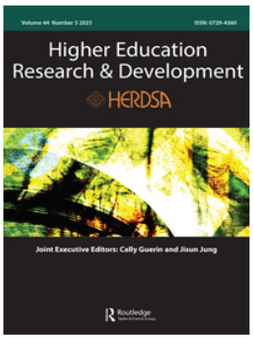


Routledge
Taylor & Francis Group

Higher Education Research & Development

ISSN: 0729-4360 (Print) 1469-8366 (Online) Journal homepage: www.tandfonline.com/journals/cher20

# Generative artificial intelligence as an enabler of student feedback engagement: a framework

Ying Zhan, David Boud, Phillip Dawson & Zi Yan

**To cite this article:** Ying Zhan, David Boud, Phillip Dawson & Zi Yan (2025) Generative artificial intelligence as an enabler of student feedback engagement: a framework, Higher Education Research & Development, 44:5, 1289-1304, DOI: 10.1080/07294360.2025.2476513

**To link to this article:** https://doi.org/10.1080/07294360.2025.2476513



Published online: 19 Mar 2025.

HIGHER EDUCATION RESEARCH & DEVELOPMENT
2025, VOL. 44, NO. 5, 1289–1304
https://doi.org/10.1080/07294360.2025.2476513

Routledge
Taylor & Francis Group



# Generative artificial intelligence as an enabler of student feedback engagement: a framework

Ying Zhan [a], David Boud [b], Phillip Dawson [b] and Zi Yan [a]

[a]Curriculum & Instruction, The Education University of Hong Kong, Hong Kong; [b]CRADLE, Deakin University, Melbourne, Australia

**ABSTRACT**

Despite the recognised importance of feedback in enhancing student learning, feedback practices in higher education have not achieved the expected effects. A primary issue lies in student disengagement, exacerbated by contextual constraints such as large classes and limited curriculum space and time. The advent of Generative Artificial Intelligence (GenAI) may help overcome these contextual constraints. However, GenAI also poses substantial challenges and ethical dilemmas during the feedback process. Meanwhile, it is essential to recognise that the feedback environment created by GenAI inevitably interacts with students' personal factors, especially their feedback literacy, to jointly influence feedback engagement. Therefore, a question remains whether GenAI can be an effective enabler of student feedback engagement. To answer the question, based on a literature review and theoretical synthesis, we scrutinise student engagement with GenAI in three stages of the feedback process and discuss the interplay of student feedback literacy and the GenAI context. We suggest that the extent to which students are engaged with feedback depends on their degree of feedback literacy as orchestrated in the GenAI context. Finally, we propose a cyclical feedback framework consisting of feedback forethought, feedback control and feedback retrospect to enable student feedback engagement in a GenAI world.

**ARTICLE HISTORY**
Received 1 May 2024
Accepted 27 February 2025

**KEYWORDS**
Generative AI; feedback engagement; feedback literacy; ecological perspective; self-regulation

## Introduction

Feedback refers to 'information given by an agent … regarding aspects of one's performance or understanding' (Hattie & Timperley, 2007, p. 102). It is regarded as an essential element in teaching and learning, contributing to students' learning improvement across nations. However, there remains a paradox regarding feedback worldwide: Why is feedback theoretically powerful yet apparently ineffective in classrooms (Hattie & Clarke, 2019)? The major problem is that students are not engaging with the information provided. Even with high-quality information, students won't improve unless they actively

**CONTACT** Ying Zhan zhanying@eduhk.hk Curriculum & Instruction, The Education University of Hong Kong, 10 Lo Ping Road, Tai Po Campus, Hong Kong

receive, understand, and act on it (Winstone et al., 2017). Contextual constraints such as large classes, limited curriculum space and time, and staff's heavy workload are common impediments to student feedback engagement in higher education (Henderson et al., 2019; Winstone & Carless, 2019). These contextual constraints may be overcome through the creative use of technology in the feedback process (Deeley, 2018).

Generative Artificial Intelligence (GenAI) has started to be applied to assessment and feedback in higher education (Rudolph et al., 2023). GenAI utilises large language models, which are extensive artificial neural networks pre-trained on vast quantities of text to generate human-like writing. GenAI has six potential affordances for education acknowledged by researchers, namely interactivity, anxiety-reduction, communicative authenticity, student-centeredness, repetitive practice and ubiquity (Jeon et al., 2023; Rawas, 2024). These affordances allow GenAI tools to deliver feedback information on students' work in more engaging and adaptable human-like conversational interactions (Ali et al., 2023). However, GenAI also poses substantial challenges and ethical dilemmas in the feedback process like biased or misleading information, plagiarism and overdependence on technology (e.g., Dawson, 2021; Kasneci et al., 2023; Su et al., 2023; Thorp, 2023). Therefore, understanding how to effectively leverage GenAI while mitigating its risks is essential for enhancing student feedback engagement.

More importantly, it is crucial to understand that the feedback environment fostered by GenAI invariably interacts with students' personal factors (e.g., their abilities, desires and expectations, prior knowledge and experiences, maturity), resulting in joint effects on their feedback engagement (Han, 2019; Nieminen et al., 2022; Shen & Chong, 2023). Among students' personal factors, their feedback literacy warrants particular scrutiny since effective feedback engagement requires much skill and effort from students (van der Kleij, 2020). Student feedback literacy refers to the knowledge, skills, and attitudes they require to interpret information and apply it for the improvement of their work or learning strategies (Carless & Boud, 2018). Feedback-literate students can overcome the barriers they encounter during the reception, perception, interpretation, and use of feedback (van der Kleij, 2020).

Although students are likely to be attracted to GenAI, our understanding of how they can effectively use feedback through engagement with this technology remains limited. Furthermore, it remains unclear how student feedback literacy interacts with the feedback environment, particularly one fostered by GenAI, to influence students' feedback engagement. This study seeks to address these knowledge gaps through a detailed exploration of the theoretical framework, analytical processes, and key insights outlined in this paper.

The paper starts with a review of the current literature on feedback engagement. It then outlines the method to construct a theoretical framework, which leads to scrutinising how a GenAI context influences student feedback engagement at the stages of eliciting, processing and enacting feedback. The paper also delves into an exploration of the interaction between student feedback literacy and the GenAI context in shaping their feedback engagement. Two contrasting examples are provided to help readers better understand such interplay. Ultimately, a pathway for enhancing student feedback engagement within the realm of GenAI is proposed. The paper aims to contribute to the discussion on the enabling roles of GenAI in feedback engagement by contemplating

how to achieve a positive alignment between the feedback environment created by GenAI and student feedback literacy and triggering further empirical research on the applicability and effectiveness of the proposed pathway in feedback practices.

## Student feedback engagement

Student feedback engagement involves how students receive, perceive, interpret, and utilise the information provided to them (Handley et al., 2011). As a complex concept, it includes various aspects and cannot be easily categorised (Zhang, 2022). The systematic examination of student feedback engagement in higher education was first conducted by Handley et al. (2011). They analysed feedback engagement by considering both 'readiness-to-engage' and 'active engagement'. Readiness-to-engage pertains to the willingness to invest time and effort in completing written assignments and reviewing feedback. Active engagement, on the other hand, involves thoughtful reflection on feedback activities, such as asking questions and interacting with feedback providers. Feedback engagement can be visible by overt actions, such as asking questions about the work assessed, and invisible by covert actions, such as reflection. The widely used categorisation of feedback engagement is based on the tripartite model of engagement proposed by Fredricks et al. (2004), namely, behavioural, cognitive and affective dimensions (e.g., Ellis, 2010; Shen & Chong, 2023; Zhang, 2022). Cognitive engagement refers to how students interpret and pay attention to feedback, while affective engagement involves their emotional reactions. Behavioural engagement encompasses whether and how students respond to the feedback.

In the literature, student feedback engagement has surprisingly not been specified regarding different stages of the feedback process. Malecka et al. (2022) classified the process of feedback into three stages: eliciting, processing and enacting. The embodiment of active engagement may vary from one stage to another of the feedback process due to the different focus of each stage. For example, the focus of eliciting feedback is to understand assessment criteria and seek help, so active engagement may involve more overt actions such as asking questions and seeking clarification. At the stage of processing feedback, the major focus is to make sense of the gained information and make a strategic follow-up plan. Therefore, active engagement can be visible, such as interaction with other people to better understand the feedback or invisible, such as critically judging and reflecting on the obtained information.

## Theoretical framework of student engagement with GenAI feedback

### *Method of developing a framework*

To construct a framework for understanding student engagement with feedback from GenAI, we utilised deductive reasoning. Deductive reasoning often involves starting with established theories or frameworks and applying them to specific contexts or cases to derive insights (Creswell & Creswell, 2017; Redmond et al., 2018). This approach allows us to begin with established theories underpinning student feedback engagement and then apply them to our specific context of GenAI in higher education.

The development of our framework involved four steps: literature search, analysis, adaptation, and refinement. First, the first author conducted a thorough review of

feedback engagement literature, focusing on key theoretical perspectives such as sociocultural theory (e.g., Ellis, 2010), social constructivism (e.g., Malecka et al., 2022), social-materialism (e.g., Gravett, 2022), and ecological perspectives (e.g., Chong, 2021). These perspectives were compared to identify which best addressed both contextual and individual factors influencing feedback engagement identified in the literature. The ecological perspective was chosen for its comprehensiveness, covering contextual factors and individual factors and highlighting the interplay between these factors (Chong, 2021; Han, 2019). However, existing ecological frameworks (e.g., Chong, 2021; To, 2022) primarily focus on traditional learning environments and do not account for GenAI's transformative impact on learning resources, actions, and relationships. To address this gap, the first author adapted the ecological framework to reflect the uniqueness of the GenAI context and its interplay with individual factors, especially student feedback literacy. The initial framework was finally refined through peer feedback from the other authors.

### *A framework*

An ecological perspective perceives humans as organisms intricately connected to and influenced by their surrounding environments (van Lier, 2004). While resources embedded in the environment provide opportunities for action, it is not guaranteed that action will occur. Individuals must, therefore, possess the ability to perceive these potential actions and intend to act upon them (van Lier, 2004). Underpinned by an ecological perspective, for feedback opportunities to be realised in a temporal and situated context, students need to acquire corresponding skills and dispositions (i.e., feedback literacy). Therefore, the positive alignment between individuals and their environments plays a crucial role in determining how students engage with feedback (Chong, 2021; To, 2022; Zhang, 2022). Consequently, a tentative framework for student feedback engagement with GenAI (Figure 1) is proposed to theorise how the opportunities and constraints in the feedback environment created by GenAI influence student feedback

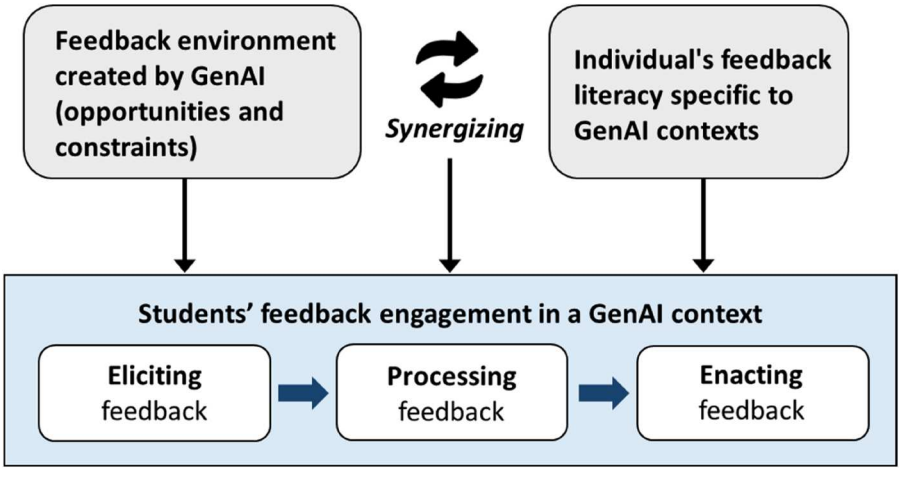


**Figure 1.** A framework for student engagement with GenAI feedback.

engagement throughout a process from eliciting and processing to enacting. It also considers student feedback literacy specific to the GenAI context and its positive interplay with the feedback environment created by GenAI in the mechanism of student feedback engagement.

This tentative framework offers a process view of feedback engagement which is different from Chong's (2021) holistic model of student feedback engagement. The process view identifies opportunities and constraints of GenAI at each feedback stage, enabling educators and researchers to tailor scaffolds for stage-specific feedback engagement. The illustrations are made in the section titled 'Influence of GenAI on student feedback engagement'. Furthermore, the framework highlights the specificity of student feedback literacy in the GenAI context and the role of its synergy with the GenAI context in enhancing student feedback engagement, which is explored in the section titled 'Interaction between GenAI context and student feedback engagement'.

## Influence of GenAI on student feedback engagement

### *At the stage of eliciting feedback*

Feedback eliciting is a key initial stage of feedback processes: students are more likely to act on comments they have sought themselves. It is a proactive search for evaluative information about performance from people, materials, or the learning environment (Leenknecht & Carless, 2023). Students who are actively engaged in this stage exhibit both learning and performance goals and adopt monitoring and inquiry strategies to address issues they have identified with respect to their own work and learning needs (e.g., Jensen et al., 2023; Leenknecht et al., 2019).

Student feedback engagement in the eliciting stage has been found to be constrained by issues such as lacking time and access to teachers and studying under a top-down culture. Milan et al. (2011) reported that lack of time on the ward and the instructor's unapproachability prevented medical students from eliciting feedback during their clerkships. Areemit et al. (2021) found that a top-down culture from teacher to student hindered students' feedback eliciting.

GenAI can offer a vehicle through which students can potentially overcome the above-mentioned contextual constraints while eliciting feedback. It is readily accessible at any time of the day without scheduling conflicts, which often occur with human instructors (Hwang et al., 2022). Students can seek inputs as often as needed without delay (Lee et al., 2022) and without their access being monitored by others. In addition, GenAI can provide a less intimidating environment for students who might otherwise be hesitant to seek feedback due to social anxieties or fear of human criticism under a top-down culture. For example, Tai and Chen (2024) found that students were less concerned about making language mistakes when working with Chatbots and felt more at ease in performing a learning task since they knew that Chatbots were artificial, not real persons.

GenAI is an on-demand and personalised tool, so specific requests (prompts) must be given to receive feedback (Wongvorachan et al., 2022). The effectiveness of its use relies heavily on the quality of the prompts asked by the students (Bearman et al., 2024). If a student does not know how to formulate effective prompts, the information they receive from the GenAI might not be useful or relevant to their learning needs. This

could potentially lead to frustration or disengagement in the subsequent feedback eliciting. In addition, we should be aware that the quality of GenAI feedback can vary significantly across different versions in response to the same request (Wu et al., 2023). Accessing the latest version of GenAI tools typically requires a subscription, which may exacerbate the digital divide among students (Bozkurt et al., 2023). This disparity could lead to student disengagement when seeking feedback if they are using an older, less capable version of GenAI tools. Another issue is the language used in feedback-seeking. GenAI has been trained on datasets that dominantly reflect US standardised English conventions (Bender et al., 2021). This may prevent non-English speaking students from seeking feedback because they may not gain satisfactory feedback by using prompts written in a mother tongue rather than English. Furthermore, students may hesitate to seek feedback from GenAI due to their concerns about the leakage of their data (e.g., assignments), privacy and intellectual property (Bearman et al., 2024; Rawas, 2024).

### *At the stage of processing feedback*

Feedback processing involves students' managing and making sense of information gathered from various sources, both human and non-human (Malecka et al., 2022). It involves evaluating whether the received information is valid, as well as other factors, such as the credibility of the source. Therefore, students who proactively engage in this stage tend to communicate with other people to understand the information received (Nicol, 2010) and make evaluative judgments, that is, 'make decisions about the quality of work of oneself and others' (Carless & Boud, 2018, p. 467). Such engagement may be visible or invisible to outsiders. In addition, students at this stage may be emotionally reflexive in regulating their emotions to think critically about the received feedback and its credibility (Bearman & Ajjawi, 2023).

In conventional feedback scenarios, students often encounter cognitive and affective barriers in processing feedback. They may have decoding problems due to the use of complex academic language by teachers or the lack of comprehensible details in their comments (Winstone & Carless, 2019). Moreover, the traditional teacher–student relationship often creates a power imbalance in which the teacher is seen as an authority figure to which the student is subordinate. This imbalance can pose a significant barrier to communication, making students hesitant to reveal their uncertainties and reach out to their teachers for clarification or to discuss the information they receive in more depth (Zhan, 2019). Meanwhile, students often exhibit negative emotional responses such as embarrassment, frustration and disappointment or defensive reactions (e.g., anger and ignorance) when they receive critical comments on their work (Winstone et al., 2017).

GenAI probably helps reduce cognitive barriers in processing feedback. Although GenAI and algorithmic decision-making processes are increasingly criticised for their black-box nature, explanatory cues in the information provided by GenAI (if prompted by students) might help students assess the quality of explanations (Shin, 2021). As suggested by Nicol (2010, p. 507), 'students requesting feedback based on their own concerns empowers them more than just receiving feedback'. In a GenAI feedback environment, students gain power by taking initiative in the feedback process, which gives them a greater sense of control and confidence. Since the feedback requests are made by

themselves, students may be more inclined to respond to the information they receive. Meanwhile, GenAI can provide immediate feedback upon request, which is always regarded as crucial for enhancing student engagement in online and distance learning environments (Hepplestone et al., 2011). As a consequence, students can immediately clarify any confusion they have about complex academic jargon or getting what they hope for.

GenAI also has the potential to lessen the emotional obstacles arising from processing feedback. Students' interaction with GenAI may cause less anxiety than interaction with humans, such as teachers and peers, because they do not have to handle human relationships in any encounter. When interacting with GenAI, some studies show that students had no concern about embarrassing themselves or bothering other humans, so they tended to be more willing to process the obtained feedback (e.g., Huang et al., 2023; Rad et al., 2023; Tai & Chen, 2024).

However, GenAI has limitations which impede students' agentic engagement in feedback processing. Thorp (2023) argues that GenAI may provide inaccurate, unintelligible or fabricated responses to students' prompts. Essien et al. (2024) also highlighted the issues of reliability and validity encountered with GenAI tools. They identified the 'hallucination effect', where ChatGPT sometimes generated responses that were wrong or not suitable for the context. Furthermore, GenAI depends heavily on training data, and when the data has biases, it could generate inappropriate and unjust feedback on students' work (Rawas, 2024). If students blindly trust the feedback provided by GenAI, their engagement could be superficial or discouraged (Bearman & Ajjawi, 2023).

Meanwhile, GenAI sometimes provides general and overlapping feedback, necessitating further clarification (Su et al., 2023). GenAI cannot clarify questions unaided (Rudolph et al., 2023). Therefore, students need to iteratively determine if they ask appropriate and relevant prompts and adjust their prompts to get the desired information (Bearman et al., 2024). The above-mentioned limitations demonstrate that students cannot place great trust in the outputs of GenAI, and they need to exercise evaluative judgement skills in assessing GenAI outputs and processes (Bearman et al., 2024). As with human feedback, GenAI is not necessarily always a benevolent source of feedback. Last but not least, although GenAI may create a less intimidating space for feedback, it is essential to recognise that over-reliance on GenAI may inadvertently limit students' exposure to real-world feedback interactions and discourage them from engaging with humans in classroom learning or workplace communication scenarios.

### *At the stage of enacting feedback*

The stage of enacting feedback requires students to act upon their interpretation of the comments that they have received to produce subsequent work that closes the feedback loop (Carless & Boud, 2018). Therefore, student feedback engagement in this stage can be visible in exemplifying new learning, such as revising work (Malecka et al., 2022). What is not visible is their self-regulation of the revision process and their application of willpower to overcome the obstacles in uptaking feedback, as these are internal processes (Winstone et al., 2017; Zhan, 2022, 2023).

Students need motivation, opportunities, and resources to use the feedback inputs they receive for improvement (Shute, 2008). In the traditional feedback environment,

students have low motivation and limited chances and resources to enact feedback. Students often get end-of-semester comments on assignments, which limits the scope of students' application of their insights from the comments and leaves them nowhere within the course to practice their new understandings (Winstone & Boud, 2022). Teachers' workload pressures may also prevent them from giving revision chances to students or following up on students' revisions (Winstone & Carless, 2019). Another barrier to students' feedback enactment is that students receive judgements about their work without useful suggestions that would lead to improvement (Henderson et al., 2019). Last but not least, students may lack self-regulated learning skills to monitor their revision process (Winstone et al., 2017). The traditional feedback environment may not be conducive to students developing their self-regulated learning skills because feedback is always fragmentary and disjointed, making it difficult for students to consistently gather and use it effectively (Malecka et al., 2022).

GenAI can be used to create a feedback environment conducive to students' enactment of feedback. Upon students' feedback requests, GenAI provides feedback information to students almost instantaneously, which can stimulate their reflection on their current work and encourage them to take further actions to revise it. It can also support students with the application of these insights to their future work (Lee et al., 2022; Rad et al., 2023; Wongvorachan et al., 2022). Moreover, GenAI can provide much information regarding students' expressed needs during subsequent revisions. The iterative and cyclical process of reflection and feedback enabled by GenAI allows students to synthesise feedback from different episodes, create their feedback loops and monitor their progress towards their self-defined goals for improvement. Furthermore, GenAI provides personalised suggestions for students in non-judgemental language through a user-friendly interface (Huang et al., 2023; Wongvorachan et al., 2022) and could even directly revise students' work or correct their mistakes if requested (Kasneci et al., 2023).

However, there is a substantial risk that students become over-reliant on GenAI's suggestions (Anson, 2024). As it simplifies the process of getting answers, students might uncritically accept its revisions without fully understanding them. Kasneci et al. (2023) suggest that this uncritical acceptance of information provided by GenAI might lead to a less thorough understanding of the subject matter. Moreover, using GenAI technology in academic settings raises questions of academic integrity (Wise et al., 2024). As Dawson (2021) notes, rules about what constitutes acceptable and unacceptable use of technology in academic contexts can be subjective and socially constructed. This means that what is considered proper use of GenAI in one context might be seen as inappropriate in another. Therefore, it is important to develop students' ability to understand and navigate these contextual boundaries. They need to know when it is appropriate to use GenAI, when it is not, and why this is the case.

## Interaction between GenAI context and student feedback literacy on student feedback engagement

The above discussion reveals that GenAI's affordances do not necessarily lead to in-depth student feedback engagement. For such affordances to be realised, there should be 'a match between the environment and agent' (van Lier, 2004, p. 96). In this section, we

examine the interaction between student feedback literacy and the GenAI-created feedback environment. We focus on the alignment and misalignment between the extent of students' feedback literacy and the GenAI-created feedback environment. To provide a clearer illustration of such interaction, we present two contrasting examples of students who participated in a trial use of GenAI in the first author's university. These students utilised ChatGPT 3.5 to receive feedback on their IELTS (an international English language test) writing tasks, with Student A displaying low feedback literacy, while Student B demonstrated high feedback literacy.

During the stage of feedback eliciting, students employ GenAI tools like ChatGPT to request feedback according to their own learning needs and concerns. This approach can strengthen students' proactivity and responsibility in the feedback process, thereby enhancing their engagement. However, if students cannot write effective prompts to elicit feedback, their engagement in this stage will be ineffective, and they will be discouraged in the subsequent stages. For instance, after Student A and Student B finished their IELTS writing tasks, they submitted them on ChatGPT 3.5 to get comments for writing improvement. Student A asked a very broad or vague question (e.g., Can you give me feedback on my IELTS writing task?). ChatGPT provided general information that Student A deemed useless. On the other hand, Student B asked a very specific or well-structured question (e.g., Act as if you are an IELTS writing examiner, please provide feedback on how I can improve to achieve a score of 7 in grammar diversity and accuracy according to the IELTS scoring criteria.). ChatGPT accordingly provided useful information on her grammatical errors. This example reveals that Student B's ability to write prompts aligns well with the personalised feedback feature of ChatGPT, while Student A lacked such ability. Such ability to write prompts should be added to the set of feedback-eliciting capacities and enrich our understanding of feedback literacy in a GenAI world. To utilise the affordances of GenAI, students need to learn how to write specific prompts against assessment criteria to make their requests responsive to their feedback needs. Teachers should provide guidance and training on engineering prompts, and students need to internalise this process and make it their own through practice. Meanwhile, students need to develop GenAI expertise through training about where their submitted work is stored and handled by GenAI and how to customise GenAI to suit their own feedback needs.

During the stage of feedback processing, although GenAI can provide rapid and specific feedback information, it sometimes provides biased and vague information, which requires students to exercise evaluative judgement and emotional reflexivity (Bearman & Ajjawi, 2023). For instance, Student A could not judge the information provided by ChatGPT appropriately and received the ChatGPT input without further inquiry. Therefore, due to a lack of evaluative judgement or a desire to proceed further, students may blindly trust or mistrust information provided by GenAI. They either passively receive the provided feedback or make incorrect evaluations. When they get lost in the provided information or are swayed by persuasive remarks, students may not write follow-up prompts for further clarification and inquiry. Consequently, GenAI's enabling role in student feedback engagement is limited. On the contrary, Student B critically judged the quality of the GenAI feedback on her writing and acknowledged the potential bias of GenAI. In her interaction with ChatGPT, she made follow-up requests when she felt unsure and even used Google to check the source of

information. The example of Student B reveals that students with high feedback literacy may actively participate in processing obtained feedback since they exercise evaluative judgement on how GenAI feedback contributes to a particular task and regulate their trust level to a balanced point. If they doubt the information received, they may write follow-up prompts to make further judgements and clarification or even seek another source. Developing students' evaluative judgement is crucial for them to work with GenAI. It requires students' critical assessment of the quality of GenAI outputs, especially hallucinated comments and the utility of the prompts they use to interrogate GenAI (Bearman et al., 2024).

During the stage of feedback enacting, although GenAI provides personalised suggestions, it could be unethically used by students or reduce their willingness to take action. For instance, Student A could not monitor his revisions and was not committed to making changes. He directly copied ChatGPT's revision to gain high marks. Although he took action to make some revisions, his superficial involvement and overreliance on ChatGPT could harm his long-term writing skills. In contrast, Student B was aware of academic integrity issues and the improvement imperative of feedback. She had self-regulation skills to monitor her revisions by observing how ChatGPT revised the work and evaluating whether her work was improved by incorporating its suggestions. Student B's engagement was deep and enabled her to realise the learning function of ChatGPT feedback. Therefore, student feedback literacy at the stage of uptake of feedback needs to be congruent with the positive affordances of GenAI to foster deeper engagement (Han, 2019). Students' feedback enactment in the context of GenAI highlights the critical and ethical use of GenAI feedback, which also poses a new requirement for feedback literacy.

## A pathway for student feedback engagement enhancement in the context of GenAI

### *The cyclical self-regulation learning model*

The above discussion reveals that a mismatch between an individual's feedback literacy and the affordances provided by the GenAI environment could lessen the enabling role of GenAI in feedback engagement. The challenge is constructing synergies between individual students' feedback literacy and the GenAI feedback environment. A pathway is suggested here based on a cyclical self-regulation learning model, which consists of three sequential phases, namely forethought, performance control and self-reflection (Zimmerman, 2000).

The *forethought* phase involves goal setting and planning for learning or task execution. The *performance control* phase entails active engagement in the task and implementing the strategies devised in the forethought phase. It involves self-monitoring and behavioural adjustments to maintain alignment with the task objectives. The final phase, *self-reflection*, involves a critical evaluation of one's performance after completing the learning task, which subsequently informs future planning and strategic adjustments. The cyclical self-regulation model is applicable for enhancing student feedback engagement in the context of GenAI, as it emphasises students' exercising their agency to adapt to the new feedback environment.

### *The cyclical self-regulation feedback model*

Figure 2 illustrates a cyclical self-regulation feedback model consisting of feedback forethought, feedback control and feedback retrospect. This feedback self-regulation process is interwoven with the three stages of feedback processes: eliciting, processing and enacting.

Feedback forethought is the initial phase, where students set feedback goals and plan strategically based on their personal learning needs and understanding of GenAI's capabilities and limitations. This could involve identifying learning weaknesses, deciding on the kind of feedback needed from the GenAI system, and understanding how best to interact with GenAI to get the desired feedback. Once goals are set, the next phase involves self-observation and self-monitoring of the feedback process through interacting with GenAI. As students begin to receive feedback information from GenAI, they observe their prompts and GenAI's responses and continuously assess the quality of their prompts and the quality of the information they receive. Students judge whether they are asking the appropriate prompts to get what they need and whether they can apply this to their learning. Accordingly, they refine their interaction with GenAI to get more useful feedback. The final phase is self-reflection on the feedback received. This involves considering the effectiveness of GenAI-generated feedback, the interaction with GenAI, the learning and revision strategies used, and the outcomes achieved. Through reflection, students can enhance their feedback strategies and develop their ethical awareness of using GenAI feedback.

The phases of self-regulating feedback are cyclical, beginning with the phase of feedback forethought, where students set goals and make plans. This lays the groundwork for self-control of the feedback process through self-observation and self-monitoring. After completing the feedback practice, students reflect on the entire process and generate insights to feed back into the forethought phase. Students' reflection on the whole feedback process enables them to set new and updated feedback goals and strategies for the next cycle. This cyclical process ensures that feedback generated from GenAI is iterative and progressive, fostering continuous engagement and development.

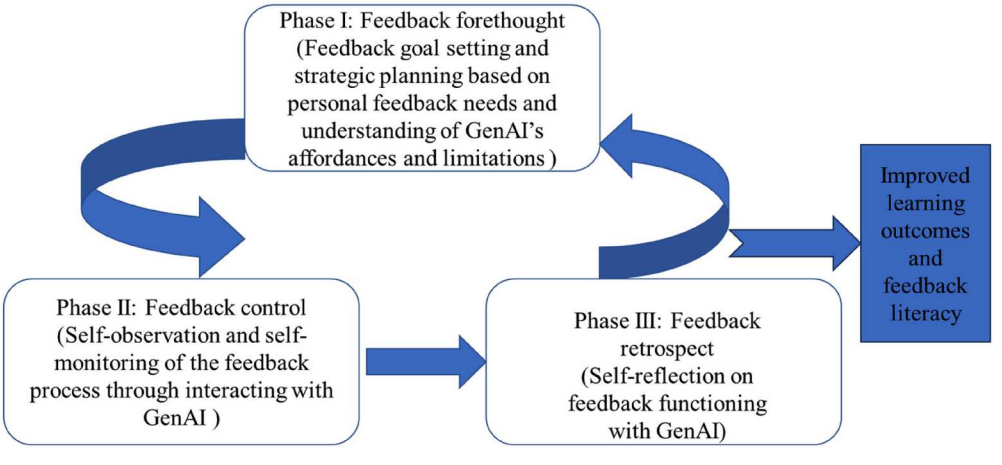


**Figure 2.** A cyclical self-regulation feedback model for student feedback engagement enhancement in the context of GenAI.

### *Application of the cyclical self-regulation feedback model*

The application of this cyclical self-regulation feedback model highlights that feedback processes need to be self-regulated in the context of GenAI (Ali et al., 2023). To facilitate this, teachers should assist students in defining their individual feedback goals before seeking feedback. They also need to teach students metacognitive strategies for planning, monitoring, and evaluation through modelling. Meanwhile, teachers should provide ample opportunities for students to engage with GenAI tools for feedback purposes. This engagement allows students to reflect on how to leverage these tools for their self-development. By doing so, students can enhance their feedback literacy, which is crucial for effectively navigating the novel feedback environment created by GenAI. Ultimately, the positive alignment between students' feedback literacy and the GenAI feedback environment fosters greater student feedback engagement.

This model has multiple applications for educators and researchers, particularly in terms of employing it to systematically investigate and monitor student feedback engagement in a GenAI context. By identifying the primary challenges at each stage of the self-regulated feedback process, educators and researchers can design responsive and well-structured interventions to facilitate students' adaptation to the feedback environment shaped by GenAI. Future research could explore the application of this model in discipline-specific feedback situations and analyse how students' engagement with feedback from GenAI tools evolves over time.

## Conclusions

GenAI can potentially enhance student feedback engagement since it can provide rapid personalised feedback, enable ongoing interaction, afford repeated practice and trace the whole feedback process. However, it also poses substantial challenges and ethical dilemmas. If students are not properly trained or misuse GenAI, it could inhibit their engagement and learning. We suggest that GenAI can be a new enabler of student feedback engagement if it is orchestrated with what students bring, especially their feedback literacy. Our paper paves the way for future research aimed at augmenting student feedback engagement and, ultimately, improving learning outcomes in an educational landscape increasingly saturated with GenAI. Given that the application of GenAI in feedback practices is still in its early stage, any current conceptualisations should remain provisional as GenAI evolves.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

This work was supported by The Education University of Hong Kong [grant number #04A47].

## ORCID

*Ying Zhan* http://orcid.org/0000-0002-2362-2887
*David Boud* http://orcid.org/0000-0002-6883-2722

*Phillip Dawson* http://orcid.org/0000-0002-4513-8287
*Zi Yan* http://orcid.org/0000-0001-9305-884X

## References

Ali, F., Choy, D., Divaharan, S., Tay, H. Y., & Chen, W. (2023). Supporting self-directed learning and self-assessment using TeacherGAIA, a generative AI chatbot application: Learning approaches and prompt engineering. *Learning: Research and Practice*, *9*(2), 135–147. https://doi.org/10.1080/23735082.2023.2258886

Anson, D. W. (2024). The impact of large language models on university students' literacy development: A dialogue with Lea and Street's academic literacies framework. *Higher Education Research & Development*, *43*(7), 1465–1478. https://doi.org/10.1080/07294360.2024.2332259

Areemit, R. S., Cooper, C. M., Wirasorn, K., Paopongsawan, P., Panthongviriyakul, C., & Ramani, S. (2021). Hierarchy, "Kreng Jai" and feedback: A grounded theory study exploring perspectives of clinical faculty and medical students in Thailand. *Teaching and Learning in Medicine*, *33*(3), 235–244. https://doi.org/10.1080/10401334.2020.1813584

Bearman, M., & Ajjawi, R. (2023). Learning to work with the black box: Pedagogy for a world with artificial intelligence. *British Journal of Educational Technology*, *54*(5), 1160–1173. https://doi.org/10.1111/bjet.13337

Bearman, M., Tai, J., Dawson, P., Boud, D., & Ajjawi, R. (2024). Developing evaluative judgement for a time of generative artificial intelligence. *Assessment & Evaluation in Higher Education*, *49*(6), 893–905. https://doi.org/10.1080/02602938.2024.2335321

Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? In *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency* (pp. 610–623). Association for Computing Machinery. https://doi.org/10.1145/3442188.3445922

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

Carless, D., & Boud, D. (2018). The development of student feedback literacy: Enabling uptake of feedback. *Assessment & Evaluation in Higher Education*, *43*(8), 1315–1325. https://doi.org/10.1080/02602938.2018.1463354

Chong, S. W. (2021). Reconsidering student feedback literacy from an ecological perspective. *Assessment & Evaluation in Higher Education*, *46*(1), 92–104. https://doi-org.ezproxy.eduhk.hk/10.108002602938.2020.1730765

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage Publications.

Dawson, P. (2021). *Defending assessment security in a digital world: Preventing e-cheating and supporting academic integrity in higher education*. Routledge.

Deeley, S. J. (2018). Using technology to facilitate effective assessment for learning and feedback in higher education. *Assessment & Evaluation in Higher Education*, *43*(3), 439–448. https://doi.org/10.1080/02602938.2017.1356906

Ellis, R. (2010). Epilogue: A framework for investigating oral and written corrective feedback. *Studies in Second Language Acquisition*, *32*(2), 335–349. https://doi.org/10.1017/S0272263109990544

Essien, A., Bukoye, O. T., O'Dea, X., & Kremantzis, M. (2024). The influence of AI text generators on critical thinking skills in UK business schools. *Studies in Higher Education*, *49*(5), 865–882. https://doi.org/10.1080/03075079.2024.2316881

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, *74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Gravett, K. (2022). Feedback literacies as sociomaterial practice. *Critical Studies in Education*, *63*(2), 261–274. https://doi.org/10.1080/17508487.2020.1747099

Han, Y. (2019). Written corrective feedback from an ecological perspective: The interaction between the context and individual learners. *System*, *80*, 288–303. https://doi.org/10.1016/j.system.2018.12.009

Handley, K., Price, M., & Millar, J. (2011). Beyond 'doing time': Investigating the concept of student engagement with feedback. *Oxford Review of Education*, *37*(4), 543–560. https://doi.org/10.1080/03054985.2011.604951

Hattie, J., & Clarke, S. (2019). *Visible learning: Feedback*. Routledge. https://doi.org/10.4324/9780429485480

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research*, *77*(1), 81–112. https://doi-org.ezproxy.eduhk.hk/10.310200346543029848

Henderson, M., Ryan, T., & Phillips, M. (2019). The challenges of feedback in higher education. *Assessment & Evaluation in Higher Education*, *44*(8), 1237–1252. https://doi.org/10.1080/02602938.2019.1599815

Hepplestone, S., Holden, G., Irwin, B., Parkin, H., & Thorpe, L. P. (2011). Using technology to encourage student engagement with feedback: A literature review. *Research in Learning Technology*, *19*(2), 117–127. https://doi.org/10.3402/rlt.v19i2.10347

Huang, A. Y., Lu, O. H., & Yang, S. J. (2023). Effects of artificial intelligence–Enabled personalized recommendations on learners' learning engagement, motivation, and outcomes in a flipped classroom. *Computers & Education*, *194*, Article 104684. https://doi.org/10.1016/j.compedu.2022.104684

Hwang, W. Y., Guo, B. C., Hoang, A., Chang, C. C., & Wu, N. T. (2022). Facilitating authentic contextual EFL speaking and conversation with smart mechanisms and investigating its influence on learning achievements. *Computer Assisted Language Learning*, *35*(1-2), 1–35. https://doi.org/10.1080/09588221.2019.1667831

Jensen, L. X., Bearman, M., & Boud, D. (2023). Feedback encounters: Towards a framework for analysing and understanding feedback processes. *Assessment & Evaluation in Higher Education*, *48*(1), 121–134. https://doi.org/10.1080/02602938.2022.2059446

Jeon, J., Lee, S., & Choe, H. (2023). Beyond ChatGPT: A conceptual framework and systematic review of speech-recognition chatbots for language learning. *Computers & Education*, *206*, Article 104898. https://doi.org/10.1016/j.compedu.2023.104898

Kasneci, E., Seßler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., … Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, *103*, Article 102274. https://doi.org/10.1016/j.lindif.2023.102274

Lee, Y. F., Hwang, G. J., & Chen, P. Y. (2022). Impacts of an AI-based chabot on college students' after-class review, academic performance, self-efficacy, learning attitude, and motivation. *Educational Technology Research and Development*, *70*(5), 1843–1865. https://doi.org/10.1007/s11423-022-10142-8

Leenknecht, M. J., & Carless, D. (2023). Students' feedback seeking behaviour in undergraduate education: A scoping review. *Educational Research Review*, *40*, Article 100549. https://doi.org/10.1016/j.edurev.2023.100549

Leenknecht, M., Hompus, P., & van der Schaaf, M. (2019). Feedback seeking behaviour in higher education: The association with students' goal orientation and deep learning approach. *Assessment & Evaluation in Higher Education*, *44*(7), 1069–1078. https://doi.org/10.1080/02602938.2019.1571161

Malecka, B., Boud, D., & Carless, D. (2022). Eliciting, processing and enacting feedback: Mechanisms for embedding student feedback literacy within the curriculum. *Teaching in Higher Education*, *27*(7), 908–922. https://doi.org/10.1080/13562517.2020.1754784

Milan, F. B., Dyche, L., & Fletcher, J. (2011). "How am I doing?" Teaching medical students to elicit feedback during their clerkships. *Medical Teacher*, *33*(11), 904–910. https://doi.org/10.3109/0142159X.2011.588732

Nicol, D. (2010). From monologue to dialogue: Improving written feedback processes in mass higher education. *Assessment & Evaluation in Higher Education*, *35*(5), 501–517. https://doi.org/10.1080/02602931003786559

Nieminen, J. H., Tai, J., Boud, D., & Henderson, M. (2022). Student agency in feedback: Beyond the individual. *Assessment & Evaluation in Higher Education*, *47*(1), 95–108. https://doi.org/10.1080/02602938.2021.1887080

Rad, H. S., Alipour, R., & Jafarpour, A. (2023). Using artificial intelligence to foster students' writing feedback literacy, engagement, and outcome: A case of Wordtune application. *Interactive Learning Environments*, *32*(9), 5020–5040. https://doi.org/10.1080/10494820.2023.2208170

Rawas, S. (2024). ChatGPT: Empowering lifelong learning in the digital age of higher education. *Education and Information Technologies*, *29*(6), 6895–6908. https://doi.org/10.1007/s10639-023-12114-8

Redmond, P., Heffernan, A., Abawi, L., Brown, A., & Henderson, R. (2018). An online engagement framework for higher education. *Online Learning*, *22*(1), 183–204. https://doi.org/10.24059/olj.v22i1.1175

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

Shen, R., & Chong, S. W. (2023). Learner engagement with written corrective feedback in ESL and EFL contexts: A qualitative research synthesis using a perception-based framework. *Assessment & Evaluation in Higher Education*, *48*(3), 276–290. https://doi.org/10.1080/02602938.2022.2072468

Shin, D. (2021). The effects of explainability and causability on perception, trust, and acceptance: Implications for explainable AI. *International Journal of Human-Computer Studies*, *146*, Article 102551. https://doi.org/10.1016/j.ijhcs.2020.102551

Shute, V. J. (2008). Focus on formative feedback. *Review of Educational Research*, *78*(1), 153–189. https://doi.org/10.3102/0034654307313795

Su, Y., Lin, Y., & Lai, C. (2023). Collaborating with ChatGPT in argumentative writing classrooms. *Assessing Writing*, *57*, Article 100752. https://doi.org/10.1016/j.asw.2023.100752

Tai, T. Y., & Chen, H. H. J. (2024). The impact of intelligent personal assistants on adolescent EFL learners' listening comprehension. *Computer Assisted Language Learning*, *37*(3), 433–460. https://doi.org/10.1080/09588221.2022.2040536

Thorp, H. H. (2023). ChatGPT is fun, but not an author. *Science*, *379*(6630), 313–313. https://doi.org/10.1126/science.adg7879

To, J. (2022). Using learner-centred feedback design to promote students' engagement with feedback. *Higher Education Research & Development*, *41*(4), 1309–1324. https://doi.org/10.1080/07294360.2021.1882403

van der Kleij, F. M. (2020). Evaluation of the 'Feedback Engagement Enhancement Tool' to examine and enhance students' engagement with feedback on their writing. *Studies in Educational Evaluation*, *66*, 100907. https://doi.org/10.1016/j.stueduc.2020.100907

van Lier, L. (2004). *The ecology and semiotics of language learning: A sociocultural perspective*. Springer. https://doi.org/10.1007/1-4020-7912-5

Winstone, N. E., & Boud, D. (2022). The need to disentangle assessment and feedback in higher education. *Studies in Higher Education*, *47*(3), 656–667. https://doi.org/10.1080/03075079.2020.1779687

Winstone, N., & Carless, D. (2019). *Designing effective feedback processes in higher education: A learning-focused approach*. Routledge.

Winstone, N. E., Nash, R. A., Parker, M., & Rowntree, J. (2017). Supporting learners' agentic engagement with feedback: A systematic review and a taxonomy of recipience processes. *Educational Psychologist*, *52*(1), 17–37. https://doi.org/10.1080/00461520.2016.1207538

Wise, B., Emerson, L., Van Luyn, A., Dyson, B., Bjork, C., & Thomas, S. E. (2024). A scholarly dialogue: Writing scholarship, authorship, academic integrity and the challenges of AI. *Higher Education Research & Development*, *43*(3), 578–590. https://doi.org/10.1080/07294360.2023.2280195

Wongvorachan, T., Lai, K. W., Bulut, O., Tsai, Y.-S., & Chen, G. (2022). Artificial intelligence: Transforming the future of feedback in education. *Journal of Applied Testing Technology*, *23*(1), 95–116. http://jattjournal.net/index.php/atp/article/view/170387

Wu, X., Duan, R., & Ni, J. (2023). Unveiling security, privacy, and ethical concerns of chatgpt. *Journal of Information and Intelligence*, *2*(2), 102–115. https://doi.org/10.1016/j.jiixd.2023.10.007

Zhan, Y. (2019). Conventional or sustainable? Chinese university students' thinking about feedback used in their English lessons. *Assessment & Evaluation in Higher Education*, *44*(7), 973–986. https://doi.org/10.1080/02602938.2018.1557105

Zhan, Y. (2022). Developing and validating a student feedback literacy scale. *Assessment & Evaluation in Higher Education*, *47*(7), 1087–1100. https://doi.org/10.1080/02602938.2021.2001430

Zhan, Y. (2023). Beyond technology: Factors influencing the effects of teachers' audio feedback on students' project-based learning. *Technology, Pedagogy and Education*, *32*(1), 91–103. https://doi.org/10.1080/1475939X.2022.2093965

Zhang, Z. (2022). Promoting student engagement with feedback: Insights from collaborative pedagogy and teacher feedback. *Assessment & Evaluation in Higher Education*, *47*(4), 540–555. https://doi-org.ezproxy.eduhk.hk/10.108002602938.2021.1933900

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13–39). Academic Press. https://doi.org/10.1016/B978-012109890-2/50031-7