

Innovating AI-Assisted Academic Literacy in Higher Education: Human Epistemic Control and Sustainable Human–AI Cognitive Partnership

Perla Yualita¹, Vismaia S. Damaianti^{2✉}, Yati Mulyati³, Andoyo Sastromiharjo⁴, Friedrich Aditya⁵

¹⁻⁴Faculty of Language and Literature Education, Universitas Pendidikan Indonesia, Indonesia

⁵Faculty of Humanities and Social Sciences, Humboldt-Universität zu Berlin, Germany

DOI: 10.23917/ijolae.v8i3.20393

Received: August 16th, 2026. Revised: September 22nd, 2026. Accepted: September 25th, 2026

Available Online: September 27th, 2026. Published Regularly: September, 2026

Abstract

The increasing adoption of generative artificial intelligence (GenAI) in academic writing has raised concerns on whether it would have any educational benefits or drawbacks for the learners, especially their capability to think critically, be authors, and maintain academic integrity. This study explores how students employ GenAI in their academic writing and the extent to which AI-interaction logs could enable reflective and responsible GenAI usage. Qualitative case study research was done involving 20 students from the Tourism Study Program at a university in Bandung, Indonesia, through open-ended interviews analyzed thematically using NVivo. There emerged nine themes which were then synthesized into six AI-assisted academic literacy dimensions namely: instrumental, cognitive, textual-authorial, critical-evaluative, ethical-integrity and reflective-regulatory. Efficiency and easiness of GenAI usage was stated by 100% of the respondents while transparency and reflection through the AI-interaction log came second (95%), ideation and comprehension (90%), and risks of dependency (90%). Students evaluated, verified, paraphrased and revised GenAI-generated content but maintained academic responsibility over the text. The study concludes that the AI-interaction log may serve as a mechanism for transparency and reflection despite the 35% who document burdens. The study suggests a sustainable human-AI cognitive partnership.

Keywords: generative artificial intelligence, AI-assisted academic literacy, advanced learning, instructional design, learning strategies, adaptive learning, human–AI cognitive partnership, design instructional adaptive



This is an open access article under the CC-BY license

✉Corresponding Author:

Vismaia S. Damaianti, Faculty of Language and Literature Education, Universitas Pendidikan Indonesia, Indonesia

Email: vismaia@upi.edu

1. Introduction

The rapid development of generative artificial intelligence (GenAI) is transforming academic writing and creating new opportunities for advanced learning experiences in higher education. Nowadays, students actively use such tools as ChatGPT to generate ideas, build outlines, polish

language, summarize the material, and get instant feedback. Systematic reviews show that GenAI can assist students in developing their academic skills in various higher-education settings (Daniel et al., 2025). The supportive factors and student interest determine ChatGPT adoption in Indonesia (Zhang et al., 2024); on the other hand, the

regular usage of ChatGPT has been associated with higher academic productivity (Firaina & Sulisworo, 2023). Onal, Kulavuz-Onal et al., (2025) state that ChatGPT assists in information searching, outlines building, and time-management during the studying process. At the same time, students know both academic benefits and the possible negative impacts of ChatGPT on their learning quality (Johnston et al., 2024).

Therefore, the educational challenge is not the use of AI itself, but how GenAI can be progressively integrated into students' thinking, writing, reflection, and learning processes without weakening human intellectual agency. GenAI can serve as scaffolding that will allow students to develop their ideas and overcome language barriers but the unthinking usage can lead to dependency and cognitive offloading (Fan et al., 2025). Similarly, ChatGPT use has two sides: it assists students in completing various academic activities but also can be connected with procrastination, memory problems, and other performance issues (Abbas et al., 2024). It means that students should be able to regulate, evaluate, and integrate GenAI products into their works.

It is important to note that AI literacy involves not only the technical skills in accessing AI-based tools but also understanding the limitations of GenAI and its outputs, ability to verify the information, make revision decisions, and be responsible for the final product. Currently, there exist several definitions of AI literacy that take into account the affective, behavioral, cognitive, and ethical dimensions of AI integration (Ng et al., 2021). It is important to mention that AI literacy is revealed in the students' interactions with GenAI. Using the think-aloud protocols, the screen recordings, and AI conversation history, Kim et al. (2025) showed that the patterns of such interactions

depend on the level of students' AI literacy and are associated with the writing performance.

Another dimension that is critical in this situation is HOTS. The focus of Bloom's taxonomy is on analyzing, evaluating, and creating since these processes are complicated enough to remain central to students' learning. GenAI can support advanced and challenging learning by engaging students in higher-order thinking processes, including comparing AI-generated outputs with independent sources, evaluating information accuracy, considering alternative arguments, and synthesizing verified information. The acceptance of GenAI products without such analysis can decrease analytical engagement even more since large language models are capable of producing hallucinations that look believable but are not correct or verifiable (Ji et al., 2023). For this reason, recent reviews emphasize that it is necessary to preserve the evaluation, reflection, and cognitive control in the process of GenAI integration (Darwin et al., 2025).

At last, GenAI brings many challenges to academic integrity. It is not only the final product but also the process of authorship, verification, and responsibility that became central in this situation. Rudolph et al. (2023) and Currie (2023) provide an overview of the opportunities and challenges connected with ChatGPT and academic integrity. In turn, Bittle & El-Gayar (2025) point out both educational benefits and increased risks of academic dishonesty. Kangwa et al. (2025) stress the importance of academic support, student self-regulation, and the clear guidelines of institutions. The values of academic integrity including honesty, trust, fairness, respect, responsibility, and courage can serve as the basis for the responsible GenAI usage (Eaton & Christensen Hughes,

2022). In this regard, Cotton et al. (2024) claim that the prohibition should be replaced by the education and transparent usage.

It means that one should pay attention to the process that includes the explanation of how GenAI is used, verified, and integrated into students' work. Such process-oriented approach is a good rationale for the usage of AI interaction logs that include all prompts, AI outputs, the results of verification activities, revision decisions, and student reflections. It will allow making students' monitoring and metacognition visible, especially, with the help of concurrent think-aloud protocols (Li et al., 2026). In academic writing, such logs can have a double function: being the reflection tool and providing evidence of the transparent AI usage while supporting feedback literacy (Zhan & Yan, 2025).

The important aspect of the problem is the disciplinary context. For example, in tourism and hospitality education, GenAI can provide various opportunities for personalized learning, research assistance, and simulations, but its implementation requires proper digital-literacy readiness of the students and teachers (Dogru et al., 2024). Bibliometric study by Fathy et al. (2025) shows the growing research interest in ChatGPT in the field of tourism and hospitality education.

However, despite the rapid growth of research in GenAI usage in higher education, the studies that integrate efficiency, idea development, critical evaluation, writing personalization, risk of dependency, academic integrity, and process transparency into one students' writing experience are still limited. Qian (2025) points out the necessity of GenAI integration that will prioritize learning quality together with efficiency (Miao & Cukurova, 2024).

Therefore, the current gap in the research area is connected with the need to reconsider AI literacy as the academic practice that is technical, cognitive, ethical, and reflective.

Accordingly, the purposes of this study are the following: (1) to analyze the ways of reconceptualizing AI literacy through the human-AI interaction in academic writing; (2) to detect the patterns of HOTS activation while evaluating and revising the AI-generated outputs; and (3) to explain how the transparency in human-AI collaboration can help to preserve academic integrity. The novelty consists in linking nine empiric themes of AI usage, supported by verbatim quotations from 20 Tourism Study Program students, with the idea of AI-assisted academic literacy. Moreover, the study positions the AI-interaction log as an instructional design mechanism that connects HOTS, reflection, feedback literacy, and academic integrity while shifting pedagogical attention from the final AI-assisted product to the learning processes underlying academic writing.

2. Method

This study used a single qualitative case study design to explore how students interact with GenAI while writing an academic paper. The study utilized a retrospective process-tracing method based on verbal reports (Yan, 2023). The study adapted the diagnostic evidence-tracing approach of process-tracing tradition to the in-depth interview data. Unlike focusing only on the final product of students' academic writing and its qualities, the process-tracing method enabled tracing the sequence of decisions in GenAI-assisted writing, including AI use, the evaluation of AI-generated content, information verification, revision, and reflection (Yin, 2018).

The study included 20 students enrolled in the Tourism Study Program of a university in Bandung City, Indonesia. The same single disciplinary context was maintained to enable a consistent interpretation of students' experience of GenAI use in academic writing because the usage of GenAI in the field of tourism and hospitality education has unique pedagogical and professional characteristics (Fathy et al., 2025). The unit of analysis of the study is individual respondent (source) in the NVivo dataset. Since qualitative data may contain different layers of meanings and refer to several dimensions of the phenomenon under consideration, one respondent may fit more than one thematic category. Thus, the percentages presented for individual themes indicate the proportion of respondents associated with each theme.

a. Data Collection

Data was collected using a structured interview guide. Participants provided answers to the interview questions in a written form. Although the written interview technique may generate data comparable to the oral interview especially when participants are under the limitation of time constraints and different schedules (Rahman et al., 2026), the written interview enables participants to reflect on their experiences with GenAI in advance before providing responses to the questions.

The dataset consists of answers to nine interview questions (Q1-Q9). The focus of the data collection is students' experiences with using GenAI for preparing an academic paper and their experiences of interacting with the AI-interaction log. The interview questions include nine topics: (1) perceived benefits of AI, (2) idea development, (3) evaluation and verification of AI-generated information, (4) personalization and revision of AI-generated text, (5) ethics and academic

integrity, (6) dependency risk, (7) transparency and reflection, (8) perceived effectiveness of the AI-interaction log, and (9) the sustainability of AI-supported learning practices.

b. Data Analysis

The data was analyzed with thematic analysis assisted with NVivo software. The analysis procedure was conducted following the six phases of Braun and Clarke (2006)'s thematic analysis approach: (1) familiarization with the dataset, (2) identification of meaningful units of data, (3) generation and organization of codes into nodes and potential themes, (4) review of thematic consistency within the dataset, (5) defining and naming of the final themes, and (6) interpretation of relationships between the themes and interview questions through matrix coding. In addition, NVivo data analysis practice was supported with the guidelines for qualitative data analysis with the help of NVivo (Miraz et al., 2025).

At the stage of generating initial codes, the meaningful segments of participants' answers were identified and coded. Codes related to one theme were combined into broader thematic categories. The researchers reviewed the connections between codes and themes to ensure that each theme is conceptually consistent and empirically supported (Yanti et al., 2025). At the matrix coding stage, the distribution of themes across nine interview questions was explored to find out the patterns in students' experiences of using GenAI for academic writing. Nine themes were selected as major analytical categories of the Tourism dataset.

The NVivo word-frequency count and word clouds were used to identify recurrent lexicons within the dataset. They were used as the supplementary tool of data analysis and considered as descriptive evidence and not as

an independent source of thematic categorization.

c. Trustworthiness and Ethical Considerations

The issue of trustworthiness was approached with the principles of credibility, dependability, transferability, and confirmability that belong to the framework of trustworthiness in naturalistic inquiry (Riazi et al., 2023). The credibility of the findings is ensured through the systematic traceability of verbatim answers of the respondents, NVivo coding nodes, thematic categories, and matrix coding (Kim et al., 2026). Verbatim quotations are used as evidence of each theme and preserved in the Results and Discussion section of the report.

Source frequency is used as a descriptive indicator of the presence of each theme among the 20 respondents. The source frequencies are not considered as inferential statistics and not used to claim statistical generalizability. However, the information about source frequencies is helpful in understanding the context of the distribution of participants' experiences within the case study. Dependability and confirmability are supported through the analytical trail from the respondents' verbatim answers to the coding, thematic analysis, and interpretation (Zhou et al., 2025). Verbatim quotations used in the Results and Discussion section are checked against the original dataset.

The issue of transferability is addressed through clear specification of the context of the study, namely, institution, discipline, and participant context, to make possible the assessment of the relevance of the findings to other similar contexts. Confidentiality of the participants is ensured by assigning anonymous identification code to each participant and not disclosing any personally identifiable information. The resulting

thematic structure becomes the empirical basis for examining the relationship among AI literacy, higher-order thinking skills, reflective practices, transparency, and academic integrity in GenAI-assisted academic writing.

3. Results and Discussion

Analysis of the students' responses regarding the implementation of GenAI in academic writing and the AI-interaction log resulted in nine interrelated themes. As seen in Table 1, the themes differ in terms of their prevalence. Specifically, efficiency and easiness of using AI (100%) were most prevalent, followed by transparency and reflection through AI interaction log (95%), idea development and comprehension (90%), and dependency and risk of AI use (90%). Since the participants could contribute to several themes, these percentage rates reflect their prevalence in terms of themes rather than mutually exclusive categories. Therefore, the results of the current study have been interpreted as an interconnected practice of students' moving from using AI instrumentally to using it cognitively, critically, ethically, and reflecting on their usage. According to this pattern, the current findings will be grouped in the four interconnected dimensions: (1) GenAI as an instrumental and cognitive scaffold in academic writing; (2) human epistemic control through critical and authorial engagement; (3) AI-interaction logs as tools for transparency, reflection, and academic integrity; and (4) sustainable AI-assisted academic literacy as a human-AI cognitive partnership.

a. GenAI as an Instrumental and Cognitive Scaffold in Academic Writing

According to the current analysis, GenAI initially serves as an instrument for increasing efficiency and accessibility of academic writing. As Table 1 shows, all 20 respondents (100%) found that AI was beneficial due to efficiency and ease of its use, while 18 respondents (90%) saw AI as helping with the development and comprehension of ideas. These findings

imply that the primary focus of students' engagement with GenAI is practical, namely, it helps to accelerate the search for information, organize ideas, and reduce effort associated with starting and developing academic writing. At the same time, the results imply that AI use goes beyond mechanical assistance as students increasingly use the technology to organize their thoughts and comprehension of academic topics.

Table 2. Distribution of Instrumental and Cognitive Functions of GenAI

Dimension	Theme	Number of Respondents	Percentage
Instrumental	Efficiency and ease of AI use	20	100%
Cognitive	Idea development and comprehension	18	90%
Combined	Respondents reporting both functions	-	-
Analytical interpretation	Instrumental-to-cognitive progression	-	-

Note. Percentages are the proportion of respondents in relation to each theme. The non-mutual exclusion of the themes implies that respondents can be attributed to several themes at once.

As demonstrated by Table 2, the instrumental function of GenAI is the most pervasive point of entry into AI-assisted academic writing. The fact that all respondents identify efficiency and ease of use means that the immediate value of GenAI is closely related to overcoming practical barriers of academic writing (Burneo-Arteaga et al., 2025). Simultaneously, the high rate associated with idea development and comprehension (90%) indicates that students do not use AI purely instrumentally. Instead, many students use GenAI for initiating ideas, clarifying concepts, organizing information, and forming the direction of their writing. This pattern corresponds with the principles of the Technology Acceptance Model (TAM) developed by Davis (1989), particularly the constructs of perceived usefulness and perceived ease of use. The recent evidence

supports the same idea, indicating that the usefulness and ease of use of ChatGPT is closely associated with its acceptance for academic writing (Strzelecki et al., 2023). A recent TAM-based research has indicated that graduate students perceived ChatGPT as relatively easy to use and useful for academic writing, confirming the relevance of the constructs mentioned above to explain students' engagement with GenAI (Kudritskaya et al., 2024).

The qualitative data explains what exactly students meant when they described GenAI as efficient and useful. Rather than merely reducing the time required to write the final text, students noted that AI could help to simplify several steps of the writing process, such as searching for information, formulating the initial ideas, and organizing the structure of a paper.

Table 3. Illustrative Evidence of Ge-nAI as an Instrumental and Cognitive Scaffold

Respondent	Participant Evidence	Primary Function	Analytical Interpretation
P-004	AI makes it easier to prepare an academic paper and obtain information without searching individually	Efficiency	Reduces procedural effort
P-020	AI assists with outlines and inspiration but still requires critical ability	Cognitive support	Supports planning while retaining student control
P-012	AI helps organize ideas and determine where to begin the paper	Idea development	Supports pre-writing organization
P-020	AI provides various viewpoints and writing structures while the student determines relevance	Comprehension	Expands the space of possible interpretations

The data in Table 3 shows that students experience GenAI not only as a tool for generating texts. Respondent P-004 emphasizes procedural easiness, whereas P-020 and P-012 note that AI helps with outlining, inspiration, organization, and establishing an appropriate starting point. Such accounts indicate that the instrumental value of GenAI can serve as an entry point to advanced learning, particularly when technological assistance is transformed into higher-level cognitive activities such as analysis, evaluation, synthesis, and independent judgment (Alubthane, 2026). Crucially, respondent P-020 clearly notes the continuous need for critical ability, which suggests that students can find both the usefulness of AI and the necessity of independent thinking complementary rather than mutually exclusive. This finding supports the recent evidence indicating that students use ChatGPT for brain-storming, summarizing, searching for research materials, and simplifying complex information, while acknowledging limitations of the AI-generated information reliability.

The prevalence of 90% of respondents associating AI with idea development and comprehension is particularly crucial from the pedagogical perspective. First, it means that the role of GenAI can go beyond the text creation and extend to the pre-writing stage, where students formulate questions, explore various perspectives, and create an initial conceptual structure (Rafi et al., 2026). This function can be interpreted in the terms of scaffolding suggested by Wood et al. (1976) and the zone of proximal development described by Vygotsky (1978). In this context, GenAI can serve as a temporary assistant that allows students to explore ideas which initially would be difficult to formulate independently. At the same time, the analogy with scaffolding does not imply that AI will be responsible for determining the learning objectives and the validity of the resulting ideas. The student is responsible for determining relevance, selecting information, and transforming the initial suggestions into academically sound arguments.

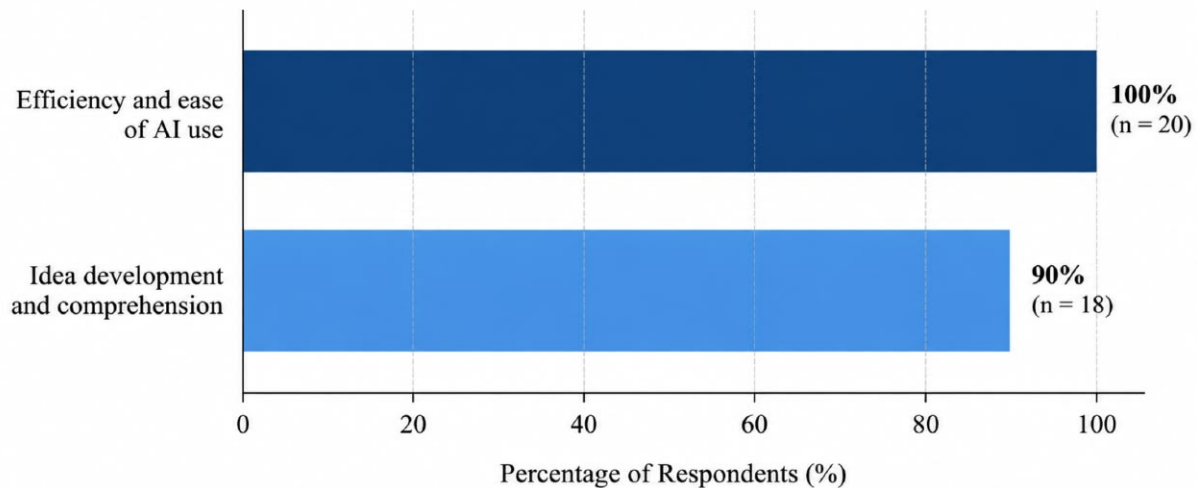


Figure 2. Pre-Writing and Efficiency Functions of GenAI

Figure 2 visually supports the key pattern identified in the qualitative data: efficiency is uni-versal, whereas cognitive engagement is highly prevalent. The 10-percentage point gap between the two themes should not be considered as evidence that the efficient use of AI necessarily entails less cognitive engagement. Instead, it means that efficiency constitutes the most pervasive experience of the participants, whereas idea development and comprehension constitute a bit less widespread but still substantial pattern of AI use (Angela et al., 2025). This difference is crucial because the efficiency alone does not provide any clear evidence of educational

value. The recent experimental evidence proves that ChatGPT-assisted writing can improve writing quality and decrease the cognitive load while impacting students' experiences of control and ownership in various ways (Zhang & Xu, 2025). Therefore, the educational significance of efficiency depends on how the saved time and effort via AI will be used for cognitive activities, such as analysis, evaluation, synthesis, and revision.

The progression from efficiency to cognitive scaffolding can be illustrated in the terms of a process rather than two separate categories.

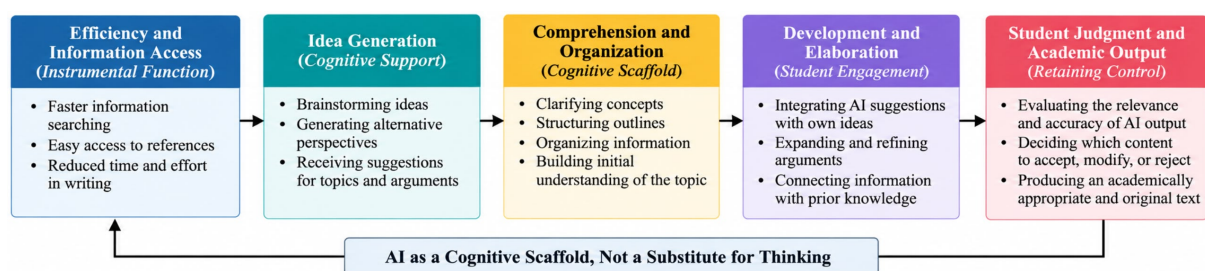


Figure 3. From Instrumental Assistance to Cognitive Scaffolding

The illustration in Figure 3 reflects the main interpretation emerging from the current findings. GenAI initially saves the procedural effort in academic writing, but its pedagogical potential increases when this

efficiency creates room for students' deeper engagement with ideas (Li & Liu, 2026). The progression from information access to idea generation, comprehension, organization, and finally students' judgments illus-

trates that cognitive scaffolding is not the same as cognitive substitution. The AI can generate possible directions, but the student will have to determine whether those directions are relevant, coherent, and academically appropriate (Chea & Xiao, 2024). This distinction is particularly important in academic writing when a technically perfect text can still lack conceptual and disciplinary accuracy. Recent research on GenAI-assisted writing confirms this conclusion and indicates that structured instructional design and explicit learning strategies can support writing productivity and quality, particularly when students are guided to interact with, evaluate, verify, and revise GenAI outputs (Rahiem, 2026).

The qualitative evidence also shows that students are able to notice this difference. P-020 states that AI is useful for creating an outline, providing inspiration, and accelerating the writing process, but also emphasizes the need for critical ability to avoid complete dependence. This observation is theoretically important since it demonstrates the emergence of the distinction between using AI to initiate/organize cognition and delegating the cognition to AI (Archana et al., 2025). The first represents a potentially productive form of cognitive scaffolding, while the second one risks reducing the students' opportunity to formulate and evaluate ideas independently. Therefore, the 100% prevalence of efficiency should not be interpreted as the evidence of the maturation of AI literacy of all students. Instead, it establishes the technological utility from which more sophisticated forms of AI literacy can emerge.

This interpretation is additionally supported by the recent research in academic writing. According to Kim et al. (2025), the students' patterns of interactions with GenAI

are associated with their AI literacy and writing performance, which means that the educational effects of AI depend on part on how students interact with it. Similarly, Almumen & Jouhar (2025) found that ChatGPT can be used as a pre-writing brainstorming tool to improve persuasive writing. Broader speaking, the recent qualitative research on the use of AI prompts in academic writing stresses that GenAI can serve as a cognitive scaffold if students use it for developing and organizing ideas rather than using it as a short-cut for writing the whole text (Wang et al., 2026).

From the perspective of AI literacy, the current findings imply that efficiency and cognitive scaffolding represent two different but complementary levels of engagement. The instrumental dimension concerns the students' ability to use AI efficiently for the access to information and writing assistance, whereas the cognitive dimension concerns their ability to use AI for expanding and organizing ideas without compromising their intellectual independence. This distinction is consistent with the multidimensional conception of AI literacy suggested by Liu et al (2026).

Crucially, the current findings should not be interpreted as the demonstration of the fact that AI automatically improves students' thinking. Instead, it shows that students recognize and employ GenAI as a tool that can create the conditions for more organized and efficient thinking. The further transformation of this potential into learning depends on the subsequent students' actions, particularly evaluation, verification, personalization, and revision (Rafi et al., 2026). From this perspective, the instrumental and cognitive functions identified in the current section provide the ground for the next step of the analysis: the human epistemic control, in which

students have to determine whether the ideas and information generated by AI need to be accepted, modified, verified, or rejected (Baldrich et al., 2025). Thus, the transition from AI as an instrument of assistance to AI as a cognitive scaffold depends crucially on students' control over academic judgment.

b. Human Epistemic Control: From AI Output to Critical and Authorial Engagement

Based on the findings, the process of using GenAI in academic writing appears to be a continuous compromise between technological assistance and cognitive control performed by the students. There are three interrelated themes, all reported by more than half of the sample: dependency and risk of AI use (18 respondents or 90% of

participants); paraphrasing and text personalization (17 respondents or 85% of participants); critical thinking and information evaluation (16 respondents or 80% of participants). Altogether, the data show that the use of AI by students is not only the consumption of output; it includes various degrees of evaluation, modification, and control over the process (Begmatova & Saydazimova, 2025). At the same time, the high percentage of concerns about dependency indicates that the convenience offered by GenAI creates a permanent tension between cognitive assistance and substitution. Research shows a similar effect: the educational role of GenAI is heavily dependent on how students interact with the technology (Kim et al., 2025).

Table 4. Distribution of Themes Related to Human Epistemic Control

Dimension	Theme	Number of Respondents	Percentage
Cognitive regulation	Dependency and risk of AI use	18	90%
Authorial engagement	Paraphrasing and text personalization	17	85%
Critical evaluation	Critical thinking and information evaluation	16	80%
Overall pattern	Human epistemic control across the three themes	—	—

As Table 4 shows, there is an interesting pattern: concerns about dependency are more frequent than explicit evaluation, yet both occur at a high level. While the 90% prevalence of dependency and risk means that the students understand the potential effect of GenAI on their cognitive processes, the 85% prevalence of personalization shows that the majority of students report transforming the AI output rather than accepting it as it is (Kudritskaya et al., 2024). Finally, the 80% prevalence of critical thinking and information evaluation shows that a significant number of students perform some kind of evaluation of the generated

output. It is important to note that these numbers should not be interpreted as some sort of hierarchy where one dimension gradually replaces another (Archana et al., 2025). On the contrary, they mean that responsible AI-assisted writing presupposes the concurrent management of convenience, authorship, and epistemic judgment.

Qualitative evidence helps to understand this pattern better. The students reported several learning strategies for maintaining control over AI-generated content, including rereading, comparing information across sources, evaluating relevance, paraphrasing, personalizing content, and deciding whether

particular outputs should be accepted, revised, or discarded (Wu et al., 2025).

Table 5. Evidence of Human Epistemic Control and HOTS Activation

Respondent	Evidence from Student Response	Cognitive Process	AI-Literacy Dimension
P-003	Evaluates AI answers based on evidence, logic, sources, and contextual relevance	Evaluating	Critical-evaluative
P-008	Rereads, evaluates, selects relevant information, rewrites it, and adds personal analysis	Analyzing–Evaluating–Creating	Textual-authorial
P-014	Rejects information that conflicts with theory, lacks relevance, or has no clear source	Evaluating	Verification and critical judgment
P-007	Paraphrases and processes information first to ensure understanding	Analyzing and transforming	Authorial engagement

As shown in Table 5, students' interaction with GenAI can include elements of higher-order cognitive processes. For instance, P-003 mentions that when generating information, AI takes into account evidence, logic, sources, and contextual relevance, which is evaluation rather than mere output generation. P-008's description is even more comprehensive: he reads the information produced by the AI, selects it, rewrites it, and adds his personal analysis, which constitutes analyzing, evaluating, and creating in sequence. Finally, P-014 explicitly uses some criteria of rejecting AI-generated information. These examples clearly illustrate that AI literacy is not only the capability to work with the system but also the capability to evaluate the epistemic quality of its output. This understanding is consistent with Uppal & Hajian (2025).

Thus, the pattern can be understood as a challenging learning process in which students move from receiving AI-generated

suggestions toward independent epistemic evaluation, verification, judgment, and revision. First, the student receives a response from the AI, then evaluates its relevance and credibility, verifies the information with other sources, and finally decides whether to accept, modify, or reject the information produced by the system. This sequence is especially important since the large language model can produce a fluent and convincing answer even in case of inaccurate or insufficiently supported information (Escalante et al., 2023). As a result, the capability of evaluating AI-generated information becomes a crucial part of responsible academic writing rather than just an additional skill. Systematic research shows that GenAI can be beneficial for fostering critical and creative thinking in academic writing tasks if it is used within an inquiry-oriented environment (Chiu et al., 2024).

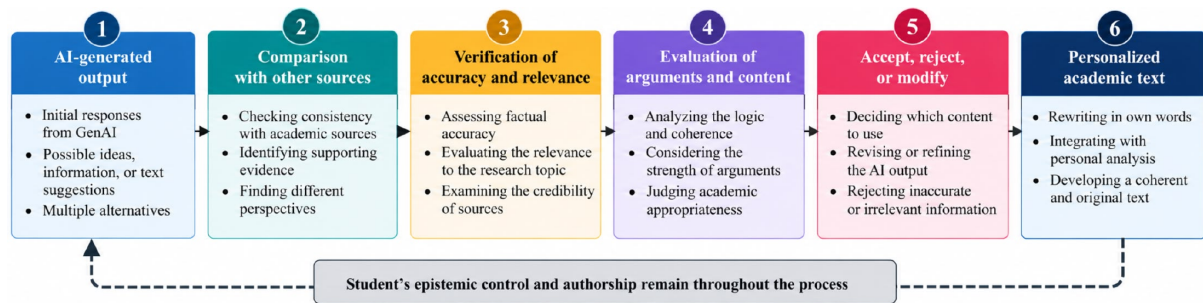


Figure 4. Pattern of Human Epistemic Control in AI-Assisted Academic Writing

Figure 4 represents the empirical pattern found in the interviews in the form of the process of epistemic regulation. The key point here is that the role of the student is not over after the AI generates a certain answer; instead, the answer becomes an object of evaluation. Comparison of the information generated by AI with external sources constitutes an evidentiary base; verification of its accuracy and reliability allows identifying problems and potential modifications, and subsequent revision makes the AI answer an integral part of the academic text produced by the student (Chee et al., 2025). This process distinguishes AI-assisted writing from AI-substituted writing. In the former case, AI provides material for consideration while the student remains responsible for the decision; in the latter case, the cognitive role of the student is taken over by the system (Panadero, 2017). This is consistent with the recent research on GenAI and academic writing, which emphasizes the importance of keeping student agency and accountability in using GenAI as a resource for writing.

The theme of dependency and risk, reported by 18 respondents (90%) is an important contrast to the above positive aspects of using GenAI. P-002 says:

“AI is very helpful and makes things easier, but sometimes it is AI itself that causes students to stop thinking critically, because of dependency (P-002).”

Thus, it becomes clear that GenAI-assisted academic writing presents a paradoxical situation where the same feature of the technology which reduces cognitive effort of the student also reduces the motivation to think critically. The phenomenon is consistent with the concept of cognitive offloading (Gerlich, 2025), which presupposes delegation of cognitive activities to the external technological resources to reduce mental effort. Uppal & Hajian (2025) identified some potential risks of ChatGPT use, including procrastination and memory-related concerns. More recent evidence shows that the unstructured use of GenAI can be associated with superficial engagement and poor self-regulation.

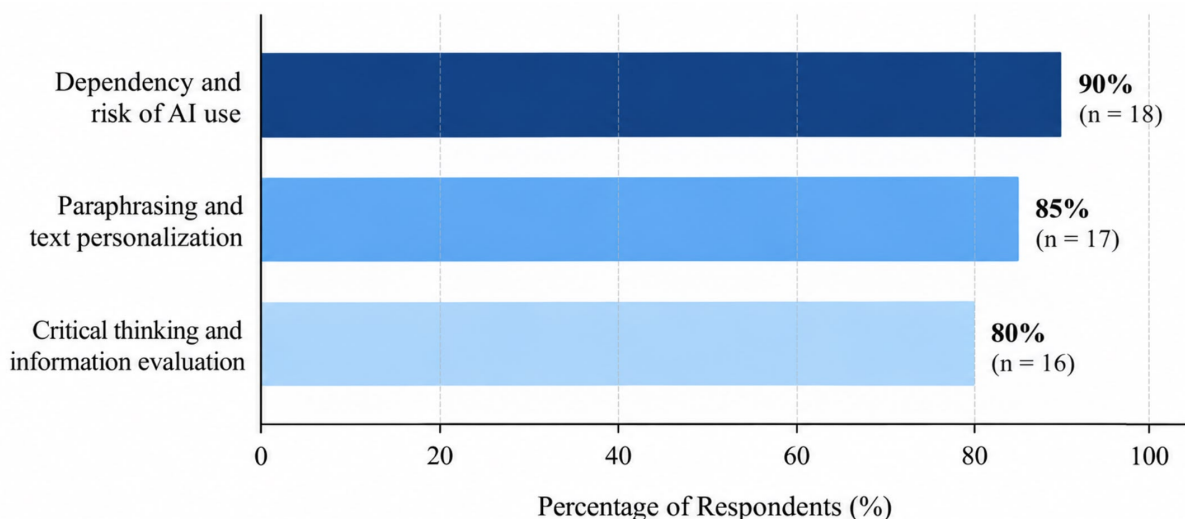


Figure 5. Dependency Risk and Cognitive Control in AI-Assisted Writing

As can be seen in Figure 5, there is an interesting tension in the students' experience: while the concern about dependency is reported by 90% of respondents, 85% report personalizing the AI-generated text and 80% report engaging in critical evaluation. Instead of presenting these findings as a contradiction, this pattern shows that the concern about dependency and practice of cognitive control can coexist within one and the same student (Gerlich, 2025). That is, the student can be aware of the potential effect of AI on her/his cognition while trying to avoid this effect by developing appropriate strategies. This interpretation is consistent with the research showing that AI literacy influences the way of how students interact with GenAI during academic writing tasks (Kim et al., 2025).

The theme of paraphrasing and text personalization, reported by 17 respondents (85%) shows that the students try to maintain authorship in their works. For example, P-008 said:

"I do not immediately copy the information I obtain. I read it again, evaluate it, select the relevant information, and then rewrite it in my own language and understanding. I also add my own analysis and revisions, so that the final

content of the paper is the result of my own thinking process, not merely the information provided (P-008)."

This statement clearly shows that the personalization of the text implies more than simple linguistic modification of the initial material. The student described the sequence of comprehension, evaluation, selection, rewriting, and analysis. From the perspective of Flower & Hayes (1981) cognitive process theory of writing, this activity can be seen as the recursive processes of planning, translating, and reviewing. The AI-generated information becomes the external resource which enters the writing process, but the student remains responsible for its transformation into the academic text (Chen & Gong, 2025). This is important since the mere mechanical paraphrasing without comprehension would just transfer the authorship to the AI system rather than enhance the writing skills of the student.

In addition, this finding confirms the idea that authorial control is directly connected to epistemic control. The student cannot meaningfully take responsibility for the text just by changing its wording; it also requires comprehension of the claims, their evaluation, and incorporation into the

academic argument (Almatrafi et al., 2024). Both experimental and qualitative research confirmed that GenAI becomes more productive for educational purposes when students personalize and evaluate AI-generated information rather than accept it (Begmatova & Saydazimova, 2025). The same principle can be seen in the current data: the personalization of information is more meaningful in case it is complemented by comprehension and evaluation.

The critical-evaluative process can be therefore understood in terms of Bloom's revised taxonomy (Anderson and Krathwohl, 2001), specifically the processes of analyzing, evaluating, and creating. The students analyze the information generated by the AI, evaluate it by comparison and verification, and create by transforming the selected information into academic arguments. The authors Bandura (1997) emphasize the importance of preserving students' higher-order cognitive engagement in AI-supported learning. Similarly, Zhao et al. (2025) emphasize the need for the instructional strategies which maintain students' evaluative capacity in case AI is incorporated into higher education.

Altogether, three themes identified in the current study show that human epistemic control is the mechanism which determines whether GenAI becomes a cognitive partner or a cognitive substitute. Convenience alone does not guarantee productive learning; instead, educational potential of GenAI is revealed when the students interrogate its output, verify information, personalize content, and make independent decisions regarding the revision (Uslan et al., 2025). This interpretation is consistent with the recent systematic evidence showing that the cognitive effects of ChatGPT are highly dependent on instructional design: scaffolding, reflective prompts, and

evaluation activities support critical and creative thinking, whereas unstructured use promotes cognitive offloading.

Therefore, the current findings extend the understanding of AI literacy from technical interaction to epistemic agency. The students demonstrate their AI literacy not by the ability to formulate prompts but by the ability to determine what to accept, what to question, what to verify, what to revise, and what to reject (Gasaymeh et al., 2024). This capability is especially important in academic writing since the final text is an expression of student's academic position and is responsible for the validity of its claims. Thus, the pattern revealed in this study means that effective AI-assisted academic writing presupposes the balance: the AI may increase the range of ideas but the student should remain in control of academic decisions (Balalle & Pannilage, 2025). This principle forms the basis of the next section dedicated to the AI interaction log as the way to reveal this process which is usually invisible.

c. AI-Interaction Logs as Mechanisms for Transparency, Reflection, and Academic Integrity

Thus, the results reveal that the AI-interaction log was not only a procedural instrument for documenting AI use, but also an opportunity to externalize reasoning, evaluation, and revision processes performed by students. Out of 20 participants, 19 students (95%) referred to the transparency and reflection aspect of the AI log, and 16 students (80%) underlined the importance of ethical and academic integrity aspects. However, seven students (35%) mentioned the issue of burdensomeness or efficiency of the process of completing the log. Due to the non-exclusive nature of the themes under consideration, it is possible to conclude that students might perceive the log as both

pedagogically valuable and procedural at the same time (Elkhatat et al., 2023). This is crucial to recognize because the transparency mechanisms cannot be viewed as mere compliance tools. If adequately designed, they have a potential to externalize decisions about evaluation, acceptance, rejection, and

revision of AI-generated information (Bittle & El-Gayar, 2025). Recent literature also confirms that process-oriented documentation could foster transparency and reflection if it documents not only the use of AI, but the human judgement performed on AI-generated information.

Table 6. Distribution of Themes Related to AI-Interaction Logs, Transparency, and Academic Integrity

Dimension	Theme	Number of Respondents (n)	Percentage (%)	Interpretive Meaning
Reflective-regulatory	AI-interaction log: transparency and reflection	19	95%	Makes AI-assisted writing processes and student decisions visible
Ethical-integrity	Ethics and academic integrity	16	80%	Maintains student responsibility, authorship, and ethical boundaries
Procedural-regulatory	AI-interaction log: burden and effectiveness	7	35%	Indicates possible documentation burden and implementation challenges
Integrated function	Transparency–reflection–integrity relationship	—	—	Connects AI disclosure with reflection, verification, and accountability

According to Table 6, transparency and reflection constitute the most widespread dimension of the AI-interaction log, mentioned by 95% of the sample. This result means that the core value of the log consists not in showing that AI is used, but in documenting the ways in which it is used in the context of academic writing. The prevalence of the theme of ethics and academic integrity (80%) shows that there is a strong connection between transparency and the responsibility for the final academic product. Importantly, the prevalence of the issue of burdensomeness does not undermine the positive feedback; instead, it helps to identify one of the issues of implementation of process documentation (Sunengko et al., 2025). This interpretation is in line with recent findings according to which transparency mechanisms are most feasible if the requirements are explicit, proportional, and incorporated in the assessment design, not imposed as excessive documentation.

This reflective role is clearly manifested in the statements of P-013, who explained:

“Completing the AI-Interaction Log helped in finishing the academic paper (KTI) because it allows the writer to document how AI was used during the process of preparing the work. Through this record, the use of AI becomes more transparent and can demonstrate that AI functions only as an aid, not as a substitute for the writer's own thinking” (P-013).

This statement illustrates an important difference between the assistance and substitution of AI. Transparency does not mean that the student needs to use less AI, but should demonstrate the contribution of AI and prove that human reasoning remains active (Ryan & Deci, 2000). This interpretation is in accordance with emerging approaches to GenAI transparency, which require not only the documentation of the final product, but also prompts, outputs,

transformations, and human validation of those outputs.

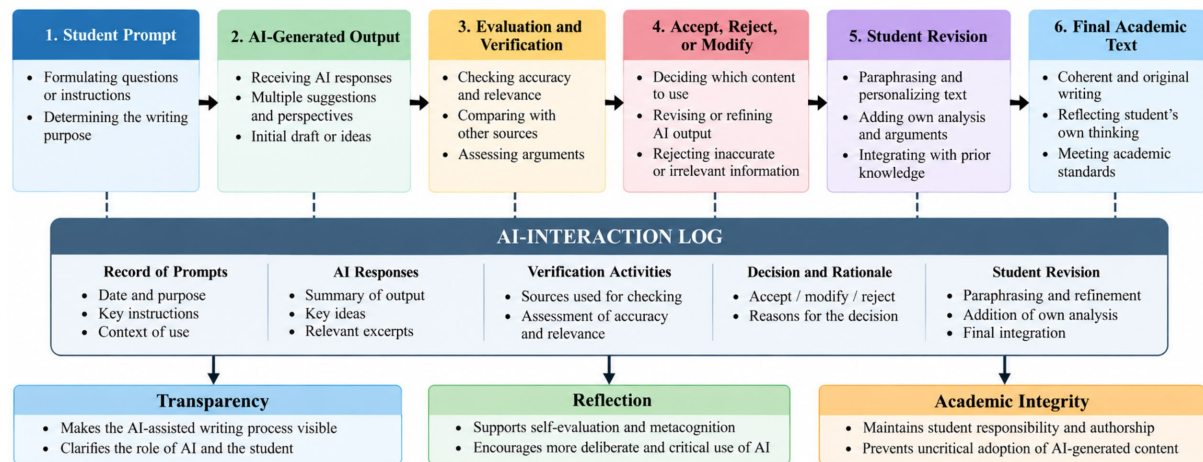


Figure 6. AI-Interaction Log as a Transparency and Reflective-Regulation Mechanism in Academic Writing

Figure 6 conceptualizes the AI-interaction log as a process-oriented rather than static mechanism. Its pedagogical value consists in documenting the critical decision points in the transition from an AI response to an academic text. Documentation of prompts, verification activities, revision decisions, and rationale helps to see how the students exercise epistemic control (Gonsalves, 2024). Thus, it becomes possible to distinguish between the uncritical adoption of AI responses and the human-AI collaboration with monitoring and regulation. Recent empirical studies show that interaction logs make the planning, monitoring, and regulatory processes observable although none of them captures the whole metacognition of the learners (Dinç et al., 2024).

The regulatory-reflexive role of the log is particularly clear from the response of P-014:

“Completing the AI-Interaction log helped me because it becomes a record of my thinking process while using AI. With that log, I can evaluate the AI's answers, record my reasons for

accepting or rejecting them, and revise the output to meet academic standards. This makes the academic paper more structured while still reflecting my own thinking” (P-014).

This response illustrates that documentation helps to reflect upon the student's cognitive decisions. Here the student does not document the interaction with AI, but articulates three regulatory actions: evaluation, acceptance or rejection, and revision. These actions correspond well to the critical evaluation procedures described in Section B, and illustrate how the AI-interaction log helps to transform implicit reasoning into explicit evidence. In this sense, the log expands the cognitive partnership of Clark & Chalmers (1998) through creating an external representation of regulatory decisions. This interpretation is in accordance with Li & Liu (2026) and Zhan & Yan (2025), who highlight the importance of interaction records for studying reflective and metacognitive processes in AI-mediated learning.

Table 7. Illustrative Evidence of Reflective and Ethical Functions of the AI-Interaction Log

Respondent	Evidence from Student Response	Reflective/ Regulatory Process	Academic Function
P-013	Documents how AI was used and distinguishes AI assistance from student thinking	Monitoring AI contribution	Transparency and authorship
P-014	Evaluates AI answers and records reasons for accepting or rejecting them	Evaluation and decision justification	Reflection and epistemic control
P-014	Revises AI output to meet academic standards	Regulation and revision	Academic responsibility
P-008	Recognizes documentation of information searching, evaluation, revision, and refinement	Retrospective process documentation	Process traceability
P-008	Reports that recalling and recording each step takes considerable time	Monitoring documentation burden	Efficiency and usability

Table 7 illustrates that the AI-interaction log performs several related functions. Cognitively, it externalizes evaluation and revision decisions; ethically, it demarcates the boundary between AI contribution and student authorship; procedurally, it creates a traceable record of the writing process. However, as the evidence from P-008 shows, this value is accompanied by a cost of documentation (Braun & Clarke, 2006). This finding leads to a more nuanced interpretation: an AI-interaction log cannot guarantee automatic reflection. Its pedagogical value depends on the fact that students are asked to document significant decision points, not to mechanically reproduce all interactions. Similarly, recent literature distinguishes the reflective documentation that facilitates self-regulation from the accountability documentation that is used primarily for monitoring purposes.

The relationship between transparency and academic integrity was also seen in the descriptions of acceptable and unacceptable AI use. P-012 stated that students should:

“Use AI as an assistant, not as the creator. AI may help you start and refine your work (such as finding ideas or checking grammar), but the process of thinking, analysis, and the final writing must still come from your own mind” (P-012).

P-014 also stated that:

“The use of AI becomes a violation of academic integrity if the entire content of the paper is merely copied raw without evaluation, if it is used to fabricate data, or if it eliminates the role of the student's critical thinking” (P-014).

Thus, students do not view academic integrity as the absence of plagiarism, but the preservation of intellectual responsibility in the process of AI-assisted work. This perspective is in agreement with Eaton & Christensen Hughes (2022), Cotton et al. (2024), Balalle & Pannilage (2025), Memarian & Doleck (2026), and Kovári (2025). The results thus reveal that the AI-interaction log can operationalize integrity in making the relationship between AI contribution and human reasoning clearer.

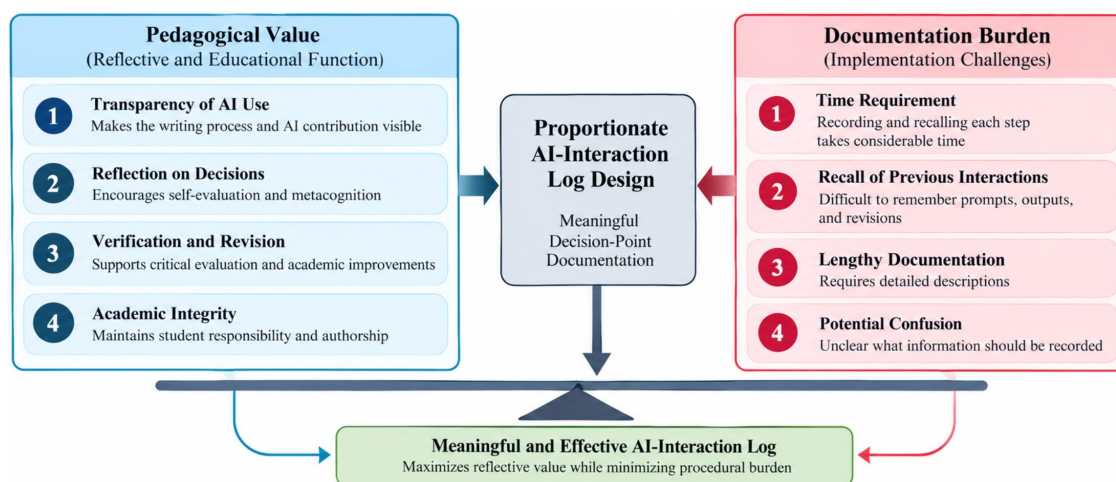


Figure 7. Dual Function of the AI-Interaction Log: Reflective Value and Documentation Burden

Figure 7 reveals a critical point of this study: transparency mechanisms can provide pedagogical value and impose procedural burden simultaneously. P-008 clearly states that the completion of the log required him/her to remember numerous steps and consume considerable time even though he/she recognized the usefulness of the process for documentation of information searching, evaluation, revision, and refinement. This dilemma can be explained through the framework of cognitive load theory (Sweller, 1988): unnecessary documentation can add extraneous load that competes with the core academic task. Dinc et al (2024) also underline the importance of designing reflective activities in such a way that the regulatory benefit compensates for the additional workload. Contemporary studies of GenAI transparency emphasize the importance of proportionality and specificity of the disclosure requirements.

This point is clearly formulated in the response of P-008:

“In my opinion, filling in the AI log did not help me very much in completing the academic paper, because I had to recall every step I had already taken during the process of preparing the paper, which took quite a lot of time and sometimes made me more confused because I had to

document a fairly lengthy process. But the log was still useful as documentation showing the process of searching for information, evaluation, revision, and refinement up to the final paper” (P-008).

Thus, the statement does not show that the AI-interaction log is inefficient; instead, it reveals the condition of its successful implementation. The log should focus on meaningful decision points, such as the reasons for rejecting AI response, verification of information, revisions, and transformation of AI assistance into the academically sound contribution rather than require the exhaustive documentation of each prompt-response pair. This approach is consistent with Panadero (2017)'s emphasis on self-regulatory reflection and with Zhan & Yan (2025) and Li & Liu (2026), who stress the value of process evidence in the context of AI-mediated learning.

Overall, the results reveal that the AI-interaction log serves as an intersection of transparency, metacognitive reflection, epistemic control, and academic integrity. The main value of the AI log does not consist in documenting the use of AI, but in making students' intellectual decisions about it visible. At the same time, its effectiveness depends on proportionality: excessive

documentation can distract attention from learning towards the procedural compliance (Long & Magerko, 2020). Thus, the results confirm the reflective rather than surveillance-oriented model of AI documentation, in which students document only the relevant interactions, verification activities, acceptance or rejection decisions, and revisions. This model preserves the student's role as the academic author accountable for his/her work while recognizing GenAI as a cognitive aid. This approach creates a solid foundation for sustainable AI-assisted academic literacy, discussed in the next section.

d. Sustainable AI-Assisted Academic Literacy: Toward a Human-AI Cognitive Partnership

Conclusions drawn from the findings imply that sustainable AI-assisted academic

literacy is becoming an increasingly relevant dimension of students' engagement with GenAI. Thus, out of the 20 respondents, 13 (65%) directly talked about the sustainability of AI usage in academic writing. Hence, it can be said that students do not view the technology in question as a transient instrument but as an ongoing technological solution that will continue impacting academic and professional activities (Memarian & Doleck, 2026). However, sustainability in this case cannot be viewed as an increase in AI adoption. Sustainability relates to students' ability to use the technology continuously in such a way that their critical and ethical thinking, academic responsibility and independence, and reflective learning abilities would not be undermined.

Table 8. Distribution of Themes Related to Sustainable AI-Assisted Academic Literacy

Dimension	Theme	Number of Respondents (n)	Percentage (%)	Interpretive Focus
Sustainable learning	Sustainability of AI learning	13	65%	Continued learning and responsible adaptation to GenAI
Ethical regulation	Ethics and academic integrity	16	80%	Maintaining responsibility and academic standards
Cognitive regulation	Dependency and risk of AI use	18	90%	Preventing excessive reliance on GenAI
Reflective regulation	AI-interaction log: transparency and reflection	19	95%	Monitoring and reflecting on AI-assisted processes

As Table 8 demonstrates, the concept of sustainability is embedded into a broader regulatory framework. Thus, while 65% of students talked explicitly about sustainability, the prevalence of dependency issues (90%), transparency and reflection (95%), and academic integrity (80%) allows understanding sustainability in the context of other themes. This implies that students need to form a regulatory system to control the ways, reasons, and extent to which AI would

be applied to their academic activities. In other words, sustainability in GenAI-assisted academic literacy should be interpreted as the continuity of human involvement in educational activities despite the changing technological context.

This aspect is especially well illustrated by the statement provided by P-003:

“AI is likely to be increasingly used in the academic and professional world, so what needs

to be taught is not merely a prohibition on using AI, but also how to use AI responsibly and critically” (P-003).

Thus, the respondents' position implies a shift from the prohibition-oriented approach to the competency-oriented one. Instead of prohibiting the use of AI, students should be taught how to use the technology responsibly and effectively. This interpretation is

consistent with [Miao & Cukurova \(2024\)](#), according to whom the incorporation of GenAI into the educational process should go hand in hand with the development of human capacity. Similarly, [UNESCO \(2023\)](#) suggests the human-centred approach that implies that AI should be used to enhance human agency rather than replace human intellectual capacity.

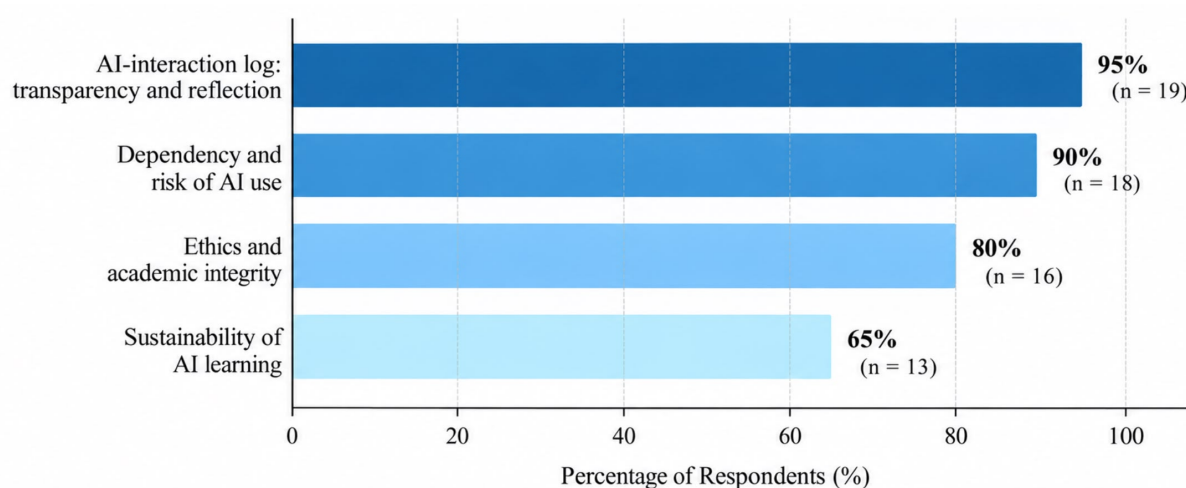


Figure 8. Prevalence of Sustainability and Regulatory Themes in AI-Assisted Academic Literacy

As shown by Figure 8, sustainability should be interpreted in the context of other dimensions of AI-assisted academic literacy. Thus, although sustainability has been identified in 65% cases, the prevalence of this theme is lower than the prevalence of transparency, dependency, and academic integrity, thus implying that students face regulatory issues more often than sustainability issues ([Fauzi et al., 2023](#)). However, the presence of sustainability in almost two-thirds of responses indicates that students think about future-related aspects of the process ([Jose et al., 2025](#)). The interpretation is consistent with the idea that the sustainable AI literacy is formed through the cumulative experience of students in terms of instrumental, cognitive, critical, ethical, and reflective practices.

The future-oriented character of this process is additionally illustrated by the statement of P-017:

“The use of AI in the process of producing academic papers should indeed continue, but ethics and academic integrity must still be observed” (P-017).

The statement implies that GenAI should be considered a technology that continues its influence on students' activities. At the same time, the students' position also demonstrates the link between sustainability and ethical regulation since students do not reject GenAI use in the future, but they are aware of the fact that continued use should be regulated normatively and cognitively ([Harmadi et al., 2025](#)). The finding is consistent with the views presented by [Qian \(2025\)](#) who argues

for the responsible GenAI use in education, and Kangwa et al. (2025), according to whom the academic integrity should be maintained.

In addition, sustainability can be explained through the motivational and self-regulatory perspective. Ryan & Deci (2000) interpret the sustainable engagement with learning in terms of autonomy, competence, and relatedness while Bandura (1997) stresses the role of self-efficacy and self-regulation in the formation of learning

behaviors that last. Applied to GenAI-assisted academic writing, these concepts imply that sustainable use of AI involves students' ability to direct their learning process rather than leave it to the technology. Thus, GenAI provides suggestions, alternative perspectives, linguistic and organizational assistance, while the responsibility for the final academic paper remains with students.

Table 9. Components of Sustainable AI-Assisted Academic Literacy Derived from the Findings

Component	Empirical Theme	Student Practice	Sustainability Function
AI competence	Efficiency and ease of AI use	Using AI to support information access and writing processes	Enables effective technological adaptation
Cognitive agency	Idea development and comprehension	Using AI to explore alternatives while maintaining personal judgment	Prevents cognitive substitution
Critical regulation	Critical thinking and information evaluation	Verifying AI outputs against evidence and relevant sources	Maintains epistemic reliability
Ethical responsibility	Ethics and academic integrity	Distinguishing assistance from authorship and unacceptable copying	Protects academic standards
Reflective regulation	AI-interaction log	Recording important prompts, evaluations, and revision decisions	Makes AI use transparent and supports metacognition
Continuous learning	Sustainability of AI learning	Updating knowledge and adapting responsible AI practices	Supports long-term human-AI collaboration

Thus, as demonstrated in Table 9, sustainability is not an independently existing component of GenAI-assisted academic literacy that can be learned separately from other dimensions. Instead, it emerges as the result of the combination of instrumental competence with cognitive agency, critical evaluation, ethical responsibility, reflective regulation, and continuous learning (Sweller, 1988). The interpretation is important since it implies that the repetition of certain actions performed with the help of GenAI does not

necessarily result in increased students' competencies and capacities.

The recent research also suggests incorporating GenAI literacy into the self-regulated learning through the cycle of planning, experimentation, evaluation, and reflection to ensure that GenAI would not replace rather than strengthen students' agency.

The relationship among the components can be illustrated by the conceptual framework below:



Figure 9. Sustainable Human–AI Cognitive Partnership for Academic Writing

Thus, Figure 9 expands the six-dimensional model based on the nine empirical themes into a progressive and adaptive sustainable learning cycle in which students continuously develop their AI literacy through cognitive engagement, critical evaluation, ethical regulation, reflection, and responsible adaptation. The circular structure is important since GenAI literacy should not be seen as a one-time acquisition of competencies that occur after students learn how to use GenAI (Kovári, 2025). Instead, students continue to encounter different AI capabilities, academic contexts, and ethical issues that require continuous adaptation. Therefore, the process begins with instrumental competence but gradually involves cognitive engagement, authorial transformation, critical evaluation, ethical regulation, and reflection. Finally, it returns to the further development of GenAI literacy.

The central position of student agency and epistemic control in Figure 9 is especially important. Thus, all respondents discussed the usefulness of AI in generating ideas, organizing the writing process, and

improving language and speed of academic writing. At the same time, students constantly referred to the necessity of verifying the information, personalizing the content, rejecting the inappropriate results, and maintaining responsibility for the final text. This pattern corresponds with the human-centred orientation suggested by UNESCO (2023). In addition, it is consistent with recent empirical studies indicating that sustainable GenAI literacy development involves the transition of students from viewing AI as a mere tool to its transformation into context-dependent partner while maintaining the boundaries (Bittle & El-Gayar, 2025).

An important implication of this finding is the development of an innovative sustainable learning process in which GenAI is integrated into students' planning, experimentation, evaluation, reflection, and continuous adaptation while preserving human epistemic agency. Sustainability does not imply the increasing delegation of the academic tasks to GenAI since it would lead to the growth of the dependency risk discussed in Section B. Instead, sustainable AI literacy is based on the development of

students' capacity to decide whether GenAI is useful, what GenAI should do, how its output should be evaluated, which elements should be kept and which – discarded, and how the AI-supported material should be transformed into academic paper (Rahman et al., 2026). This is why dependency, academic integrity, and reflection are the components of sustainability.

Thus, the findings demonstrate a progressive learning trajectory from technological adoption to cognitive engagement, critical evaluation, reflective regulation, and responsible human-AI collaboration. Initially, GenAI provides instrumental benefits, namely, efficiency and availability of alternative ideas. Then, the benefits can be used for cognitive and authorial processes if the students have epistemic control (Uppal & Hajian, 2025). Critical evaluation and ethical regulation determine whether AI assistance can be seen as academically acceptable, while the AI-interaction log is a mechanism for making the process transparent and reflective. Finally, sustainability appears as a result of the ongoing learning cycle (Gonsalves, 2024).

In general, the findings imply that the AI-assisted academic literacy should be interpreted not as the capacity to use GenAI effectively, but as the ability to maintain productive, critical, ethical, and reflective relations with the technology while preserving human authorship and responsibility.

Overall, the findings suggest an innovative learning approach in which GenAI functions as a cognitive partner rather than a cognitive substitute, while students remain responsible for authorship, evaluation, decision-making, and reflection. The human-AI cognitive partnership provides the coherent conceptualization of nine empirical themes identified in the

present study and six dimensions presented in the conceptual model (Burneo-Arteaga et al., 2025). Therefore, the contribution of the current study consists not in proving the GenAI use, but in providing the interpretation of its responsible use as the combination of instrumental assistance, cognitive development, authorial transformation, critical evaluation, ethical regulation, and reflective learning. Such a perspective is consistent with the human-centred direction of the modern AI-in-education scholarship.

4. Conclusion

The current study explored the usage of GenAI by Tourism Study Program students in academic writing as well as the role of AI-interaction log in responsible and reflective use of this technology. Based on the analysis of responses received from 20 participants, nine related themes have been revealed and summarized into six dimensions of AI-assisted academic literacy, namely instrumental, cognitive, textual-authorial, critical-evaluative, ethical-integrity, and reflective-regulatory. The results show that students consider GenAI to be an efficient means of acquiring assistance when searching for the information, generating ideas, organizing the structure of academic writing and enhancing textual expression. However, the educational potential of this instrument depends on the maintenance of the epistemic control over the generated material. As students' responses demonstrate, they adopt various practices such as comparison of AI-generated material with other sources, evaluation of its accuracy and relevance, paraphrasing and personalization of content, acceptance or rejection of AI-generated information. Thus, true AI literacy implies not only technical skills but also the ability to evaluate the generated information critically and take responsibility for its further use.

An important novelty of this study is the conceptualization of the AI-interaction log as a reflective-regulatory tool, not just a register of the use of AI technology. With the help of the log, students' decisions about prompts, verification process, decision-making rationale and revisions may become more transparent and thus contribute to reflection and academic responsibility. Nevertheless, the current research has discovered the conflict between the pedagogical potential of the tool and its documentation burden. It suggests that AI-interaction logs should focus on meaningful decision points, not all AI interactions. Thus, this study suggests a model of Sustainable Human–AI Cognitive Partnership in which GenAI will be a cognitive partner, while students will be the authors, decision-makers and learners. In such a cognitive partnership, sustainable AI-assisted learning emerges through the interaction of instrumental competence, advanced cognitive activity, authorial transformation, critical evaluation, ethical regulation, reflective learning strategies, and continuous adaptation to changing learning demands. Thus, the present study adds to the existing body of literature on the use of AI technology in higher education and shifts the focus from the mere use of the technology to the agency and reflectivity maintained during its use.

5. References

- Abbas, M., Jam, F. A., & Khan, T. I. (2024). Is it harmful or helpful? Examining the causes and consequences of generative AI usage among university students. *International Journal of Educational Technology in Higher Education*, 21(10), 1–22. <https://doi.org/10.1186/s41239-024-00444-7>
- Almatrafi, O., Johri, A., & Lee, H. (2024). A systematic review of AI literacy conceptualization, constructs, and implementation and assessment efforts (2019–2023). *Computers and Education Open*, 6, 100173. <https://doi.org/10.1016/j.caeo.2024.100173>
- Almumen, H. A., & Jouhar, M. R. (2025). The impact of ChatGPT as a brainstorming tool on gifted students' persuasive writing. *Journal of Writing Research*, 17(2), 181–207. <https://doi.org/10.17239/jowr-2025.17.02.01>
- Alubthane, F. O. (2026). Amplifier or substitute? A systematic review of generative AI's impact on higher-order cognitive skills among university students. *Frontiers in Psychology*, 17, Article 1863931. <https://doi.org/10.3389/fpsyg.2026.1863931>
- Anderson, L. W., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
- Angela, L., Handican, R., & Casanova, A. (2025). Linking belief to thought: A structural equation modeling analysis of self-efficacy and critical thinking among Indonesian pre-service teacher. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 393–410.
- Archana, S. N., Renjith, V. R., Padmakumar, P. K., C, S., & Aboobaker, N. (2025). AI assisted learning and research: An exploratory study among university students and scholars. *Discover Education*, 4(1), 390.
- Balalle, H., & Pannilage, S. (2025). Reassessing academic integrity in the age of AI: A systematic literature review on AI and academic integrity. *Social Sciences & Humanities Open*, 11, 101299. <https://doi.org/10.1016/j.ssaho.2025.101299>
- Baldrich, K., Pérez-García, C., & Santamarina-Sancho, M. (2025,

- November). Artificial intelligence in academic literacy: Empirical evidence on reading and writing practices in higher education. In *Frontiers in Education* (Vol. 10, p. 1701238). Frontiers Media SA.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Begmatova, K., & Saydazimova, I. (2025). Enhancing learners' academic writing skills: A comparative analysis of traditional and AI-assisted instruction approaches. *Applied Corpus Linguistics*, 100176.
- Bittle, K., & El-Gayar, O. (2025). Generative AI and academic integrity in higher education: A systematic review and research agenda. *Information*, 16(4), 296. <https://doi.org/10.3390/info16040296>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp0630a>
- Burneo-Arteaga, P., Lira, Y., Murzi, H., Balula, A., & Costa, A. P. (2025). Capability-based training framework for generative AI in higher education. *Frontiers in Education*, 10, Article 1594199. <https://doi.org/10.3389/feduc.2025.1594199>
- Chea, P., & Xiao, Y. (2024). Artificial intelligence in higher education: The power and damage of AI-assisted tools on academic English reading skills. *Journal of General Education and Humanities*, 3(3), 287–306.
- Chee, H., Ahn, S., & Lee, J. (2025). A competency framework for AI literacy: Variations by different learner groups and an implied learning pathway. *British Journal of Educational Technology*, 56(5), 2146–2182. <https://doi.org/10.1111/bjet.13556>
- Chen, C., & Gong, Y. (2025). The role of AI-assisted learning in academic writing: A mixed-methods study on Chinese as a second language students. *Education Sciences*, 15(2), 141.
- Chiu, T. K. F., Ahmad, Z., Ismailov, M., & Sanusi, I. T. (2024). What are artificial intelligence literacy and competency? A comprehensive framework to support them. *Computers and Education Open*, 6, 100171. <https://doi.org/10.1016/j.caeo.2024.100171>
- Clark, A., & Chalmers, D. (1998). The extended mind. *Analysis*, 58(1), 7–19. <https://doi.org/10.1093/analysis/58.1.7>
- Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2024). Chatting and cheating: Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, 61(2), 228–239. <https://doi.org/10.1080/14703297.2023.2190148>
- Currie, G. M. (2023). Academic integrity and artificial intelligence: Is ChatGPT hype, hero or heresy? *Seminars in Nuclear Medicine*, 53(5), 719–730. <https://doi.org/10.1053/j.semnuclmed.2023.04.008>
- Daniel, K., Msambwa, M. M., & Wen, Z. (2025). Can generative AI revolutionise academic skills development in higher education? A systematic literature review. *European Journal of Education*, 60(1), Article e70036. <https://doi.org/10.1111/ejed.70036>
- Darwin, Rusdin, D., Mukminatien, N., Suryati, N., Laksmi, E. D., & Marzuki. (2025). Integrating critical thinking and artificial intelligence in higher education: A bibliometric and systematic review of skills and strategies. *Social Sciences & Humanities Open*, 12, 101924. <https://doi.org/10.1016/j.ssaho.2025.101924>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Dinç, E., Wherley, M. S., & Sankey, H. (2024). Student perception of journaling

- as an assessment for an engagement experience. *Journal of Experiential Education*, 47(3), 484–503. <https://doi.org/10.1177/10538259231203671>
- Dogru, T., Line, N., Hanks, L., Acikgoz, F., Abbott, J., Bakir, S., & Suess, C. (2024). The implications of generative artificial intelligence in academic research and higher education in tourism and hospitality. *Tourism and Hospitality Research*. <https://doi.org/10.1177/13548166231204065>
- Eaton, S. E., & Christensen Hughes, J. (2022). *Academic integrity in Canada: An enduring and essential challenge*. Springer. <https://doi.org/10.1007/978-3-030-83255-1>
- Elkhatat, A. M., Elsaid, K., & Almeer, S. (2023). Evaluating the efficacy of AI content detection tools in differentiating between human and AI-generated text. *International Journal for Educational Integrity*, 19(1), 17. <https://doi.org/10.1007/s40979-023-00140-5>
- Escalante, J., Pack, A., & Barrett, A. (2023). AI-generated feedback on writing: Insights into efficacy and ENL student preference. *International Journal of Educational Technology in Higher Education*, 20, Article 57. <https://doi.org/10.1186/s41239-023-00425-2>
- Fan, Y., Tang, L., Le, H., Shen, K., Tan, S., Zhao, Y., & Gašević, D. (2025). Beware of metacognitive laziness: Effects of generative artificial intelligence on learning motivation, processes, and performance. *British Journal of Educational Technology*, 56(2), 489–530. <https://doi.org/10.1111/bjet.13544>
- Fathy, E. A., Zidan, H. A. K. Y., El Sayed, A. H., & Fouad, A. M. (2025). Integrating ChatGPT in tourism and hospitality education: A systematic and bibliometric analysis of research trends, applications, and implications. *Journal of Hospitality & Tourism Education*. <https://doi.org/10.1177/14673584251357510>
- Fauzi, F., Tuhuteru, L., Sampe, F., Ausat, A. M. A., & Hatta, H. R. (2023). Analysing the role of ChatGPT in improving student productivity in higher education. *Journal on Education*, 5(4), 14886–14891. <https://doi.org/10.31004/joe.v5i4.2563>
- Firaina, R., & Sulisworo, D. (2023). Exploring the usage of ChatGPT in higher education: Frequency and impact on productivity. *Buletin Edukasi Indonesia*, 2(1), 39–46. <https://doi.org/10.56741/bei.v2i01.310>
- Flower, L., & Hayes, J. R. (1981). A cognitive process theory of writing. *College Composition and Communication*, 32(4), 365–387. <https://doi.org/10.2307/356600>
- Gasaymeh, A. M. M., Beirat, M. A., & Abu Qbeita, A. A. (2024). University students' insights of generative artificial intelligence (AI) writing tools. *Education Sciences*, 14(10), 1062. <https://doi.org/10.3390/educsci14101062>
- Gerlich, M. (2025). AI tools in society: Impacts on cognitive offloading and the future of critical thinking. *Societies*, 15(1), 6. <https://doi.org/10.3390/soc15010006>
- Gonsalves, C. (2024). Generative AI's impact on critical thinking: Revisiting Bloom's taxonomy. *Journal of Marketing Education*. <https://doi.org/10.1177/02734753241305980>
- Harmadi, F., Maryani, I., Sukirman, S., & Montano, E. C. N. (2025). Digital transformation: Exploring the relationship between literacy, motivation, and TPACK in elementary education. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 295–311.
- Harris, S. L., Shaw, M., & Green, J. F. (2024). Utilizing asynchronous email interviewing for qualitative research among multiple participant groups:

- Perspectives on met and unmet needs from chaplain staffing. *International Journal of Qualitative Methods*, 23. <https://doi.org/10.1177/16094069241257943>
- International Center for Academic Integrity. (2021). *The fundamental values of academic integrity* (3rd ed.). Clemson University.
- Ji, Z., Lee, N., Frieske, R., Yu, T., Su, D., Xu, Y., & Fung, P. (2023). Survey of hallucination in natural language generation. *ACM Computing Surveys*, 55(12), Article 248. <https://doi.org/10.1145/3571730>
- Johnston, H., Wells, R. F., Shanks, E. M., Boey, T., & Parsons, B. N. (2024). Student perspectives on the use of generative artificial intelligence technologies in higher education. *International Journal for Educational Integrity*, 20(1), 2. <https://doi.org/10.1007/s40979-024-00149-4>
- Jose, B., Cleetus, A., Joseph, B., Joseph, L., Jose, B., & John, A. K. (2025). Epistemic authority and generative AI in learning spaces: Rethinking knowledge in the algorithmic age. *Frontiers in Education*, 10, Article 1647687. <https://doi.org/10.3389/feduc.2025.1647687>
- Kangwa, D., Msafiri, M. M., & Fute, A. (2025). Exploring the factors that promote a balance between academic integrity and the effective use of GenAI tools in higher education: A systematic review. *Journal of Computer Assisted Learning*, 41(5), e70109. <https://doi.org/10.1111/jcal.70109>
- Kim, J., Lee, S.-S., Detrick, R., Wang, J., & Li, N. (2026). Students-generative AI interaction patterns and its impact on academic writing. *Journal of Computing in Higher Education*, 38, 504–525. <https://doi.org/10.1007/s12528-025-09444-6>
- Kim, J., Yu, S., Lee, S.-S., & Detrick, R. (2025). Students' prompt patterns and its effects in AI-assisted academic writing: Focusing on students' level of AI literacy. *Journal of Research on Technology in Education*, 58(3), 638–655. <https://doi.org/10.1080/15391523.2025.2456043>
- Kim, J., Yu, S., Lee, S. S., & Detrick, R. (2026). Students' prompt patterns and its effects in AI-assisted academic writing: Focusing on students' level of AI literacy. *Journal of Research on Technology in Education*, 58(3), 638–655.
- Kirschner, P. A., Sweller, J., & Clark, R. E. (2006). Why minimal guidance during instruction does not work: An analysis of the failure of constructivist, discovery, problem-based, experiential, and inquiry-based teaching. *Educational Psychologist*, 41(2), 75–86. https://doi.org/10.1207/s15326985ep4102_1
- Kovári, A. (2025). Ethical use of ChatGPT in education—Best practices to combat AI-induced plagiarism. *Frontiers in Education*, 9, Article 1465703. <https://doi.org/10.3389/feduc.2024.1465703>
- Kudritskaya, M., Plastinina, N., Kushnina, L., Plekhanova, Y., Matytcina, M., & Stepanova, M. (2024, June). Balancing innovation with ethics: AI applications for enhancing language competence in academic writing and reading. In *2024 4th International Conference on Technology Enhanced Learning in Higher Education (TELE)* (pp. 380–385). IEEE.
- Li, C., Cui, H., & Hagedorn, L. S. (2026). The cognitive impact of ChatGPT in higher education: A systematic review of critical and creative thinking outcomes. *Computers and Education: Artificial Intelligence*, 10, Article 100571. <https://doi.org/10.1016/j.caeai.2026.100571>
- Li, S., & Liu, J. (2026). Mapping the distribution and depth of metacognitive processes in generative AI-assisted learning: Evidence from interaction logs

- and concurrent think-aloud protocols. *Behavioral Sciences*, 16(8), 1365. <https://doi.org/10.3390/bs16081365>
- Lintner, T. (2024). A systematic review of AI literacy scales. *npj Science of Learning*, 9, 64. <https://doi.org/10.1038/s41539-024-00264-4>
- Liu, J. E., Qiu, Z., & Lin, A. M. Y. (2026). Integrating GenAI with genre-based pedagogy and the PAA model in a college writing course: Enhancing critical engagement in an AI-mediated learning ecology. *Linguistics and Education*.
- Long, D., & Magerko, B. (2020). What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1–16). Association for Computing Machinery. <https://doi.org/10.1145/3313831.3376727>
- Memarian, B., & Doleck, T. (2026). A systematic review of academic integrity and misconduct with artificial intelligence in higher education. *SN Computer Science*, 7, Article 49. <https://doi.org/10.1007/s42979-025-04569-y>
- Miao, F., & Cukurova, M. (2024). *AI competency framework for teachers*. UNESCO. <https://doi.org/10.54675/ZJTE2084>
- Miraz, M. H., Annamalah, S., & Sham, R. (2025). Integrating PLS-SEM and NVivo in mixed-methods educational research: A comprehensive evaluation of quantitative and qualitative analytical tools. *Educational Process: International Journal*, 19, Article e2025531. <https://doi.org/10.22521/edupij.2025.19.531>
- Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, Article 100041. <https://doi.org/10.1016/j.caeai.2021.100041>
- Ng, D. T. K., Luo, W., Chan, H. M. Y., & Chu, S. K. W. (2024). Design and validation of the AI literacy questionnaire: The affective, behavioural, cognitive and ethical approach. *British Journal of Educational Technology*, 55(3), 1082–1104. <https://doi.org/10.1111/bjet.13411>
- Onal, S., Kulavuz-Onal, D., & Childers, M. (2025). Patterns of ChatGPT usage and perceived benefits on academic performance across disciplines: Insights from a survey of higher education students in the United States. *Journal of Educational Computing Research*. <https://doi.org/10.1177/00472395251341214>
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, 8, Article 422. <https://doi.org/10.3389/fpsyg.2017.00422>
- Qian, Y. (2025). Pedagogical applications of generative AI in higher education: A systematic review of the field. *TechTrends*, 69, 1105–1120. <https://doi.org/10.1007/s11528-025-01100-1>
- Rafi, M. S., Ng, D. T. K., Amjad, I., & Ho Siu Yee, W. (2026, December). Guest editorial: AI-assisted academic writing, translation, and literacy for the promotion of human agency in higher education. *Artificial Intelligence in Education*, 2(2), 247–251. Emerald Publishing Limited.
- Rahiem, M. D. H. (2026). Generative AI in higher education in Indonesia: Patterns of use and learning impact. *Social Sciences & Humanities Open*. <https://doi.org/10.1016/j.ssaho.2026.102672>
- Rahman, S. S., Islam, M. A., Alam, M. M., Zeba, M., Rahman, M. A., Chowa, S. S., ... Azam, S. (2026). Hallucination to truth: A review of fact-checking and factuality evaluation in large language models. *Artificial Intelligence Review*,

- 59(2), 1–54.
<https://doi.org/10.1007/s10462-025-11454-w>
- Riazi, A. M., Rezvani, R., & Ghanbar, H. (2023). Trustworthiness in L2 writing research: A review and analysis of qualitative articles in the Journal of Second Language Writing. *Research Methods in Applied Linguistics*, 2(3), Article 100065.
<https://doi.org/10.1016/j.rmal.2023.100065>
- 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>
- Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, 55(1), 68–78.
<https://doi.org/10.1037/0003-066X.55.1.68>
- Strzelecki, A., Cicha, K., Rizun, M., & Rutecka, P. (2023). ChatGPT in higher education learning: Acceptance and use. *Computers and Education: Artificial Intelligence*, 5, 100190.
<https://doi.org/10.1016/j.caeai.2023.100190>
- Sunengko, S., Firmansyah, F., Fitriani, D., Nurfaisal, N., Idayanti, I., Najamudin, N. M., & Saputri, R. (2025). Critical digital literacy in AI-assisted academic writing among English literature students: A mixed-methods study. *JUPEIS: Jurnal Pendidikan dan Ilmu Sosial*, 4(4), 127–136.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257–285.
https://doi.org/10.1207/s15516709cog1202_4
- UNESCO, Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research*. UNESCO.
<https://doi.org/10.54675/EWZM9535>
- Uppal, K., & Hajian, S. (2025). Students' perceptions of ChatGPT in higher education: A study of academic enhancement, procrastination, and ethical concerns. *European Journal of Educational Research*, 14(1), 199–211.
<https://doi.org/10.12973/eu-jer.14.1.199>
- Uslan, U., Abdullah, N. B., Aiman, U., & Yenni, Y. (2025). Pedagogical efficacy of guided inquiry modules: Enhancing critical thinking in elementary education through quasi-experimental validation. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 601–617.
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.
- Wang, G., Wang, W., Yang, D., & Ren, J. (2026). Generative AI, cognitive offloading, and learner agency in higher education: A scoping review. *Behavioral Sciences*, 16(7), 1150.
<https://doi.org/10.3390/bs16071150>
- Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. *Journal of Child Psychology and Psychiatry*, 17(2), 89–100.
<https://doi.org/10.1111/j.1469-7610.1976.tb00381.x>
- Wu, J.-Y., Lee, Y.-H., Chai, C. S., & Tsai, C.-C. (2025). Strengthening human epistemic agency in the symbiotic learning partnership with generative artificial intelligence. *Educational Researcher*, 54(6), 358–368.
<https://doi.org/10.3102/0013189X251333628>
- Yan, L., Greiff, S., Teuber, Z., & Gašević, D. (2024). Promises and challenges of generative artificial intelligence for human learning. *Nature Human Behaviour*, 8(10), 1839–1850.
<https://doi.org/10.1038/s41562-024-02004-5>
- Yan, Lixiang, Greiff, S., Lodge, J. M., & Gašević, D. (2025). Distinguishing performance gains from learning when using generative AI. *Nature Reviews Psychology*, 4, 435–436.
<https://doi.org/10.1038/s44159-025->

- 00467-5
 Yan, W. (2023). An introduction to process tracing as an innovative qualitative research method to explore affective variables in SLA. *Frontiers in Psychology*, 13, Article 984444. <https://doi.org/10.3389/fpsyg.2022.984444>
- Yanti, F. A., Wardana, R. W., Buyung, B., Heryensi, E., & Khamis, N. (2025). Automatic assessment-based artificial intelligent to measure students environmental literacy. *Indonesian Journal on Learning and Advanced Education (IJOLAE)*, 461–480.
- Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.
- Zhan, Y., & Yan, Z. (2025). Students' engagement with ChatGPT feedback: Implications for student feedback literacy in the context of generative artificial intelligence. *Assessment & Evaluation in Higher Education*. <https://doi.org/10.1080/02602938.2025.2471821>
- Zhang, L., & Xu, J. (2025). The paradox of self-efficacy and technological dependence: Unraveling generative AI's impact on university students' task completion. *The Internet and Higher Education*, 65, 100978. <https://doi.org/10.1016/j.iheduc.2024.100978>
- Zhang, S., Zhao, X., Zhou, T., & Kim, J. H. (2024). Do you have AI dependency? The roles of academic self-efficacy, academic stress, and performance expectations on problematic AI usage behavior. *International Journal of Educational Technology in Higher Education*, 21(1), 34. <https://doi.org/10.1186/s41239-024-00467-0>
- Zhao, G., Sheng, H., Wang, Y., Cai, X., & Long, T. (2025). Generative artificial intelligence amplifies the role of critical thinking skills and reduces reliance on prior knowledge while promoting in-depth learning. *Education Sciences*, 15(5), 554. <https://doi.org/10.3390/educsci15050554>
- Zhou, X., Li, Y., Chai, C. S., & Chiu, T. K. F. (2025). Defining, enhancing, and assessing artificial intelligence literacy and competency in K-12 education from a systematic review. *Interactive Learning Environments*. <https://doi.org/10.1080/10494820.2025.2487538>