in Spanish. *Applied Sciences*, *15*(14), 1–23. https://doi.org/10.3390/app15147651
	Chan, C. K. Y., & Colloton, T. (2024). *Generative AI in Higher Education: The ChatGPT Effect* (1st Edition). Routledge. https://doi.org/10.4324/9781003459026
Student engagement	Dogaru, M., Pisică, O., Popa, C.-Ștefan, Răgman, A.-A., & Tololoi, I.-R. (2025). The Perceived Impact of Artificial Intelligence on Academic Learning. *Frontiers in Artificial Intelligence*, *8*, 1–13. https://doi.org/10.3389/frai.2025.1611183
	Lee, D., & Palmer, E. (2025). Prompt Engineering in Higher Education: A Systematic Review to Help Inform Curricula. *International Journal of Educational Technology in Higher Education*, *22*(1), 1–22. https://doi.org/10.1186/s41239-025-00503-7
AI-mediated learning	Mehrvarz, M., Salimi, G., Abdoli, S., & McLaren, B. M. (2025). How Does Students' Perception of ChatGPT Shape Online Learning Engagement and Performance? *Computers and Education: Artificial Intelligence*, *9*, 1–15. https://doi.org/10.1016/j.caeai.2025.100459
	Nasr, N. R., Tu, C.-H., Werner, J., Bauer, T., Yen, C.-J., & Sujo-Montes, L. (2025). Exploring the Impact of Generative AI ChatGPT on Critical Thinking in Higher Education: Passive AI-Directed Use or Human–AI Supported Collaboration? *Education Sciences*, *15*(9), 1–28. https://doi.org/10.3390/educsci15091198
	Sokhulu, L. H., Zulu, M. W., & Lott-Naidoo, D. (2025). Artificial Intelligence in Higher Education South Africa: The Role of ChatGPT in Students' Learning. *Journal of Education*, (99), 142–166. https://doi.org/10.17159/2520-9868/i99a08
	Zhao, R., Yunus, M. M., & M. Rafiq, K. R. (2023). The Impact of the Use of ChatGPT in Enhancing Students' Engagement and Learning Outcomes in Higher Education: A Review. *International Journal of Academic Research in Business and Social Sciences*, *13*(12), 4134–4144. https://doi.org/10.6007/IJARBSS/v13-i12/20258

The implications of CIFs on engagement using PE with ChatGPT

The study by Hamman and Iyamu (2025) discussed the characteristics, rules of engagement, language use, contextualisation and intentionality, that lead to the development of the CIFs. The rules of engagement include ethics, mitigation and structure. Each attribute defines rules within which prompts take place in academic settings (Nazari & Saadi, 2024). Thus, rules of engagement, in this context, describe how prompts are constituted, which directly influences the inquiry CIF. When using PE, the time spent developing and refining prompts depends on how clearly the user communicates the tasks to reduce ambiguity in the interaction (Garg et al., 2025). This shows how language used directly impacts prompt timing. To produce a fruitful outcome with ChatGPT, the students must provide relevant information to generate responses that are more aligned with their academic needs (Rathod & Kale, 2024). This is the contextualisation of the task, which determines the significance of the interaction. Subsequently, purposeful prompting requires the evaluation of AI-generated responses and reflection on the construction of prompts. The intentionality of these actions requires students to use critical thinking to assess whether AI-generated outputs support their understanding or merely complete tasks on their behalf (Doyle et al., 2025).

Thus, the CIFs, Critical thinking, Inquiry, Prompt timing, and Interaction in a learning environment, have implications for learners. These implications include quality of engagement, intellectual stimulation, continuous simplification, new reality, deepened engagement, and collaborative effort. The implications of the CIFs for learners' engagement in using PE with ChatGPT are presented in Table 2.

Table 2. Implications of CIFs

Impact Factor	Implication	Description
Critical thinking	Quality of engagement	This demonstrates intellectual investment and engrossed interest in prompting using ChatGPT in resolving an academic activity or challenge. This could be based on the relationships between the dependent and independent variables and making sense of the interaction that occurs between agents in a social system (Iyamu & Roode, 2012).
	Intellectual stimulation	Promotes creativity and innovation, which in turn encourages a proactive and empathetic approach towards academic excellence. Giddens (1984) views this from a cognitive perspective, where he argues that 'knowledgeability" is displayed in the form of coded programs and that it distances itself from the cognitive skills displayed by humans.
Inquiry	Continuous simplification	Recursivity in PE helps solve problems by continuously simplifying the content of the interaction until it becomes sufficiently simple to comprehend. Iyamu (1984:121) emphasises this from a structuration standpoint that "Continuity of practices presumes reflexivity, but reflexivity in turn is possible only because of the continuity of practices that makes them distinctively 'the same' across space and time."
	New reality	Creates new realities rather than incremental improvements. It involves leveraging collective intelligence for significant outcomes. Bernardi (2017) suggests that this creates a deeper understanding of how human interaction both shapes and is shaped by the technologies they use.
Prompt timing	Deepened engagement	It fosters individual growth, development, and enhanced engagement through consistent changes that build on one another to reshape structures, cultures, or perspectives. Consequently, it deepened engagement creates knowledgeability of humans that are most deeply involved in the recursive ordering of practices (Giddens, 1984).
Interaction	Collaborative effort	The collaborative effort manifests from interaction within social practice, such as the use of ChatGPT with PE. This helps to build a culture of engagement, which is transformative to a purposeful learning environment. Giddens (1984) describes transformative as having relations that are incorporated into the production and reproduction of social practices (p. 18).

Limitations & further research

The study is comprehensive and achieves its objective to identify the implications of critical success factors in prompting, using ChatGPT. However, there are some limitations. At this point, we could only identify three limitations. The first limitation is that the study only used existing materials as its data set. Therefore, limiting the perspectives to only what is represented in the literature. Significantly, this limits empirical evidence where participants could have shared their respective views and experiences. Secondly, experiences of students from various academic institutions may be different, which could have contributed to the data richness. Thirdly, the scope of the study was narrowed to Prompt Engineering (PE) and ChatGPT in the context of student engagement in higher education. This could be expanded to include other AI-mediated learning tools.

Based on the limitations highlighted above, we suggest that further studies can be conducted to advance PE by using AI tools in improving student-to-educator engagement and enhancing the critical thinking of students. The CIF presented in this study can be tested in another study. Additionally, future research could collect qualitative or quantitative data from both students and educators (lecturers) to examine how the identified factors appear in real-life teaching and learning settings. Also, there is room to extend the focus of further studies beyond PE, perhaps, to include adaptive learning systems, automated assessment creation, and other generative AI tools used in higher education. While this study was limited to only analysing existing documents, further research could explore participants' experiences in interpreting and responding to AI-mediated learning. This can clarify how the factors operate across student groups, disciplines, educational contexts, and institutions.

Conclusion

The study examines the implications of CIFs for learners' engagement using ChatGPT with PE for academic purposes. The study is important primarily because an understanding of the CIFs helps to get a quick, quantifiable measure of their influence in academic activities. Also, CIFs can enhance both learners' and educators' credibility and integrity. Additionally, CIFs can be used to assess quality. Also, it guides relevance and ethical considerations.

The CIFs provide a conceptual lens for understanding how PE with ChatGPT influences student engagement in higher education. The significance of this study lies in identifying the conditions under which PE with ChatGPT becomes educationally engaging and pedagogically focused. Existing literature recognises both the pedagogical potential of ChatGPT, and the risks associated with academic integrity, weak critical thinking, and insufficient pedagogical integration. This research responds to this gap by offering a focused way of examining the relationship between ChatGPT, PE, critical thinking, and student engagement. In doing so, the CIFs contribute to academic scholarship by providing a basis for theorising and evaluating AI-mediated engagements. It also offers educators and academics a practical framework for designing learning activities and assessments, while providing clarity on how students can use ChatGPT to support inquiry, comprehension, and reflection. At an institutional level, the CIFs can further support the development of ethically responsible AI guidelines, assessment practices, and pedagogical strategies.

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