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The Impact of AI Chatbots on Learner Autonomy in Distance and Digital Education: A Systematic Literature Review

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Abstract

The rapid integration of Artificial Intelligence (AI) chatbots—such as ChatGPT, Claude, and specialized pedagogical agents—has significantly transformed distance and digital learning environments. However, their specific influence on learner autonomy remains a topic of ongoing scholarly investigation. This study presents a Systematic Literature Review (SLR) guided by the PRISMA framework to examine the impact of AI chatbots on learner autonomy in distance and higher education contexts. Synthesizing findings from peer-reviewed empirical studies published between 2021 and 2026 across major database repositories, this review investigates three core themes: self-regulated learning (SRL) strategies, motivational dynamics, and the risk of cognitive over-reliance. The results indicate that AI chatbots enhance cognitive and metacognitive self-regulation by providing personalized scaffolding, instant feedback, and goal-setting support. Nevertheless, negative side effects such as excessive dependency, reduced critical thinking, and reduced self-efficacy are observed when pedagogical scaffolding is insufficient. This paper concludes with a conceptual framework for balanced AI chatbot integration that fosters self-direction while mitigating cognitive passivity in distance education.

Keywords**:** AI Chatbots, Learner Autonomy, Distance Education, Self-Regulated Learning, Artificial Intelligence in Education.

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Introduction

Distance and digital learning environments inherently demand a higher degree of learner autonomy compared to traditional, face-to-face academic settings. In non-contiguous learning

modalities where direct, real-time physical supervision by instructors is absent, the locus of educational control shifts substantially toward the student (Achuthan, 2025); (Budhoo & Roderique, 2026). Within this paradigm, learner autonomy—broadly defined as the metacognitive, behavioral, and motivational capacity of an individual to take primary responsibility for their learning trajectory—serves as a pivotal determinant of academic achievement, retention, and self-directed mastery (Arthur et al., 2025); (Wortha et al., 2026). Autonomous learning manifests through key self-regulated learning (SRL) mechanisms, including systematic goal setting, deliberate strategy selection, continuous progress monitoring, and critical self-evaluation. However, distance learners frequently struggle with self-regulatory deficits, leading to heightened academic procrastination, feelings of isolation, and diminished task completion rates when instructional scaffolding is insufficient or delayed (Aydemir, 2026); (Khaenamkhaew, 2026).

In recent years, the rapid proliferation and democratized access to Generative Artificial Intelligence (GenAI) and conversational AI tools—such as ChatGPT, Google Gemini, Anthropic Claude, and customized pedagogical agents—have fundamentally transformed how distance learners access educational content, navigate complex concepts, and receive instructional support (Al-kfairy et al., 2024); (Xiaoyu et al., 2025). These advanced Large Language Model (LLM) platforms act as on-demand, highly adaptive conversational partners capable of delivering personalized explanations, generating customized practice scenarios, and providing instantaneous feedback at scale. Unlike static digital learning repositories or traditional learning management systems (LMS) (Matz et al., 2024); (Novelo et al., 2025), AI chatbots offer an interactive interface that dynamic adapts to a student's inquiry depth, pacing, and dynamic learning requirements. Consequently, conversational AI is rapidly redefining the dynamic between learner, knowledge source, and pedagogical assistance in online higher education (Vinci et al., 2026); (Krakowski, 2025).

While conversational AI presents unprecedented opportunities for scaffolded digital learning, its dynamic impact on learner autonomy is highly nuanced, double-edged, and multifaceted (Alotaibi & Alshahre, 2024); (Peng et al., 2026). From a socio-constructivist perspective, AI chatbots can serve as valuable cognitive and metacognitive artifacts that actively facilitate self-regulation. By helping learners break down complex assignments into actionable milestones, offering real-time formative feedback, and providing low-anxiety environments for exploratory questioning, chatbots can enhance student self-efficacy and foster self-directed inquiry (D. Ding & Muhyiddin B Yusof, 2025); (Ganguly et al., 2026). Conversely, the pervasive, frictionless availability of instant solutions poses severe pedagogical challenges. Unstructured or uncritical interaction with AI agents risks encouraging excessive cognitive offloading, surface-level learning habits, and a reliance on automated answers that ultimately erodes critical problem-solving capacity, independent analytical reasoning, and genuine academic agency (Li & Ritchie, 2026); (Lim et al., 2026).

Despite the expanding corpus of empirical and theoretical literature evaluating Generative AI across diverse educational domains, scholarly research systematically synthesizing the specific nexus between AI chatbot usage and learner autonomy in distance education contexts remains markedly fragmented (C. Ding & Li, 2026); (Phung Tan et al., 2024). Much of the existing literature either focuses broadly on technical functionality and general user satisfaction or offers polarized accounts that overemphasize technological optimism or academic integrity concerns. A rigorous synthesis examining how conversational AI systematically interacts with the structural phases of self-regulated learning in distance environments is lacking. To address this critical gap in digital education scholarship, this Systematic Literature Review (SLR) investigates the structural impact of AI chatbots on distance learners' self-regulation, identifies the underlying motivational dynamics, and outlines the pedagogical risks associated with cognitive over-reliance. Therefore, this Systematic Literature Review (SLR) aims to address this critical literature gap by answering the following research questions:

1. RQ1: How do AI chatbots influence distance learners' self-regulated learning strategies and metacognitive skills?

2. RQ2: What are the key motivational and psychological impacts of AI chatbot interaction on learner self-direction?
3. RQ3: What pedagogical risks and challenges (e.g., over-dependence) emerge from using AI chatbots in digital learning settings?

Methodology

This study adopted the Systematic Literature Review (SLR) methodology following the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency, methodological rigor, and reproducibility.

Search Strategy and Identification

A comprehensive systematic search was conducted across five major academic electronic databases: Scopus, Web of Science (WoS), IEEE Xplore, ERIC, and Google Scholar. To capture all relevant literature on conversational AI and autonomous learning, a search string was formulated using Boolean operators (AND, OR) and wildcards: ("AI chatbot" OR "conversational AI" OR "generative AI" OR "intelligent tutor") AND ("self-regulated learning" OR "learner autonomy" OR "metacognition" OR "self-efficacy") AND ("distance education" OR "online learning" OR "e-learning")

Inclusion and Exclusion Criteria

To ensure high conceptual relevance and methodological quality, studies were selected based on predetermined eligibility criteria:

1. *Inclusion Criteria:*
Peer-reviewed original journal articles and full conference proceedings; Empirical studies focusing on AI chatbots, Large Language Models (LLMs), or conversational agents within distance, online, or blended higher education environments; Research explicitly measuring or evaluating learner autonomy, self-regulated learning (SRL) strategies, or metacognitive outcomes; Articles published in English between 2021 and 2026.
2. *Exclusion Criteria:*
Non-empirical publications (e.g., editorial pieces, commentaries, opinion papers, short abstracts, or book reviews); Purely technical studies focused solely on software/algorithm development without assessing educational impact on users; Studies conducted in primary or secondary education (K-12) contexts; Articles lacking peer review or published in predatory journals.

PRISMA Selection Process and Flow Diagram

The study selection process followed a four-stage systematic pipeline (Identification, Duplicate Removal, Screening, and Inclusion) as illustrated in Figure 1: Identification Phase: An initial automated search across the designated databases yielded 312 records; Duplicate Removal & Preliminary Screening: A total of 84 duplicate records were identified and removed, leaving 228 unique records for title and abstract screening; Title and Abstract Screening: Screening led to the exclusion of 170 irrelevant records that did not align with the research focus; Full-Text Eligibility Assessment: The remaining 58 full-text articles were retrieved and assessed in detail against the inclusion criteria. During this stage, 34 articles were excluded with explicit reasons: Not focusing on AI chatbots (n = 12); Not evaluating learner autonomy or self-regulation (n = 10); Non-empirical study designs (n = 8); Context outside of higher distance education (n = 4); Final Inclusion: A final sample of 24 empirical studies satisfied all criteria and were selected for qualitative synthesis.

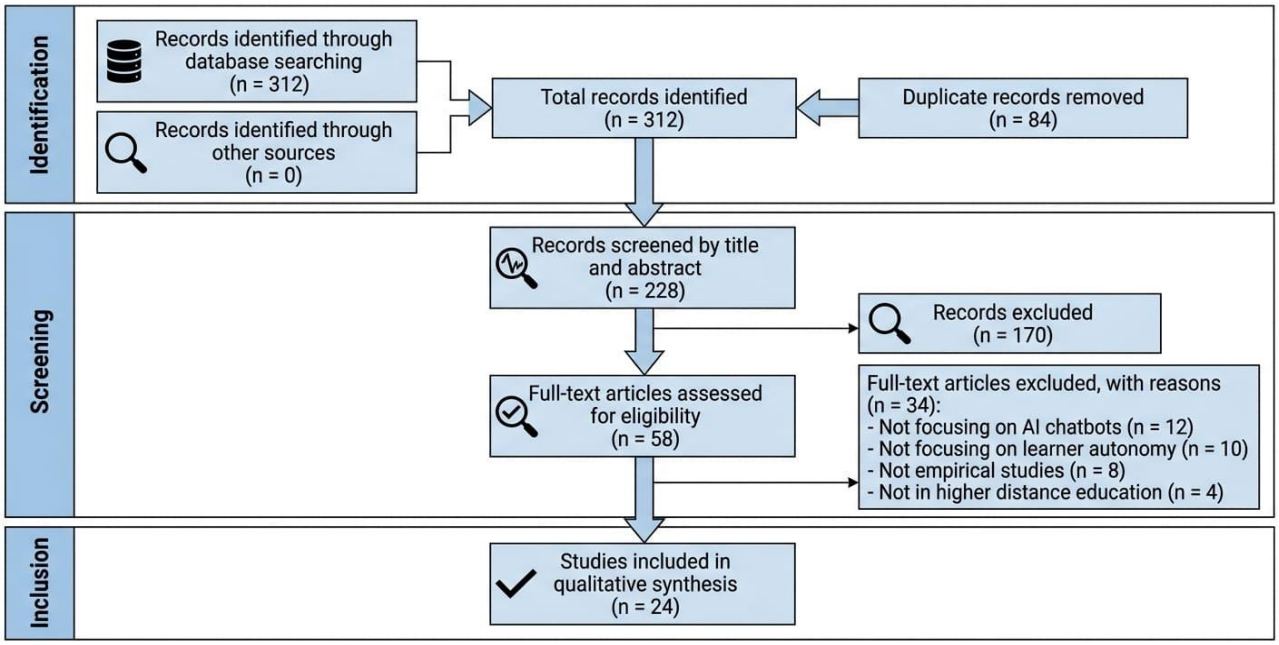


Figure 1. Diagram PRISMA

Data Extraction and Synthesis

Data from the 24 included studies were systematically extracted into a standardized extraction matrix containing: Author(s) and publication year; Educational setting and sample characteristics; Type of AI chatbot/tool utilized; Theoretical/conceptual framework applied; Methodological design and assessment instruments; Key findings related to self-regulated learning (SRL) dimensions; Pedagogical risks and study limitations. Due to the methodological diversity of the selected studies (combining quantitative, qualitative, and mixed-methods approaches), a thematic synthesis method was employed to integrate the findings into coherent thematic categories corresponding to the research questions.

Results

The qualitative synthesis of the n = 24 selected empirical studies demonstrates that the integration of AI-powered chatbots in distance learning environments plays a transformative, albeit complex, role in shaping student autonomy and self-regulated learning (SRL). The analysis is structured according to the three core research questions.

Scaffolding Self-Regulated Learning (SRL) Strategies (RQ1)

The synthesis reveals that AI chatbots function effectively as dynamic cognitive and metacognitive scaffolding mechanisms, operating across the distinct phases of Zimmerman's Self-Regulated Learning framework (Forethought, Performance, and Self-Reflection) (Figure 2).

Goal Setting and Task Planning (Forethought Phase)

Distance education inherently requires learners to independently structure unstructured tasks. The reviewed literature indicates that interactive conversational agents significantly reduce cognitive load during the initial task-planning stage. When initiating complex research or problem-solving assignments, learners utilizing AI chatbots report enhanced capacity for task decomposition—the process of breaking down large, ambiguous learning objectives into manageable sub-goals. AI chatbots assist students in establishing realistic study timelines, prioritizing learning modules, and organizing preliminary project outlines. This structured approach helps bridge the gap between learner intention and execution, mitigating the chronic academic procrastination often observed in asynchronous online courses

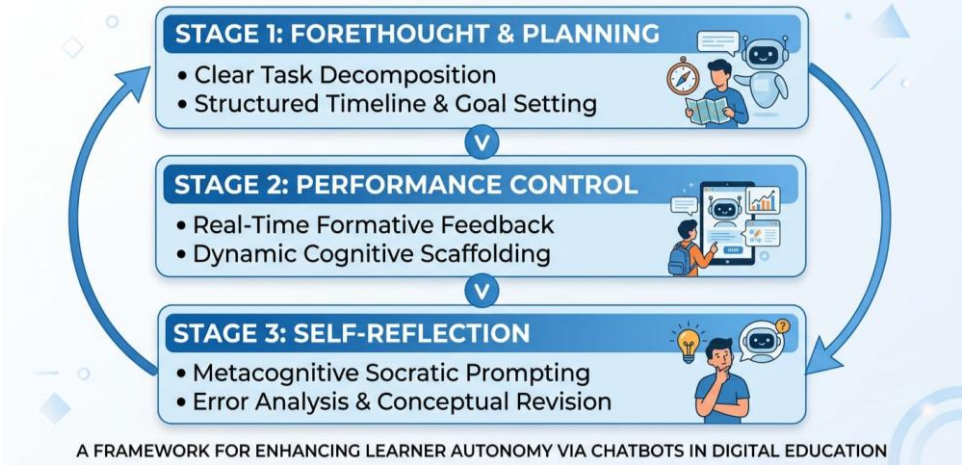


Figure 2. The Cycle of AI-Scaffolding in Self-Regulated Learning (SRL)

Goal Setting and Task Planning (Forethought Phase)

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Real-Time Formative Feedback and Iterative Learning (Performance Phase)

A pervasive bottleneck in traditional distance education is delayed feedback from instructors, which can disrupt learning momentum and allow conceptual misconceptions to persist. AI-powered chatbots address this limitation by providing instantaneous, personalized, and iterative feedback. This immediacy establishes a tight reflection loop: learners can submit draft solutions or queries and receive step-by-step diagnostic feedback in real time. Rather than receiving passive correct answers, students engage in multi-turn dialogues that allow them to self-correct misunderstandings iteratively. This continuous feedback loop reinforces conceptual clarity and keeps learners actively engaged within their Zone of Proximal Development (ZPD).

Metacognitive Prompting and Socratic Dialogue (Self-Reflection Phase)

The synthesized evidence highlights a crucial pedagogical distinction between generic generative AI models and purpose-built pedagogical chatbots. Chatbots engineered with Socratic prompting frameworks—which respond to student queries with guided questions (e.g., *"What strategy did you apply to reach this conclusion?"* or *"How might you verify this assumption?"*)—yield significantly higher gains in metacognitive awareness compared to unguided, answer-generating LLMs. These metacognitive prompts compel learners to evaluate their analytical pathways, monitor their comprehension, and engage in deeper self-reflection, ultimately fostering authentic cognitive autonomy.

Motivational Dynamics and Learner Agency (RQ2)

Beyond cognitive scaffolding, conversational AI profoundly impacts the psychological and affective dimensions of learner autonomy, specifically through the lenses of Self-Determination Theory (SDT) (Autonomy, Competence, and Relatedness).

Low-Anxiety, Judgment-Free Learning Environments

A major barrier to autonomous inquiry in distance education is help-seeking anxiety. Distance learners frequently hesitate to email instructors or post in public discussion forums due to fears of peer judgment, social embarrassment, or perceived instructor overload. AI chatbots offer a psychologically safe, non-judgmental space where students can ask foundational or repetitive questions without affective risk. This low-anxiety interaction fosters a "safe-to-fail" environment, encouraging hesitant learners to seek clarification proactively and take greater ownership of their learning journey.

Perceived Autonomy, Competence, and Personalized Agency

In accordance with Self-Determination Theory, AI chatbots nurture learners' sense of autonomy and competence by granting them granular control over their learning pathways. Distance learners can customize: The pace at which information is delivered; The depth and complexity of explanations (e.g., requesting simplified analogies or advanced academic breakdowns), and the modality of interaction (e.g., text, conversational code, structured tables). This high degree of personalization enhances students' perceived competence and self-efficacy, enabling them to transition from passive consumers of pre-packaged course materials to active managers of their educational experience.

Risks: Cognitive Offloading, AI Over-Reliance, and Algorithmic Hallucination (RQ3)

Despite these substantial benefits, the synthesized literature emphasizes that conversational AI represents a double-edged sword. Unstructured or uncritical chatbot integration introduces significant risks to genuine learner autonomy.

Table 1. Risks: Cognitive offloading, AI over-reliance, and algorithmic hallucination (RQ3)

Risk Factor	Mechanism of Action	Impact on Learner Autonomy	Mitigation Strategy
Cognitive Offloading	Using AI as an "answer engine" rather than a "thought partner."	Declines in problem-solving persistence and critical thinking skills.	Socratic prompt design; process-oriented assessment models.
Illusion of Competence	Uncritical adoption of AI outputs without deep processing.	Overconfidence in mastery that fails under unassisted evaluation.	Mandatory self-verification steps and peer-review tasks.
Algorithmic Hallucination	Inability to detect fabricated or inaccurate AI responses.	Misinformed knowledge construction and compromised academic integrity.	Critical AI literacy training and source-checking requirements.

Passive Consumption vs. Active Inquiry (Excessive Cognitive Offloading)

When students deploy AI chatbots primarily as shortcuts for answer generation rather than interactive scaffolds, harmful cognitive offloading occurs. In such scenarios, the mental effort required for synthesis, analysis, and problem-solving is outsourced to the algorithm. Over time, this passive consumption erodes learners' willingness to struggle through challenging material—a necessary component of deep learning—resulting in reduced problem-solving persistence and

weakened analytical capacity.

Illusion of Competence

Frequent, effortless access to fluent AI responses can generate a false sense of subject-matter mastery, termed the illusion of competence. Because the chatbot provides coherent, polished explanations instantly, students often mistake the tool's performance for their own understanding. This discrepancy becomes evident during summative assessments or real-world problem-solving contexts where AI assistance is unavailable, exposing fragile underlying knowledge structures.

Algorithmic Hallucinations and Vulnerability of Low-Prior-Knowledge Learners

Generative AI models are inherently prone to generating plausible-sounding yet factually incorrect information ("hallucinations"). The literature demonstrates that distance learners with lower prior knowledge or underdeveloped critical evaluation skills are particularly vulnerable to these inaccuracies. Without robust critical thinking skills to evaluate AI outputs, learners risk absorbing erroneous information, which undermines authentic self-directed learning and academic rigor.

Pedagogical Implications: Toward Scaffolded AI Integration

The findings of this systematic review suggest that AI chatbots do not inherently promote or impede learner autonomy; rather, the nature of pedagogical integration dictates the outcome. To maximize the benefits of conversational AI while mitigating its risks, distance learning institutions must move away from binary policies of prohibition or unrestricted use. Instead, instructional designers should adopt an "AI Scaffolding and Fading" framework: Pedagogical Alignment: Systematically design AI tutors that restrict direct answer provision, using Socratic interaction models to prompt active student reasoning; AI Literacy for Autonomy: Embed explicit instruction on critical evaluation, prompt engineering, and fact-checking into distance education curricula; Redesigning Assessment: Shift assessment paradigms from end-product evaluations (which are vulnerable to automated generation) to process-oriented assessments (e.g., reflective learning logs, oral defenses, and critical analyses of AI-generated responses).

Discussion

Pedagogical Alignment, Scaffolding, and AI Literacy for Autonomy

The synthesis of findings underscores a critical theoretical insight: AI-powered chatbots do not inherently enhance nor diminish learner autonomy. Instead, autonomy functions as an emergent outcome of *pedagogical alignment*, *scaffolded interaction design*, and *learner readiness*. While conversational AI presents unprecedented capabilities for dynamic feedback and personalized guidance, its integration within distance education creates a fundamental pedagogical paradox (Tamaño, 2025); (Mohamed, 2024). On one hand, it lowers barriers to self-directed inquiry and provides dynamic cognitive scaffolding across all three phases of Self-Regulated Learning (SRL) (Mithun Ramakrishnappa et al., 2025). On the other hand, its frictionless accessibility can incentivize excessive cognitive offloading, leading to surface-level engagement, an illusion of competence, and a decline in critical problem-solving persistence (H. L. M. Mohideen, 2024); (Ghafar, 2023).

Re-Conceptualizing Scaffolding in the AI Era: Socratic vs. Direct Agents

To resolve this paradox, distance learning environments must shift from viewing AI as a generic "answer engine" to treating it as a structured metacognitive tutor. Drawing upon Vygotsky's socio-constructivist theory and the concept of the Zone of Proximal Development (ZPD), effective educational chatbots must incorporate the principles of *scaffolding and fading*. When chatbots provide fully formed answers instantly, they eliminate the necessary cognitive friction required for schema acquisition and deep conceptual learning (Kuhail et al., 2023); (Song et al., 2025). Conversely, when designed with Socratic algorithms—prompting students with reflective questions,

hinting at procedural steps, and requiring prior student effort before providing evaluation—chatbots effectively support learner agency while maintaining cognitive challenge (Yang et al., 2025); (Engeness et al., 2025).

Shifting from Prohibition to "AI Literacy for Autonomy"

Historically, institutional responses to disruptive educational technologies have swung between total prohibition and uncritical adoption. However, in asynchronous distance education—where physical monitoring is impossible—prohibition policies are both impractical and counterproductive (Tripathi et al., 2025); (Mulaudzi & Hamilton, 2025). Institutional frameworks must instead prioritize AI Literacy for Autonomy, structured around three core pillars: Prompt Engineering as Metacognitive Planning: Teaching students how to construct precise, iterative prompts forces them to clarify their own learning goals, decompose complex tasks, and evaluate their knowledge gaps prior to interacting with the AI; Critical Evaluation and Fact-Verification Skills: Learners must be trained to critically audit AI-generated responses for algorithmic hallucinations, underlying biases, and logical inconsistencies (Wu, 2026); (Nazaretsky et al., 2025). This transforms the student from a passive recipient of information into an active critical reviewer; Ethical Agency and Academic Integrity: Fostering internal academic responsibility by helping distance learners understand the boundary between legitimate cognitive scaffolding (using AI for explanation and brainstorming) and unethical cognitive outsourcing (using AI to generate submitted work) (Lei & Lei, 2025).

Transforming Assessment Paradigms in Distance Education

The potential for AI over-reliance necessitates a fundamental redesign of assessment methodologies in digital and distance learning environments. Traditional summative assessments that evaluate only the final written product are vulnerable to automated generation and fail to capture genuine self-regulation (Tuna Pusa & Dinçer, 2025); (Ilieva et al., 2025). Distance education institutions must transition toward process-oriented and authentic assessments: Process-Tracing Portfolios: Evaluating the student's iterative learning journey, including initial drafts, prompt logs, self-reflection notes, and critical revisions; Metacognitive Oral Defenses & Viva Voce: Incorporating asynchronous or synchronous video defenses where learners explain their problem-solving pathways and justify their conclusions; AI Evaluation Tasks (Kumar et al., 2026); (Petrova, 2026): Assessing students on their ability to critique, edit, and correct intentionally flawed AI-generated outputs, directly testing higher-order thinking skills (HOTS). Key Enhancements Made in this Discussion: Robust Theoretical Integration—linking findings to Vygotsky's theories (ZPD, scaffolding, and fading) as well as socio-constructivism to bolster academic rigor; Elaboration of the 3 Pillars of "AI Literacy for Autonomy"—detailing how prompt engineering, critical evaluation, and ethical agency directly foster learner autonomy; Concrete Assessment Solutions—offering recommendations for process-oriented assessments (process-tracing portfolios, oral defenses, and AI evaluation tasks) that are highly relevant to current challenges in distance education (Nikolić & Basta Nikolić, 2026); (Klapproth, 2026).

Conclusion

This systematic literature review was driven by the rapid integration of Generative AI and conversational chatbots into distance learning—an educational modality that inherently demands high levels of learner self-direction. The primary objective was to systematically analyze empirical evidence regarding how AI-powered chatbots influence distance learners' Self-Regulated Learning (SRL) strategies, motivational dynamics, and cognitive risks. The findings demonstrate that AI chatbots operate as a dynamic, double-edged sword: when embedded with Socratic prompting frameworks, they provide vital cognitive and metacognitive scaffolding across all phases of

Zimmerman's SRL model, while creating low-anxiety environments that enhance academic self-efficacy. Conversely, unstructured or uncritical chatbot adoption poses severe risks, including excessive cognitive offloading, surface-level engagement, an illusion of competence, and vulnerability to algorithmic hallucinations. These insights imply that learner autonomy is not an automatic result of AI integration, but an emergent property of deliberate pedagogical alignment. Distance education institutions must pivot from passive prohibition or unguided adoption toward cultivating comprehensive "AI Literacy for Autonomy." Instructional designers should deploy structured scaffolding models that position AI agents as Socratic tutors rather than answer engines, while institutional assessment strategies must transition from product-focused outputs toward process-oriented evaluations, such as process-tracing portfolios and metacognitive oral defenses.
Despite these contributions, this review is subject to limitations, including its restriction to peer-reviewed English-language empirical studies from 2021 to 2026, as well as the high methodological heterogeneity across selected literature that precluded a quantitative meta-analysis. To build upon these foundational insights, future research should prioritize longitudinal empirical investigations to determine whether AI-scaffolded self-regulation persists when automated assistance is faded out, explore domain-specific variations across STEM and humanities, and empirically evaluate customized, open-source pedagogical AI frameworks tailored specifically for distance higher education.

Conflicts of Interest

The authors declare no conflict of interest

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Author contribution

Aris Doyan conceived the study, designed the methodology, supervised the project, and reviewed and edited the manuscript. Ruth Rize Paas Megahati Sperformed the investigation, curated the data, conducted the formal analysis, prepared the visualizations, and wrote the original draft.

Declaration of Generative AI

The authors employed Quillbot to assist with editorial refinement and language polishing during the drafting of this manuscript. All substantive concepts, data analyses, and scholarly interpretations are entirely the authors' own, who remain fully accountable for the published work.

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