Student Agency and Self-Regulated Learning in Students' Use of Generative AI: A Qualitative Study of High-Achieving Health Science Undergraduates

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Abstract

This study examines how high-achieving undergraduate health science students report integrating generative AI (GenAI) into their self-regulated learning (SRL) practices in contexts where GenAI tools are available. Rather than evaluating GenAI as an instructional support, the focus is on how students integrate these tools within their own regulatory strategies. We conducted semi-structured interviews with 24 undergraduate students (first- and third-year) from biomedical and health science programs. Participants were classified as high-achieving based on consistent academic performance within the top 40% of their cohort. Data were analyzed using inductive thematic analysis informed by SRL frameworks. Students reported using GenAI tools iteratively to clarify concepts, generate practice questions, and monitor understanding. GenAI was embedded within broader self-regulatory processes rather than used as a primary source of answers. Participants adjusted prompts, regulated assistance, and critically evaluated outputs. Participants' accounts suggest that the perceived value of generative GenAI in learning may depend on learners' agency and metacognitive engagement, rather than on the tool itself.

Keywords

Generative AI, Self-Regulated Learning, Learner Agency

1. Introduction

University learning requires increasing levels of self-regulation, including planning, monitoring, and reflection [1]. Many students experience difficulties in effectively regulating these processes. Generative AI (GenAI) tools are becoming widely available in higher education and are increasingly incorporated into students' study practices. Prior research has largely focused on system performance or learning outcomes, while fewer studies examine how students themselves engage with these tools.

Self-regulated learning (SRL) provides a useful framework for analyzing these practices, as it emphasizes learners' active role in managing their cognition, motivation, and behavior [2]. Existing work suggests that GenAI-based systems may support SRL processes; however, less is known about how students enact SRL in contexts where generative GenAI tools are already part of their learning environment.

This study addresses this gap by examining how high-achieving students describe and reflect on their SRL practices in contexts where generative GenAI is available. The focus is not on GenAI as a support system, but on how students integrate these tools within their own regulatory activity.

2. Theoretical Background

Modifying SRL is commonly conceptualized as a cyclical process involving planning, monitoring, and reflection [2,3]. These processes rely heavily on metacognitive skills and learner agency.

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GenAI-based tools have been associated with potential support for SRL, including feedback provision and scaffolding [4]. At the same time, concerns exist regarding overreliance and reduced cognitive engagement.

Recent scholarship has highlighted a tension between the scaffolding potential of GenAI and the risk of cognitive offloading. While large language models may support elaboration, feedback generation, and adaptive prompting [5], concerns remain regarding overreliance, reduced epistemic effort, and diminished reflective engagement when learners outsource core regulatory processes. From this perspective, the educational implications of GenAI depend not only on system capabilities but also on learners' epistemic agency, including the capacity to critically evaluate, regulate, and strategically appropriate GenAI-generated support within ongoing learning activity.

From a learner-centered perspective, the impact of GenAI depends on how students actively regulate and critically engage with these tools, rather than on their availability alone.

3. Methodology

3.1. Participants

A qualitative study was conducted with undergraduate students enrolled in biomedical and health science programs. Participants (n = 24) included first- and third-year students recruited from core disciplinary courses. Students were classified as high-achieving based on their academic performance, defined as students that passed the course on their first attempt, ranked within the top 40% of their cohort. This criterion was used to ensure the inclusion of students with demonstrated academic self-regulation skills. The focus on high-achieving students was intentional, as these learners are more likely to exhibit well-developed metacognitive and self-regulatory strategies. This sampling strategy was not intended for comparison but to examine these processes in depth, as they are more likely to be observable and explicitly articulated in high-achieving students.

3.2. Data Collection

Data were collected through semi-structured interviews conducted between 2024 and 2025. Each interview lasted approximately 30–45 minutes and was conducted in Spanish. Interviews were audio-recorded and transcribed verbatim for analysis. The full interview protocol is available in Appendix.

The interview protocol was designed to explore core components of self-regulated learning, including: (a) planning strategies (e.g., how students organize their study sessions), (b) monitoring processes (e.g., how they assess understanding during learning), (c) use of external resources, and (d) reflection on learning outcomes. Example questions included: "Can you describe how you prepared for the final exam?"; "What materials or tools did you use during your study process?"; "When you did not understand something, what did you usually do?"; "Did you use any strategies to check whether you were understanding correctly?".

Importantly, the use of generative GenAI tools was not explicitly prompted in the interview questions. Although the protocol included broad questions about study resources and tools, generative GenAI was not explicitly probed as a focal topic. Mentions of GenAI emerged through participants' own elaborations when discussing their study practices. Of the 24 interviewed students, 22 explicitly referred to using generative GenAI tools during their study practices, and these accounts formed the basis of the present analysis.

3.3. Data Analysis

Data were analyzed using inductive thematic analysis. The analysis followed an iterative process involving: (1) initial open coding to identify segments related to learning strategies and resource use, (2) grouping of codes into broader categories, and (3) refinement of themes in relation to established

SRL frameworks, particularly Pintrich's model. Table 1 summarizes the progression from initial coding categories to the final analytic themes.

Coding was conducted by the first author using MAXQDA (VERBI Software). The coding process was iterative and recursive, involving repeated revisiting of transcripts and continuous comparison across cases to refine emerging categories. Analytic memos were used throughout the process to document coding decisions, support theme development. The analysis focused on identifying how reported uses of generative GenAI were embedded within broader SRL processes.

4. Results

Table 1: Analytical dimensions identified according to SRL phases

Dimension	Conceptual definition	SRL phase	Conceptual focus
GenAI use for monitoring and conceptual understanding	This dimension refers to the use of GenAI as a support for the progressive construction of conceptual explanations. Students combine conventional study strategies with the repeated and reformulated posing of questions, which allows them to access explanations from different perspectives in a flexible way, adjusted to their study needs and time constraints. Through the feedback provided by the application, they deepen conceptual understanding and consolidate learning, perceiving GenAI as a complementary resource to in-person and independent study, rather than as a substitute for the learning process.	Monitoring/ Control	Strategic help-seeking Metacognitive monitoring of comprehension
Strategic regulation and control of GenAI use	In this dimension, GenAI use is shown to go beyond obtaining specific answers and becomes integrated into core self-regulated learning (SRL) practices. Students incorporate it into strategic study planning by formulating exam-style questions in advance, organizing their study activities according to learning objectives, and monitoring their understanding in order to reflect on the effectiveness of the strategies they employ.	Monitoring/ Control	Real-time strategic regulation
Critical evaluation of GenAI outputs	Students identify inaccuracies, errors, or insufficient explanations in the application's responses and use these limitations as a cognitive input to contrast information, review concepts, and deepen their understanding, incorporating error as an active and reflective part of the learning process.	Monitoring/ Control	Critical metacognitive monitoring Strategic regulation through source comparison and verification

Dimension	Conceptual definition	SRL phase	Conceptual focus
Ethical boundaries and self-regulation	This dimension describes an ethical regulation of GenAI use based on individual responsibility and self-regulation of learning. Students establish clear boundaries between legitimate use, oriented toward understanding, verifying, and organizing content, and inappropriate use that replaces their own cognitive effort, particularly in assessment contexts.	Forethought	Planning Emotional self-regulation
Adaptation of GenAI use to learning needs	GenAI functions as a complementary resource integrated with other study materials, allowing students to combine, verify, and contrast information strategically, thereby promoting metacognitive monitoring and control of the learning process. GenAI is also used as an instrumental support to optimize task execution through the automation of processes such as writing and translation, reducing physical effort and barriers to content access, and facilitating effort regulation without replacing cognitive processing.	Monitoring/ Control	Regulation of resources and effort

4.1. GenAI Use for Monitoring and Conceptual Understanding

Across interviews, students consistently described using generative GenAI tools as part of their metacognitive monitoring processes, particularly to identify gaps in understanding and refine conceptual knowledge. Rather than requesting direct answers, participants engaged in iterative interactions aimed at testing and validating their comprehension.

One first-year student explained: "When there was something I didn't understand, I asked ChatGPT about that specific concept. Then I asked again: 'So, is it like this?' to see if I had really understood." (S1_F_1st year)

Similarly, a third-year student described: "When I didn't understand anything I was reading, I asked it to explain it in the simplest way possible. From that, I started building the topic." (S10_M_3rd year)

A recurring pattern across participants was the reformulation of questions and requests for alternative explanations until the content aligned with their own understanding. In this sense, GenAI was used not as a final source of information, but as a means to iteratively refine comprehension.

Another student noted: "Sometimes I asked it to explain the same thing in different ways, because the first explanation didn't always help me." (S8_F_1st year)

Interview accounts suggested that students perceived GenAI as a dynamic feedback mechanism to support ongoing evaluation of their understanding. This pattern is consistent with metacognitive monitoring processes described in SRL frameworks, where learners actively assess and regulate their cognition during task engagement.

4.2. Strategic Regulation and Control of GenAI Use

Participants described a high degree of intentionality in how they interacted with GenAI tools, actively regulating both the type and level of assistance received. Rather than passively accepting outputs, students adjusted prompts, constrained responses, and defined specific roles for GenAI within their study process.

One third-year student explained: "I use it in 'study mode'. I tell it what I want—like making questions—but I ask it not to give me the answers, just to make me think." (S11_F_3rd year)

Another participant emphasized: “The problem with GenAI is not the tool itself, but how you ask. If you don’t ask well, the answer won’t help you.” (S5_M_1st year)

A recurring strategy involved iterative prompting, where students refined their queries based on previous outputs in order to obtain more useful or targeted responses. This process required continuous evaluation of the relevance and quality of GenAI -generated information.

In addition, some students explicitly limited GenAI support: “I try not to let it give me everything solved, because then I don’t learn.” (S2_F_1st year)

These reported practices suggest that participants approached GenAI use as a resource strategically aligned with their learning goals, rather than as an external driver of the learning process. Participants’ accounts further suggest deliberate calibration between external support and internal cognitive effort.

4.3. Critical Evaluation of GenAI Outputs

> Participants’ accounts consistently reflected a critical stance toward GenAI-generated information, recognizing both its usefulness and its limitations. A common practice was the verification of GenAI outputs through triangulation with course materials, notes, and peer discussions.
>
> One student reported: “Sometimes it gives weird answers… you ask for a reference and it invents an article. So I had to check if what it was saying made sense.” (S3_M_3rd year)
>
> Another participant stated: “I never trust it completely. I compare it with what we saw in class.” (S7_F_1st year)
>
> This pattern of verification was observed across participants and reflects an awareness of potential inaccuracies in GenAI-generated content. Students did not treat GenAI as an authoritative source, but as one input among others within their learning process.
>
> In some cases, students also used discrepancies as learning opportunities: “If something didn’t match what I had, I tried to understand why. That actually helped me learn more.” (S9_M_3rd year)

These findings suggest that GenAI use was accompanied by forms of epistemic vigilance, where learners actively evaluated the reliability and coherence of information.

4.4. Ethical Boundaries and Self-Regulation

Participants articulated clear ethical boundaries regarding the use of GenAI, particularly in relation to assessment contexts. The use of GenAI during exams or graded assignments was generally rejected and framed as incompatible with learning goals.

One student explained: “For an exam, no—because that’s copying. If you only copy the answer, you don’t learn anything.” (S12_F_3rd year)

Similarly: “Using it to study is fine, but not when you’re being evaluated.” (S6_F_1st year)

These positions were not described as externally imposed, but as internally regulated decisions aligned with personal responsibility and learning objectives. Participants described distinguishing between acceptable and unacceptable uses based on their perceived impact on learning.

This suggests that ethical considerations were integrated into students’ self-regulatory processes, shaping how and when GenAI tools were used.

4.5. Adaptation of GenAI Use to Learning Needs

Students reported a range of GenAI uses adapted to their individual learning needs and preferences. These included generating practice questions, summarizing content, supporting comprehension, transcription, and translation.

For example: “You can upload PDFs or videos and it makes multiple-choice questions. That was really useful for practicing.” (S6_F_1st year)

"I dictated and it wrote everything. It's faster, and then I can read it or print it." (S5_M_1st year)

Some participants also used GenAI for language support: "Sometimes I translate texts or ask it to explain things in simpler English." (S4_F_3rd year)

A recurring pattern was the flexible integration of GenAI into existing study routines, rather than the replacement of those routines. Participants reported selecting specific functionalities depending on the task at hand.

These findings suggest that GenAI tools were appropriated as adaptable resources within broader learning strategies, supporting different phases of the learning process according to individual needs.

5. Discussion

The present analysis suggests that participants reported integrating generative GenAI tools into their learning processes in ways that align with SRL frameworks. GenAI use was closely linked to planning (e.g., generating exam questions), monitoring (e.g., checking understanding), and reflection (e.g., evaluating coherence with prior knowledge), corresponding to the phases described by Pintrich [2, 3]. These results extend previous research by showing how these SRL processes emerge not only in GenAI -designed learning environments, but also in students' self-initiated, everyday interactions with generative GenAI tools [4, 6].

Consistent with recent literature, the educational value of AI appeared to depend on students' active, critical, and reflective engagement rather than on the mere avail-ability of the tool. In line with contemporary models of GenAI-enhanced SRL, participants described using generative GenAI as a metacognitive scaffold that supported monitoring, elaboration, and strategic control, rather than as a shortcut to task completion [4, 7]. Importantly, students reported deliberately regulating the level of assistance received, reformulated prompts, and rejected uses that bypassed cognitive effort, suggesting a sophisticated calibration of external support. This pattern contrasts with concerns that generative GenAI inevitably promotes passive or superficial learning [6]. Instead, the findings support a conditional view in which learning outcomes depend on learners' metacognitive skills, goals, and ethical positioning. Students' practices of triangulating GenAI-generated information with course materials and peer discussions further underscore the role of judgment and epistemic vigilance in GenAI-supported learning.

From a human-centered AIED perspective, these findings respond to recent calls to move beyond technology-driven evaluations of GenAI systems and to foreground learners' agency, theoretical grounding, and contextualized use of GenAI in educational re-search [7]. Rather than positioning generative GenAI as an autonomous tutor, participants framed it as a flexible resource that could be strategically orchestrated within their broader learning ecology. This aligns with recent calls to shift the focus of GenAI in education from system capabilities to learners' capacities to regulate, critique, and appropriate AI tools in support of their own learning goals [5, 8].

6. Limitations

This study has several limitations that should be considered when interpreting the findings. First, the analysis is based on students' self-reported accounts rather than direct observation of study practices. As such, the findings reflect participants' perceptions and retrospective descriptions, which may not fully capture actual regulatory behaviors during GenAI use.

Second, the intentional focus on high-achieving students limits the transferability of findings to broader student populations. Because these participants were selected based on demonstrated academic success, they were more likely to articulate well-developed metacognitive and self-regulatory strategies. Future research should compare how students across different achievement levels engage with generative GenAI, particularly to examine whether similar patterns of critical regulation emerge among learners with less developed SRL skills.

Third, although generative GenAI emerged through participants' own elaborations, the interview protocol included broad questions about study resources and tools, which may have indirectly prompted references to GenAI use.

7. Conclusion

This study contributes to understanding how students engage with generative GenAI in real learning contexts. The present findings suggest that generative GenAI may become meaningful as a learning resource when integrated into students' self-regulatory practices. Rather than acting as an autonomous tutor, participants described generative GenAI as a flexible and controllable resource within their learning practices. These results highlight the importance of supporting students' metacognitive skills and critical engagement when integrating GenAI into higher education.

8. Declaration on Generative AI

> During the preparation of this work, the authors used ChatGPT-4 for grammar and spelling checking texts translated from Spanish into English.

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A. Semi-structured Interview Guide

The following appendix includes the semi-structured interview guide used to collect qualitative data from participants in the present study.

Introduction

> Thank you for agreeing to share this space with me. As I mentioned earlier, I would like to learn more about your experience in the course, particularly in relation to your learning

process. This interview is anonymous, and under no circumstances will your responses have any impact on your academic progress.

I encourage you to reflect on and recall specific moments from the course so that you can describe your experience in as much detail as possible.

Thank you in advance for your time and participation.

Do you consent to this interview being audio-recorded to facilitate subsequent analysis?
Name

ID number

Interview Guide

Now that the course has finished, how would you describe your overall experience?

Did you enjoy the course? Did you feel comfortable while taking it? Did you find the topics or content interesting?

Let's focus now on the period when you were preparing for the final exam. How long in advance did you start preparing?

Can you describe how you prepared for it? Please explain in as much detail as possible what you did.

What materials or tools did you use?

At what points during your study process did you use different strategies? How did you organize your time to carry out these activities?

Now, let's focus on the place or environment where you usually study. Please describe it in as much detail as possible.

In your opinion, why do you choose to study in this type of environment?

While preparing for this exam, did you encounter any difficulties? Which ones? Were you able to overcome or solve them? How?

Was there any specific course content that you found particularly difficult to understand?

When you did not understand something, what did you usually do?

Did you ever seek help? From whom? How did they help you? Did you find it useful? Through which channels did you seek help? (e.g., social media, email, phone, in person,

discussion forums)

Did you study alone or with classmates for this exam? What does each of these study modes contribute?

Did you find it difficult to maintain concentration or continue studying when you were tired?

How did you handle that situation?

What tends to distract you the most while studying? Do these distractions significantly affect your study time?

Do you use any strategies to check or confirm your progress—that is, whether you are understanding correctly? Can you describe them? Do you do this alone or with others?

Does this depend on the subject, or do you always do this when studying? Please provide as many examples as possible based on your experience.

Now let's focus on your study activity through the course platform (EVA). What was your experience like? Did you have any difficulties adapting to it or using it?

What activities did you carry out on the Moodle (EVA) platform? In your opinion, is the EVA platform important? Why?

Is there anything you would change about the platform to make it easier to understand or to find information?

How did you organize your time between activities on the platform and those outside of it? When studying on EVA or outside of it, did you use the same study space or a different one? Is there anything else you would like to add before we finish?