

Evaluating Truth in the Age of AI: A Qualitative Exploration of Students' Verification Strategies, Attitudes, and Learning Autonomy in Interactions with Generative AI

N.S. Lubbi Abdur Rahman Wakhid ^{a.1,*}, Syarif Hidayatullah ^{b.2}, Sibawaihi ^{c.3}

^aProgram Studi Magister Pendidikan Agama Islam, UIN Sunan Kalijaga Yogyakarta, Indonesia

^bProgram Studi Magister Pendidikan Agama Islam, UIN Sunan Kalijaga Yogyakarta, Indonesia

^cProgram Studi Magister Pendidikan Agama Islam, UIN Sunan Kalijaga Yogyakarta, Indonesia

^{*1}24204011017@student.uin-suka.ac.id ²19700q301997031004@uin-suka.ac.id

*Correspondent Author

Received: 27-02-2026

Revised: 20-04-2026

Accepted: 14-05-2026

KEYWORDS

Generative Artificial Intelligence; Strategi Verifikasi Informasi; Kemandirian Belajar; Literasi Digital Kritis

ABSTRACT

The development of Generative Artificial Intelligence (AI), such as ChatGPT and Gemini, has significantly transformed how students acquire, verify, and interpret information in the learning process. However, the cognitive and epistemological dynamics underlying students' interactions with AI remain underexplored. This study aims to: (1) analyze how students position AI as either a learning assistance tool or a source of learning dependency; (2) examine the verification strategies employed by students to assess the accuracy of AI-generated outputs; (3) investigate the impact of AI usage on learning autonomy and Self-Regulated Learning (SRL); and (4) explore students' ethical and epistemological reflections in evaluating truth in the digital era. This research adopts a qualitative approach with a descriptive phenomenological design, involving ten undergraduate students from the Islamic Education program who actively use generative AI in academic activities. Data were collected through in-depth interviews and analyzed using thematic analysis. The findings reveal that students occupy a continuum of AI use, ranging from supportive learning tools to cognitive dependency. Verification strategies vary from rigorous cross-checking with scholarly sources to algorithmic trust based on perceived logical coherence and academic tone of AI responses. The use of AI demonstrates differential effects on SRL: integrative use enhances planning and reflective processes, while substitutive use leads to cognitive offloading that may weaken learning autonomy. Furthermore, students' ethical and epistemological reflections indicate varying levels of understanding regarding the probabilistic nature of AI-generated knowledge. This study contributes to the international literature by providing empirical insights into students' verification behavior, epistemic positioning, and self-regulated learning in the context of generative AI, particularly from a Global South perspective, which remains underrepresented in current research.

This is an open-access article under the [CC-BY-SA](#) license.



Introduction

The rapid advancement of Artificial Intelligence (AI) over the past decade has significantly transformed various sectors, particularly higher education. The emergence of generative AI tools such as ChatGPT, Gemini, and Copilot has introduced a new paradigm in learning processes by enabling instant

access to information, supporting academic writing, and providing interactive assistance in understanding complex concepts (Bhullar dkk., 2024; Pallio dkk., 2023). This technological integration has reshaped learning environments into more efficient, personalized, and adaptive systems, positioning students as primary users who increasingly incorporate AI into their daily academic activities (Baig & Yadegaridehkordi, 2024; Guettala dkk., 2024). As a result, generative AI is no longer merely a supplementary tool but has evolved into a potential learning partner capable of enhancing academic performance and intellectual productivity.

Despite these advantages, the integration of generative AI into higher education also raises critical epistemological and pedagogical concerns. While AI offers efficiency and accessibility, it simultaneously challenges fundamental educational values, particularly students' critical thinking, reflective capacity, and intellectual autonomy (Abbas dkk., 2024; Marshall, 2026). The increasing reliance on AI blurs the boundary between learning assistance and learning dependency, where students may shift from actively constructing knowledge to passively consuming algorithm-generated outputs. This shift introduces a fundamental paradox in education: AI can both facilitate and hinder learning, depending on how it is utilized. Excessive dependence on AI risks replacing authentic cognitive processes with instant algorithmic outputs, potentially weakening students' ability to think independently and critically (Tian & Zhang, 2026; Zhang dkk., 2024).

From a theoretical perspective, contemporary education emphasizes the importance of learning autonomy and self-regulated learning (SRL), which refer to students' ability to plan, monitor, and evaluate their own learning processes (Mahniza dkk., 2024; Zimmerman, 2002). Within this framework, AI is ideally positioned as a cognitive partner or co-creator of knowledge that enhances analytical and reflective thinking (Liu dkk., 2026; Wilson & Burleigh, 2026). However, recent studies suggest that the increasing use of AI may lead to cognitive offloading, a phenomenon in which individuals delegate cognitive tasks to technological systems, thereby reducing their engagement in higher-order thinking processes (Khalid dkk., 2026; Lee dkk., 2024). This raises a critical question regarding whether AI use strengthens students' learning autonomy or instead contributes to its erosion.

Existing studies on generative AI in higher education have largely focused on behavioral and psychological aspects of usage. For example, research on the "AIholic" phenomenon highlights patterns of emotional and functional dependency driven by efficiency and convenience (Salah dkk., 2023). Other studies warn of risks such as cognitive infantilization and digital passivity resulting from the dominance of algorithmic systems (Costa Júnior dkk., 2025). While these studies provide valuable insights into the consequences of AI use, they tend to overlook the underlying cognitive and epistemological processes that shape how students interact with AI, particularly in terms of how they interpret, evaluate, and verify AI-generated information.

Consequently, a significant research gap remains in understanding how students position AI within their learning processes, how they develop verification strategies to assess the credibility and accuracy of AI-generated outputs, and how these practices influence their learning autonomy and self-regulated learning. In an era where AI-generated knowledge is inherently probabilistic rather than inherently true, the ability to critically evaluate information becomes an essential academic competency. However, empirical research examining these verification practices and their relationship with epistemological awareness is still limited, especially in Global South contexts that remain underrepresented in the international literature.

Addressing this gap, the present study offers a novel contribution by focusing on the cognitive and epistemological dimensions of students' interactions with generative AI. Specifically, it integrates the analysis of verification strategies, epistemic positioning, and self-regulated learning into a unified framework, providing a more comprehensive understanding of how students construct and evaluate knowledge in AI-mediated learning environments. Furthermore, this study contributes empirical evidence from a Global South educational context, thereby enriching the diversity of perspectives in the global discourse on AI in education. Accordingly, this study aims to analyze how students position AI as either learning assistance or learning dependency, examine the strategies they employ to verify AI-generated information, investigate the impact of AI use on learning autonomy and self-regulated learning, and explore students' ethical and epistemological reflections in evaluating truth in the digital era.

Method

his study employs a qualitative approach with a descriptive phenomenological design to gain an in-depth understanding of students' lived experiences in using Generative Artificial Intelligence (AI) within higher education learning contexts. A phenomenological approach was selected as it allows the researcher to explore the meaning and essence of participants' subjective experiences, particularly in how they perceive and engage with AI either as a form of learning assistance or as a source of learning dependency that may lead to cognitive reliance (Creswell & Creswell, 2017). Through this approach, the study seeks to uncover students' awareness, reflections, and interpretations regarding the role of AI in shaping their learning autonomy and self-regulated learning in the digital era.

The participants of this study were undergraduate students enrolled in the Islamic Education Program at UIN Sunan Kalijaga Yogyakarta who actively use generative AI tools such as ChatGPT or Gemini in their academic activities. A purposive sampling technique was employed to ensure that participants possessed relevant and rich experiences related to the phenomenon under investigation. The inclusion criteria included: (1) active undergraduate student status, (2) regular use of generative AI in academic tasks such as assignments, information searching, or writing assistance, and (3) willingness to participate in in-depth interviews. A total of ten participants were selected, as this number was considered sufficient to achieve data saturation and capture diverse perspectives while maintaining depth of phenomenological inquiry.

Data were collected through in-depth interviews using a semi-structured interview protocol designed to guide the exploration of key themes while allowing flexibility for participants to elaborate on their experiences. The interview instrument was developed based on the research objectives, focusing on three main domains: students' patterns of AI use, their strategies for verifying AI-generated information, and their reflections on learning autonomy and self-regulated learning. Each interview lasted approximately 45–60 minutes, was audio-recorded with participants' consent, and transcribed verbatim to preserve the authenticity and richness of the data. During the interviews, probing techniques were used to elicit deeper insights into how students evaluate the credibility of AI outputs and how such interactions influence their cognitive processes and learning behaviors.

The data analysis followed the thematic analysis framework proposed by Braun and Clarke, which provides a systematic yet flexible method for identifying patterns within qualitative data. The analysis process involved six stages: initial familiarization with the data through repeated reading of transcripts, generation of initial codes to identify meaningful units, searching for themes by clustering related codes, reviewing themes to ensure coherence and alignment with the data, defining and naming themes to capture the essence of participants' experiences, and producing a comprehensive interpretative report (Braun & Clarke, 2012). This analytical approach enabled the researcher to construct a nuanced understanding of the patterns and meanings underlying students' interactions with generative AI.

To ensure the trustworthiness and rigor of the study, several validation strategies were implemented. Credibility was enhanced through member checking, where participants were invited to review and confirm the accuracy of the researcher's interpretations. Triangulation was conducted by comparing responses across participants to identify consistent patterns and variations in experiences. Additionally, an audit trail was maintained to document all stages of the research process, including data collection, coding decisions, and theme development, thereby ensuring transparency and methodological accountability. These strategies collectively strengthen the reliability and validity of the findings.

Through this methodological framework, the study aims to provide a comprehensive understanding of how students engage with generative AI, the extent to which they apply verification strategies to assess AI-generated information, and how these practices influence their learning autonomy and self-regulated learning processes.

Result and Discussion

The findings of this study are presented based on a thematic analysis of in-depth interview data with ten students from the Islamic Education Study Program at UIN Sunan Kalijaga Yogyakarta who actively use Generative Artificial Intelligence (AI) technologies such as ChatGPT and Gemini in their learning processes. The analysis was conducted by examining students' experiences, perceptions, and reflections regarding

the use of AI in academic activities, which were then interpreted in relation to contemporary learning theories and findings from previous studies.

The data analysis revealed four main themes that represent the dynamics of students' interactions with AI technologies: (1) the positioning of AI in the learning process, ranging between learning assistance and learning dependency; (2) students' strategies in verifying AI-generated information; (3) the implications of AI use on learning autonomy and self-regulated learning; and (4) students' ethical and epistemological reflections in evaluating truth in the digital era. These four themes are not independent but are interrelated, forming a comprehensive understanding of how AI shapes students' ways of thinking, acting, and learning in higher education contexts.

The following section discusses each theme in detail, beginning with how students position AI within their learning processes whether as a cognitive partner that supports knowledge construction or as a tool that potentially creates dependency and weakens intellectual autonomy.

1. The Position of AI in the Learning Process: Between Learning Assistance and Learning Dependency

The initial findings of this study indicate that students perceive the role of Artificial Intelligence (AI), particularly Generative AI, in diverse ways within their learning processes. On the one hand, some students utilize AI as a form of learning assistance, serving as a tool to understand basic concepts, seek preliminary explanations before consulting scholarly sources, or obtain more systematic writing structures. On the other hand, there are patterns of use that reflect learning dependency, where students rely heavily on AI-generated answers or structures, thereby reducing their engagement in critical thinking and reflective activities. This variation is important to analyze, as students' initial perceptions of AI influence how they verify information, develop epistemic attitudes, and maintain their learning autonomy. To illustrate this dynamic, a summary of the interview findings is presented in the following table.

Tabel 1. Students' Perceptions of the Role of AI in the Learning Process

Informan Code	Key Statement	Identified Pattern
M1	"I use ChatGPT to find basic concepts so I can understand faster before reading journals."	AI as learning assistance for initial exploration
M3	"I usually ask AI to help me create an outline for my paper, then I just fill in the sections."	AI as a structural facilitator in writing
M5	"When writing a paper, I mostly use AI-generated answers and just edit them a bit."	High dependency on AI
M7	"AI makes learning more practical, but sometimes it makes me lazy to think on my own."	Decrease in reflection and intrinsic motivation
M10	"I see AI as a discussion partner, not a replacement for myself."	Critical and reflective use of AI

The data indicate that students demonstrate varied patterns in using generative AI. Informants such as M1 and M3 use AI to explore basic concepts and generate writing structures, suggesting a supportive role of AI in facilitating learning. In contrast, M5 and M7 show a tendency toward dependency, where AI-generated outputs are used directly with minimal modification, leading to reduced engagement in critical thinking and reflection. Meanwhile, M10 represents a more balanced approach by positioning AI as a discussion partner rather than a replacement for cognitive processes.

These patterns suggest that students' interaction with AI is not uniform but exists along a continuum from assistance to dependency. The meaning behind these findings lies in how students cognitively frame AI: whether as a tool for enhancing understanding or as a shortcut that replaces intellectual effort. This distinction is crucial because it directly influences the depth of learning and the development of higher-order thinking skills.

From a theoretical perspective, these findings can be interpreted through constructivist learning theory, which emphasizes that knowledge is actively constructed through engagement and reflection. When AI is used as a supportive tool, it enhances the construction of knowledge by providing

scaffolding. However, when it replaces cognitive processes, it disrupts this construction by limiting opportunities for critical engagement. Additionally, Self-Determination Theory (SDT) explains that autonomy and competence are essential for intrinsic motivation; excessive reliance on AI may reduce both, leading to passive learning behaviors.

These findings align with international research. Studies by Chunpeng Zhai demonstrate that over-reliance on AI systems can reduce higher-order thinking by minimizing active knowledge construction (Zhai *et al.*, 2024). Similarly, research by Roshni Doshi and Marc Hauser indicates that while generative AI improves efficiency, it can also constrain cognitive diversity and promote convergent thinking when heavily relied upon (Doshi & Hauser, 2024).

Analytically, these findings reveal that the impact of AI is mediated by students' epistemic positioning. Students who maintain control over AI usage are able to integrate it into their cognitive processes, whereas those who relinquish control experience cognitive offloading, resulting in diminished critical engagement. Thus, the issue is not the presence of AI itself, but the mode of interaction between students and the technology.

The implications of this finding are significant for higher education. Institutions need to emphasize not only AI literacy but also epistemic awareness and critical thinking skills. Educators should guide students to use AI as a cognitive partner rather than a substitute, ensuring that technology enhances rather than diminishes intellectual autonomy.

2. Information Verification Strategies: From Critical Reflection to Algorithmic Reliance

In the context of students' interaction with Generative AI, the process of information verification becomes a crucial aspect that determines both the quality of learning and students' epistemic attitudes. The interviews reveal that students' abilities and habits in verifying the accuracy of AI-generated information vary significantly. Some students demonstrate rigorous verification practices by cross-checking AI outputs with scholarly literature, while others tend to accept AI-generated responses without further examination, simply because the explanations appear logical, well-structured, and academic.

This variation reflects a continuum between critical reflection and algorithmic reliance, which, in the context of higher education, has serious implications for digital literacy, academic integrity, and the depth of conceptual understanding. To illustrate these differences in verification strategies, a summary of the interview findings is presented in the following table.

Tabel 2. Students' Strategies in Verifying AI-Generated Information

Informant Code	Verification Strategy	Attitude Toward Information Accuracy
M2	Compares AI outputs with scholarly articles on Google Scholar	Critical and selective
M4	Relies on AI explanations if they appear logical and easy to understand	Trusts without in-depth verification
M6	Checks against institutional literature, but not consistently	Partial verification
M8	Assumes AI outputs are correct because they are well-structured and academic in tone	High algorithmic reliance
M9	Always rechecks AI outputs with original sources before citing	Reflective and ethical

The data reveal that students employ diverse strategies in verifying AI-generated information, ranging from rigorous cross-checking with scholarly sources to uncritical acceptance based on surface-level plausibility. Students such as M2 and M9 demonstrate systematic and reflective verification practices, while others, such as M4 and M8, exhibit a tendency to rely on AI outputs without substantial

scrutiny. Meanwhile, M6 reflects an intermediate pattern characterized by partial and inconsistent verification.

The meaning of these findings indicates that students' verification behavior exists along a continuum from critical evaluation to algorithmic reliance. This variation reflects differences in epistemic awareness, digital literacy, and academic habits. Students who engage in rigorous verification treat AI outputs as provisional knowledge requiring validation, whereas those who rely on AI without verification tend to perceive it as an authoritative source of truth.

From a theoretical perspective, this phenomenon can be understood through the framework of digital literacy, particularly in the dimension of evaluating information. Students who actively verify information demonstrate higher-order critical thinking skills, including analysis, evaluation, and self-regulation. In contrast, students who rely on AI outputs without verification exhibit limited critical engagement. This aligns with critical thinking theory developed by Peter Facione, which emphasizes that sound judgment requires evidence-based evaluation rather than intuitive acceptance.

Furthermore, this finding can be explained through the concept of algorithmic trust, where individuals attribute credibility to algorithmically generated content due to its structured and authoritative presentation. Students like M8 illustrate what can be described as aesthetic trust, where linguistic quality and academic tone are mistaken for epistemic validity.

These findings are consistent with international research on the implications of generative AI and digital literacy in contemporary education. Yogesh K. Dwivedi et al. highlight that users tend to place unwarranted trust in AI-generated content due to its coherent, fluent, and authoritative linguistic style, rather than its verified factual accuracy (Dwivedi dkk., 2023). This phenomenon increases the risk of uncritical acceptance of information, particularly in academic contexts where analytical evaluation is essential. In a similar vein, Nili Steinfeld demonstrates that limited digital literacy significantly reduces individuals' ability to assess the credibility of online information, leading them to bypass verification processes and become more susceptible to misinformation (Steinfeld, 2023). Taken together, these studies reinforce the present findings that reliance on AI without critical verification is not merely a behavioral tendency, but reflects deeper epistemic limitations related to how knowledge is evaluated, validated, and constructed in the digital age.

Analytically, the results suggest that verification practices are a key indicator of students' epistemic maturity. Students who verify information demonstrate an evaluativist epistemology, recognizing that knowledge must be justified through evidence. In contrast, those who rely on AI without verification tend to exhibit a more naïve epistemological stance, where information is accepted based on appearance rather than validity. This distinction has significant implications for how students construct knowledge in AI-mediated environments.

The implications of these findings are substantial for higher education. There is an urgent need to strengthen students' digital and epistemic literacy, particularly in evaluating AI-generated content. Educational institutions should integrate verification practices into learning activities and encourage students to treat AI as a tool for inquiry rather than a source of unquestioned truth. Without such interventions, the widespread use of AI may lead to superficial learning and compromised academic integrity.

3. The Impact of AI Use on Learning Autonomy and Self-Regulated Learning (SRL)

Students' interaction with Generative AI not only influences how they acquire information but also directly affects their level of learning autonomy and their Self-Regulated Learning (SRL) capabilities. The interview data reveal varying patterns of AI use that contribute differently to students' ability to plan, monitor, and evaluate their learning processes. Some students use AI as a tool to enhance their planning skills and support initial exploration, while others tend to delegate reasoning

and writing processes entirely to AI, thereby weakening their reflective capacity and cognitive responsibility.

This variation is important to analyze, as SRL serves as a fundamental foundation for students' intellectual independence in the digital era. To illustrate these dynamics, a summary of the interview findings is presented in the following table.

Tabel 3. Patterns of the Relationship between AI Use and Learning Autonomy

Informant Code	Pattern of AI Use	Impact on Learning Autonomy
M1	Uses AI for initial ideas and topic exploration	Strengthens the forethought phase (learning planning)
M3	Relies on AI for constructing arguments and analysis	Reduces reflection and cognitive responsibility
M5	Delegates the entire writing process to AI	Loss of cognitive and ethical control
M7	Uses AI for clarification after reading original sources	Supports self-monitoring and reflection
M10	Integrates AI outputs with academic literature	Demonstrates optimal integration between AI and SRL

The data indicate that students employ diverse patterns of AI usage that lead to different impacts on learning autonomy and Self-Regulated Learning (SRL). Students such as M1 and M7 use AI as a supportive tool to enhance planning and clarify understanding, suggesting a constructive and complementary role of AI in the learning process. In contrast, M3 and M5 demonstrate a substitutive pattern, where AI is used to replace core cognitive activities such as reasoning and writing, leading to diminished reflection and loss of cognitive control. Meanwhile, M10 represents an integrative pattern in which AI is combined with academic sources, reflecting a more advanced and balanced use.

The meaning of these findings suggests that AI does not inherently determine learning outcomes; rather, its impact depends on how students regulate and integrate it into their learning processes. The distinction between integrative and substitutive use is critical, as it determines whether AI functions as a tool for empowerment or as a source of dependency. This variation highlights that SRL is not only a personal skill but also shaped by how technology is utilized.

From a theoretical perspective, these findings can be explained through the Self-Regulated Learning framework developed by Barry Zimmerman, which conceptualizes learning as a cyclical process involving forethought, performance, and self-reflection. Students like M1 and M7 maintain all three phases by using AI as a support for planning and monitoring. In contrast, students like M3 and M5 disrupt this cycle by outsourcing performance and reflection to AI, resulting in incomplete SRL processes. Additionally, the concept of cognitive offloading explains how reliance on external tools reduces the need for internal cognitive effort, potentially weakening learning autonomy.

These findings are consistent with international research on the role of artificial intelligence in supporting self-regulated learning (SRL) within digital learning environments. Studies suggest that AI can function as a metacognitive tool that facilitates key SRL processes, including planning, monitoring, and self-evaluation. For instance, Zhou et al. demonstrate that AI-assisted learning environments can enhance higher-order thinking and support learners in regulating their cognitive processes when used actively and reflectively (Zhou dkk., 2024). Similarly, Kendall Hartley et al. highlight that AI technologies can promote learner autonomy by providing structured guidance and feedback that support independent learning (Hartley dkk., 2024). However, the benefits of AI are contingent upon how it is used. A systematic review on educational chatbots shows that while AI tools can support SRL, excessive reliance may lead to reduced learner control, passive engagement, and diminished self-regulation capacity (Guan dkk., 2025). These findings indicate that AI holds a dual role in education serving either

as a facilitator of autonomous learning or as a factor that undermines it when it replaces, rather than supports, students' cognitive efforts.

Analytically, the findings suggest that the relationship between AI and SRL is mediated by students' level of control and awareness. Students who actively regulate AI use maintain cognitive engagement and develop stronger autonomy, whereas those who passively rely on AI experience a decline in self-regulation and intellectual responsibility. This indicates that the key issue is not AI usage itself, but the quality of interaction between the learner and the technology.

The implications of these findings are significant for higher education. Educational practices should focus on developing students' SRL skills in conjunction with AI literacy. AI should be positioned as a metacognitive tool that supports planning, monitoring, and reflection, rather than as a replacement for cognitive effort. Without such guidance, the widespread use of AI may lead to reduced autonomy, superficial learning, and diminished academic responsibility.

4. Ethical and Epistemological Reflection: Evaluating Truth in the Age of AI

The development of Generative AI has placed students in a new context for evaluating truth. In this context, the ability to assess whether AI-generated information is accurate, valid, and appropriate for use is not merely a technical issue but also an ethical and epistemological one. Interview data reveal that students employ diverse criteria in evaluating the truth of information, ranging from reliance on scholarly sources and personal logical reasoning to trust in language that appears academic in tone.

This variation illustrates how students construct their epistemic standards, which are influenced by their level of digital literacy, academic habits, and awareness of the biases and limitations of AI. To further understand students' positions in determining truth in the age of AI, a summary of the interview findings is presented in the following table.

Tabel 4. Students' Attitudes toward the Truth of AI-Generated Responses

Informant Code	Criteria for Evaluating Truth	Ethical and Epistemic Reflection
M2	"I only trust it if there is a clear source."	Based on scientific authority and source verification
M4	"As long as it's logical and makes sense, it doesn't need references."	Truth based on perceived logic
M6	"If the language sounds academic, I believe it's correct."	Aesthetic reliance rather than epistemic judgment
M9	"I use AI to compare perspectives, not to determine the truth."	Reflective and dialogic stance
M10	"AI is a thinking aid, not a determinant of right or wrong."	High epistemological awareness

The data show that students employ diverse criteria in evaluating the truth of AI-generated information, ranging from evidence-based verification to superficial judgment based on linguistic appearance. Students such as M2 and M9 demonstrate reflective and critical approaches, relying on source validation and comparative reasoning. In contrast, M4 and M6 exhibit more intuitive and surface-level evaluation strategies, where logical coherence or academic tone is taken as sufficient proof of truth. Meanwhile, M10 reflects a more advanced epistemic stance by recognizing AI as a tool rather than an authority.

The meaning of these findings suggests that students' approaches to truth evaluation exist along a spectrum of epistemological development. Some students demonstrate an awareness that knowledge must be justified through credible evidence, while others rely on heuristic cues such as clarity, coherence, or style. This variation indicates differing levels of epistemic maturity and awareness of AI's limitations.

From a theoretical perspective, these findings can be interpreted through epistemic cognition, which examines how individuals understand the nature of knowledge and truth. Students like M2 and M9 align with evaluativist epistemology, where knowledge is assessed based on evidence and reasoning. In contrast, M4 and M6 reflect more naïve or absolutist epistemologies, where truth is

perceived as inherent in the information itself, regardless of its source or validation. The perspective of Luciano Floridi is particularly relevant here, as he argues that AI lacks epistemic agency and produces probabilistic outputs rather than definitive truths.

These findings are consistent with international research in digital epistemology. Studies indicate that individuals with higher levels of digital literacy tend to engage with AI as a dialogic and reflective tool, whereas those with lower literacy are more likely to perceive AI outputs as authoritative sources. For instance, Baldrich et al. show that students with stronger epistemic awareness are more likely to critically evaluate AI-generated content, while others rely on surface-level indicators such as linguistic coherence and textual quality rather than factual accuracy (Baldrich dkk., 2025). Similarly, research on AI literacy and trust suggests that limited digital literacy increases users' tendency to accept AI outputs uncritically, reducing their engagement in verification processes (Sahebi & Formosa, 2025). These findings reinforce the present study, indicating that reliance on AI without verification is not merely a behavioral issue, but reflects deeper epistemic limitations in how knowledge is assessed and validated in digital environments.

Analytically, these findings reveal that students' evaluation of truth is not merely a cognitive process but also an ethical one. Students who critically assess AI outputs demonstrate epistemic responsibility, while those who accept information without verification risk engaging in epistemic negligence. The presence of aesthetic trust suggests a shift in how truth is constructed in digital environments, where appearance may override substance.

The implications of these findings are profound for higher education. There is a need to strengthen epistemic literacy alongside digital literacy, ensuring that students understand the probabilistic nature of AI-generated knowledge. Educational practices should encourage students to critically evaluate AI outputs, recognize their limitations, and maintain human judgment as the ultimate authority in determining truth. Without such interventions, the widespread use of AI may lead to shallow epistemic practices and weakened academic integrity.

The synthesis of the findings reveals that students' interactions with Generative Artificial Intelligence (AI) form a complex, multidimensional pattern involving learning support, verification strategies, learning autonomy, and ethical–epistemological reflection. These dimensions are not isolated; rather, they are deeply interconnected and collectively shape how students construct knowledge and engage in academic learning in the AI era.

First, regarding the positioning of AI in the learning process, students exist along a continuum between learning assistance and learning dependency. Those who use AI as a supportive tool for initial exploration, conceptual clarification, and structural guidance demonstrate a more productive and empowering learning approach. In contrast, students who rely heavily on AI-generated outputs without critical engagement exhibit patterns of dependency that reduce reflection, creativity, and intrinsic motivation. This positioning becomes the foundation that influences subsequent behaviors, particularly in information verification and epistemic judgment.

Second, in terms of information verification strategies, students demonstrate varying levels of epistemic awareness and digital literacy. Some students employ rigorous verification practices by cross-checking AI outputs with scholarly sources, reflecting critical and evaluative thinking. Others rely on surface-level indicators such as logical coherence or academic tone, indicating algorithmic reliance and aesthetic trust. These differences highlight that verification is not merely a technical skill but an epistemic practice that determines the quality and credibility of knowledge construction.

Third, the impact of AI on learning autonomy and Self-Regulated Learning (SRL) also varies significantly. Integrative use of AI where students maintain control and use AI as a cognitive and metacognitive tool enhances planning, monitoring, and reflection processes. Conversely, substitutive use where AI replaces core cognitive functions leads to cognitive offloading, diminished self-regulation, and weakened intellectual responsibility. This finding confirms that AI can either strengthen or undermine learning autonomy depending on how it is utilized.

Fourth, in the domain of ethical and epistemological reflection, students exhibit different levels of awareness regarding the nature of truth in AI-mediated environments. Students with higher epistemic awareness evaluate truth based on evidence, sources, and critical comparison, treating AI as a dialogic

partner. In contrast, others rely on logical plausibility or linguistic appearance, reflecting a more naïve epistemological stance. This variation indicates that the challenge of AI in education is not only technological but fundamentally epistemological related to how students understand and justify knowledge.

Taken together, these findings suggest that students' use of AI cannot be understood in isolation from their epistemic positioning, verification practices, and self-regulation capacities. The way students perceive and interact with AI directly influences how they verify information, regulate their learning, and construct truth. Students who position AI as a supportive tool tend to exhibit stronger critical thinking, higher autonomy, and more mature epistemic awareness. Conversely, those who treat AI as an authoritative source are more likely to experience dependency, reduced reflection, and superficial learning.

Theoretically, this synthesis integrates perspectives from constructivism, Self-Regulated Learning, and epistemic cognition, highlighting that meaningful learning in the AI era requires active engagement, critical evaluation, and reflective judgment. Practically, the findings underscore the urgent need for higher education to move beyond technological adoption toward the development of AI literacy, epistemic literacy, and critical thinking skills.

Ultimately, this study contributes to the international discourse by demonstrating that the central issue is not the presence of AI itself, but how students cognitively, ethically, and epistemologically engage with it. Strengthening these dimensions is essential to ensure that AI serves as a tool for intellectual empowerment rather than a source of cognitive dependency.

Conclusion

This study demonstrates that students' interactions with Generative Artificial Intelligence (AI) create a complex and multidimensional learning dynamic encompassing cognitive, metacognitive, and ethical-epistemological dimensions. The findings reveal that AI use is neither uniform nor linear; rather, it exists along a continuum ranging from learning assistance to learning dependency, from critical reflection to algorithmic reliance, and from strong learning autonomy to cognitive dependence.

First, regarding the position of AI in the learning process, students who utilize AI as a cognitive support tool tend to engage in deeper, more reflective, and constructive learning. In contrast, when AI is used as a substitute for thinking, it leads to reduced cognitive engagement, diminished reflection, and weakened intrinsic motivation. Second, in terms of information verification strategies, the findings highlight disparities in digital literacy and epistemic awareness. Some students demonstrate rigorous evaluation practices by cross-checking AI outputs with scholarly sources, while others rely on surface-level indicators such as logical coherence or academic tone. Third, within the framework of Self-Regulated Learning (SRL), AI can either strengthen or weaken learning autonomy depending on the extent to which students actively regulate and integrate its use into their learning processes. Fourth, in the ethical and epistemological domain, students exhibit varying levels of epistemic maturity, ranging from evidence-based evaluation to intuitive judgments that are vulnerable to technological bias.

Overall, this conclusion is consistent with the findings, indicating that the impact of AI on learning is primarily determined by how students perceive, use, and critically reflect on the technology. In other words, the central issue lies not in the presence of AI itself, but in the quality of cognitive and epistemic interaction between students and the technology.

From a broader educational perspective, these findings underscore that higher education institutions must move beyond merely promoting AI adoption. There is a pressing need to systematically develop students' AI literacy, critical digital literacy, and epistemic literacy. Curricula should be designed to integrate evaluative, reflective, and ethical competencies in AI use, including the ability to verify information, understand algorithmic limitations, and maintain intellectual autonomy. Furthermore, educators play a crucial role in guiding students to position AI as a cognitive partner rather than a substitute for intellectual effort. Pedagogical approaches such as metacognitive scaffolding and guided inquiry are particularly relevant to ensure that AI enhances, rather than diminishes, the quality of learning.

For future research, several recommendations emerge. First, subsequent studies should expand the scope of participants and contexts across disciplines and institutions to enhance generalizability. Second, longitudinal research is needed to examine how students' epistemic behaviors and learning practices

evolve over time with sustained AI use. Third, experimental studies should be conducted to test the effectiveness of specific pedagogical interventions, such as AI literacy training or SRL-based learning models, in improving the quality of student–AI interaction. Fourth, further research should explore ethical and academic integrity issues in greater depth, including how institutional policies can regulate AI use in a balanced and responsible manner.

In conclusion, this study not only contributes empirically to understanding AI use in higher education but also offers strategic directions for developing adaptive, critical, and intellectually empowering learning practices in the age of artificial intelligence.

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(1), 10. <https://doi.org/10.1186/s41239-024-00444-7>
- Baig, M. I., & Yadegaridehkordi, E. (2024). ChatGPT in the higher education: A systematic literature review and research challenges. *International Journal of Educational Research*, 127, 102411. <https://doi.org/10.1016/j.ijer.2024.102411>
- Baldrich, K., Pérez-García, C., & Santamarina-Sancho, M. (2025). Artificial intelligence in academic literacy: Empirical evidence on reading and writing practices in higher education. *Frontiers in Education*, 10, 1701238. <https://doi.org/10.3389/feduc.2025.1701238>
- Bhullar, P. S., Joshi, M., & Chugh, R. (2024). ChatGPT in higher education—A synthesis of the literature and a future research agenda. *Education and Information Technologies*, 29(16), 21501–21522. <https://doi.org/10.1007/s10639-024-12723-x>
- Braun, V., & Clarke, V. (2012). *Thematic analysis*. (hlm. 57–71).
- Costa Júnior, J. F., Lins, P. P. M., De Oliveira, A. P. S., Ruas, G. C. R., Dos Reis Neto, R. A., Moraes, L. S., De Barros, M. J., Martins, P. C. M., Lopes, L. C. L., Schimdt, M. Q., Giese, W., & Dos Santos, I. B. (2025). ALGORITMOS VS. AUTONOMIA: OS RISCOS DA DEPENDÊNCIA DE IA NA FORMAÇÃO CRÍTICA DE ESTUDANTES. *ARACÊ*, 7(7), 35445–35461. <https://doi.org/10.56238/arev7n7-018>
- Creswell, J. W., & Creswell, J. D. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches—John W. Creswell, J. David Creswell—Google Buku*. https://books.google.co.id/books?hl=id&lr=&id=335ZDwAAQBAJ&oi=fnd&pg=PT16&dq=creswell&ots=YEyRKPznsF&sig=LaGjX5hXEw40U0NO9emHtNMQt6g&redir_esc=y#v=onepage&q=creswell&f=false
- Doshi, A. R., & Hauser, O. P. (2024). Generative AI enhances individual creativity but reduces the collective diversity of novel content. *Science Advances*, 10(28), eadn5290. <https://doi.org/10.1126/sciadv.adn5290>
- Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., ... Wright, R. (2023). Opinion Paper: “So what if ChatGPT wrote it?” Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management*, 71, 102642. <https://doi.org/10.1016/j.ijinfomgt.2023.102642>
- Guan, R., Raković, M., Chen, G., & Gašević, D. (2025). How educational chatbots support self-regulated learning? A systematic review of the literature. *Education and Information Technologies*, 30(4), 4493–4518. <https://doi.org/10.1007/s10639-024-12881-y>

- Guettala, M., Bourekkache, S., Kazar, O., & Harous, S. (2024). Generative Artificial Intelligence in Education: Advancing Adaptive and Personalized Learning. *Acta Informatica Pragensia*, 13(3), 460–489. <https://doi.org/10.18267/j.aip.235>
- Hartley, K., Hayak, M., & Ko, U. H. (2024). Artificial Intelligence Supporting Independent Student Learning: An Evaluative Case Study of ChatGPT and Learning to Code. *Education Sciences*, 14(2), 120. <https://doi.org/10.3390/educsci14020120>
- Khalid, N., Kasbun, R., & Ab Rahman, N. F. (2026). EFFICIENCY, ENGAGEMENT, AND COGNITIVE OFFLOADING: A REVIEW OF GENERATIVE AI IN EDUCATION. *International Journal of Education Psychology and Counseling*, 11(62), 1238. <https://doi.org/10.35631/IJEP.1162072>
- Lee, H.-Y., Chen, P.-H., Wang, W.-S., Huang, Y.-M., & Wu, T.-T. (2024). Empowering ChatGPT with guidance mechanism in blended learning: Effect of self-regulated learning, higher-order thinking skills, and knowledge construction. *International Journal of Educational Technology in Higher Education*, 21(1), 16. <https://doi.org/10.1186/s41239-024-00447-4>
- Liu, D., Fan, G., & Pan, L. (2026). Tool, tutor, or crutch?: A grounded theory of cognitive scaffolding and offloading in AI-assisted programming education. *International Journal of STEM Education*, 13(1), 10. <https://doi.org/10.1186/s40594-025-00592-w>
- Mahniza, M., Sari, R. E., Suci, P. H., Saputra, I., & Putri, E. Y. (2024). AI-Driven Learning: Mediating and Moderating Dynamics in Self-Regulated Learning. *Journal of Educational Science and Technology (EST)*, 10(3), 229. <https://doi.org/10.26858/est.v10i3.68254>
- Marshall, J. (2026). Conceptually demystifying the intersection between higher education students' GenAI use and critical thinking. *Discover Education*. <https://doi.org/10.1007/s44217-026-01392-2>
- Pallio, S., Melita, G., Shahini, E., Vitello, A., Sinagra, E., Lattanzi, B., Facciorusso, A., Ramai, D., & Maida, M. (2023). Diagnosis and Management of Esophagogastric Varices. *Diagnostics*, 13(6), 1031. <https://doi.org/10.3390/diagnostics13061031>
- Sahebi, S., & Formosa, P. (2025). The AI-mediated communication dilemma: Epistemic trust, social media, and the challenge of generative artificial intelligence. *Synthese*, 205(3), 128. <https://doi.org/10.1007/s11229-025-04963-2>
- Salah, M., Abdelfattah, F., Alhalbusi, H., & Mukhaini, M. A. (2023). *Me and My AI Bot: Exploring the "Alholic" Phenomenon and University Students' Dependency on Generative AI Chatbots - Is This the New Academic Addiction?* In Review. <https://doi.org/10.21203/rs.3.rs-3508563/v1>
- Steinfeld, N. (2023). How Do Users Examine Online Messages to Determine If They Are Credible? An Eye-Tracking Study of Digital Literacy, Visual Attention to Metadata, and Success in Misinformation Identification. *Social Media + Society*, 9(3), 20563051231196871. <https://doi.org/10.1177/20563051231196871>
- Tian, J., & Zhang, R. (2026). Outsourcing thinking to AI? Focused immersion, AI dependency, and the double-edged impact on critical thinking. *Humanities and Social Sciences Communications*. <https://doi.org/10.1057/s41599-026-07153-8>
- Wilson, A., & Burleigh, C. (2026). Generative Artificial Intelligence as a Collaborative Thought Partner: Rethinking Cognitive Partnership, Creativity, and Knowledge Work in the Age of Intelligent Systems. *International Journal of AI in Pedagogy, Innovation, and Learning Futures*, 2026(1). <https://doi.org/10.46787/ijaipil.v2026i1.6963>

- Zhai, C., Wibowo, S., & Li, L. D. (2024). The effects of over-reliance on AI dialogue systems on students' cognitive abilities: A systematic review. *Smart Learning Environments*, 11(1), 28. <https://doi.org/10.1186/s40561-024-00316-7>
- 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>
- Zhou, X., Teng, D., & Al-Samarraie, H. (2024). The Mediating Role of Generative AI Self-Regulation on Students' Critical Thinking and Problem-Solving. *Education Sciences*, 14(12), 1302. <https://doi.org/10.3390/educsci14121302>
- Zimmerman, B. J. (2002). Becoming a Self-Regulated Learner: An Overview. *Theory Into Practice*, 41(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2