GENERATIVE AI IN HIGHER EDUCATION: PARADOXICAL ROLES IN SELF-REGULATED LEARNING AND ACADEMIC DEPENDENCY

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ABSTRACT
Generative artificial intelligence (GenAI) is rapidly reshaping higher-education learning while creating both opportunities for self-regulation and risks of academic dependency. This narrative review aimed to synthesize how GenAI may support self-regulated learning (SRL), how intensive or uncritical use may promote cognitive offloading, and which contextual conditions appear to distinguish these outcomes. Ten peer-reviewed articles published between 2022 and 2026 were identified through Publish or Perish using Google Scholar and synthesized thematically. The evidence indicates that GenAI can support SRL by functioning as a learning tutor, assisting goal setting and planning, facilitating monitoring and self-evaluation, and improving learning efficiency. At the same time, overreliance on GenAI is associated in the reviewed literature with cognitive offloading, academic dependency, reduced cognitive effort, weaker critical evaluation, and diminished learner autonomy. The synthesis proposes four contextual boundary conditions - purpose of AI use, SRL capability, AI literacy, and intensity of use - that may shape whether GenAI acts primarily as a learning scaffold or as a substitute for cognitive engagement. The framework is conceptual and has not been empirically validated. Higher-education institutions should therefore combine GenAI access with pedagogical practices that strengthen planning, verification, reflection, critical thinking, and responsible AI literacy.

Keywords: Academic dependency, Cognitive offloading, Generative artificial intelligence, Higher education, Self-regulated learning

INTRODUCTION

Generative artificial intelligence (GenAI) has rapidly altered how students in higher education access information, interpret course material, generate ideas, and complete academic tasks. The broader expansion of artificial intelligence in higher education had already produced applications in assessment, prediction, intelligent tutoring, academic assistance, and learning management before the recent wave of large language models (Crompton & Burke, 2023). With conversational GenAI, these capabilities have become more immediate and accessible to students, creating opportunities for personalized support, explanation, brainstorming, and feedback, while also raising concerns about accuracy, overreliance, and responsible use (Chan & Hu, 2023; Kasneci et al., 2023; Tlili et al., 2023). Thus, GenAI is increasingly positioned not merely as an auxiliary technology but as a digital learning resource that can influence how students plan, execute, and evaluate academic work.

From an educational-psychology perspective, the relevance of GenAI extends beyond convenience or task completion. Self-regulated learning (SRL) emphasizes learners' active control over goals, strategies, monitoring, and reflection. Zimmerman (2002) conceptualizes SRL through the cyclical phases of forethought, performance, and self-reflection, while Panadero (2017) shows that contemporary SRL models consistently highlight metacognition, strategic control, motivation, and feedback. Recent work on AI-supported learning suggests that GenAI and educational chatbots can scaffold several of these processes, particularly strategy enactment, resource identification, monitoring, explanation, and feedback (Chiu, 2024; Guan et al., 2025). Guided use of ChatGPT has also been associated with SRL, higher-order thinking, and knowledge-construction processes in blended learning, underscoring the importance of pedagogical design rather than the mere availability of the technology (Lee et al., 2024).

The same affordances, however, can create educational risks when AI becomes a substitute for rather than a support to cognitive activity. Easy access to ready-made answers may encourage cognitive offloading, passive acceptance of outputs, reduced verification, and lower effort in analysis and argument construction. Experimental evidence on AI assistance indicates that learners can become reliant on support instead of learning from it, which directly raises questions about student agency (Darvishi et al., 2024). Reviews of AI dialogue systems similarly identify overreliance as a threat to critical, analytical, and decision-making processes (Zhai et al., 2024), while empirical studies connect problematic AI use with academic stress, self-efficacy, and performance expectations (Zhang et al., 2024). The paradox becomes even clearer in university settings where GenAI may simultaneously strengthen task-related self-efficacy and increase technological dependence (Zhang & Xu, 2025).

These learning concerns intersect with broader issues of academic integrity and responsible educational practice. GenAI can reduce barriers to information and provide personalized, real-time support, but it also creates risks related to hallucinated content, uncritical use, plagiarism, and ambiguity about acceptable assistance (Cotton et al., 2024; Farrokhnia et al., 2024). Student-perception research further indicates that learners recognize both the benefits and challenges of GenAI and expect institutions to provide clear guidance for effective integration (Chan & Hu, 2023). Consequently, the educational question is not simply whether GenAI is beneficial or harmful, but how the purpose, intensity, and quality of use interact with learners' regulatory and evaluative capacities.

Recent syntheses have examined important parts of this problem from different angles. Deng et al. (2025) synthesized experimental evidence on the effects of ChatGPT on student learning, Lan and Zhou (2025) reviewed AI-empowered SRL in higher education, and Sardi et al. (2025) examined relationships among GenAI, SRL, and critical thinking. These studies establish a strong basis for understanding specific outcomes, but they do not fully resolve the apparent contradiction between AI-supported self-regulation and AI-related dependency within a single educational-psychology explanation. The remaining gap concerns how these positive and negative pathways can be integrated and what contextual conditions may help explain why the direction of reported outcomes differs across studies.

This review addresses that gap by integrating SRL and cognitive offloading as complementary lenses and by synthesizing four recurring contextual conditions: the purpose of AI use, SRL capability, AI literacy, and intensity of use. The contribution is therefore not the claim that GenAI has both benefits and risks - an observation already established in the literature - but the proposal of a synthesis-derived framework that organizes these competing outcomes as context-dependent possibilities. Accordingly, this narrative review aims to examine the paradoxical role of GenAI in learning, synthesize evidence on its relationship with SRL and academic dependency, and propose conditions that may shape whether AI functions primarily as a learning scaffold or as a substitute for students' cognitive engagement.

METHOD

This study employed a narrative literature review to integrate findings on GenAI, self-regulated learning, cognitive offloading, and academic dependency. A narrative approach was selected because the available literature is methodologically heterogeneous and includes empirical studies, systematic and scoping reviews, a meta-analysis, and conceptual work. The purpose of the review was interpretive synthesis rather than pooled effect estimation (Ferrari, 2015).

The literature search was conducted through Publish or Perish using Google Scholar and was restricted to publications from 2022 to 2026. The reported search terms were Generative Artificial Intelligence, ChatGPT, self-regulated learning, higher education, AI dependency,

cognitive offloading, critical thinking, and academic integrity. The exact historical execution date and complete Boolean string were not preserved in the source search record available for this revision. To improve reproducibility without reconstructing undocumented information, the following representative query reflects the reported search concepts: ("generative artificial intelligence" OR ChatGPT) AND ("self-regulated learning" OR "academic dependency" OR "cognitive offloading" OR "critical thinking") AND ("higher education" OR university OR learning).

Articles were eligible when they were peer-reviewed journal publications, available in full text, published within the 2022-2026 window, concerned GenAI in learning or education, and substantively relevant to SRL, dependency, cognitive offloading, critical thinking, or closely related learning processes. Records failing any of these eligibility conditions were excluded. No additional language restriction was documented in the source search record. Because the review sought to explain a cross-study paradox rather than estimate a single effect, empirical studies and secondary or conceptual syntheses were retained when they contributed distinct evidence or theoretical interpretation; their evidentiary roles are differentiated in Table 1.

The available search record reports 400 initial records and 10 articles in the final narrative synthesis. Intermediate counts for duplicate removal, title/abstract screening, and full-text assessment were not documented and are therefore reported as unavailable rather than reconstructed. Figure 1 presents this transparent selection record.

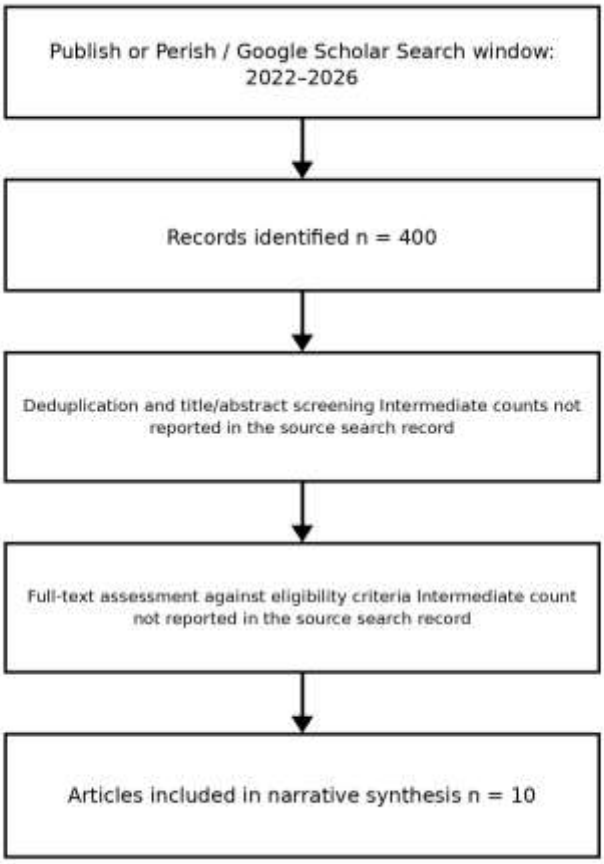

Figure 1. Revised Article Search and Selection Flow

The synthesis used a theory-informed thematic procedure informed by established thematic-analysis reporting principles (Braun & Clarke, 2024). SRL and cognitive offloading served as sensitizing concepts, while recurring functions, risks, and contextual conditions were grouped across the included articles. First, findings were organized into two broad outcome

domains: GenAI as support for SRL and GenAI as a potential source of dependency-related risk. Second, recurrent functions and risks were compared across studies. Third, recurring contextual explanations were synthesized into four proposed boundary conditions: purpose of AI use, SRL capability, AI literacy, and intensity of use. The source record does not document independent multi-reviewer coding or inter-rater reliability statistics; consequently, no inter-reviewer agreement is claimed, and this limitation is acknowledged below.

To strengthen theoretical positioning and the discussion, this revised manuscript also cites additional high-quality international literature on GenAI, educational chatbots, AI-supported SRL, student agency, academic integrity, and AI dependency. These contextual references were not retrospectively added to the documented ten-study narrative corpus and therefore do not alter the reported search flow or the number of studies formally synthesized.

This review analyzed published literature and did not collect primary data from human participants. Institutional ethics approval and participant informed consent were therefore not applicable to the review itself.

RESULTS AND DISCUSSION

Literature Search and Evidence Profile

Ten articles met the stated eligibility criteria. The corpus is heterogeneous in design and educational scope, which is analytically useful for a narrative synthesis but requires careful interpretation. Most evidence concerns university or student learning contexts, whereas Junaedi et al. (2025) focuses on secondary education and Klar (2025) examines K-12 learners. These two sources are retained as cross-level conceptual or supporting evidence and are not treated as direct evidence about university students.

Table 1. Characteristics and Evidentiary Role of the Ten Included Articles

Source	Educational scope/context	Evidence type	Role in the synthesis
Abbas et al. (2024)	University students	Empirical, two-study design	Benefits and adverse learning consequences associated with GenAI use
Aprianingrum et al. (2026)	Student learning context	Phenomenological study	Student experiences related to independence and reliance on AI
Deng et al. (2025)	Educational experimental studies	Systematic review and meta-analysis	Evidence on learning outcomes and effectiveness of ChatGPT-supported learning
Fitriani & Arfini (2025)	University students	Descriptive qualitative/case study	Use of AI to support literacy and academic learning activities
Hashmi et al. (2026)	Students in blended-learning contexts	Mixed-methods study	Relationships among GenAI use, SRL, technological self-efficacy, and cognitive offloading
Junaedi et al. (2025)	Secondary education	Integrative conceptual review	Cross-level conceptual support for GenAI as a learning companion within an SRL framework
Klar (2025)	K-12 education	Mixed-methods study	Cross-level evidence on interaction patterns and support needs when learning with GenAI chatbots
Lan & Zhou (2025)	Higher education	Qualitative systematic review	Evidence on AI support across SRL phases
Mahmud et al. (2026)	Student learning and working memory	Scoping review	Evidence on cognitive offloading and working-memory implications
Sardi et al. (2025)	Educational studies	Systematic review	Evidence on GenAI, SRL, and critical-thinking outcomes

Generative AI as Support for Self-Regulated Learning

Across the core corpus, GenAI is repeatedly described as an external learning support that can assist students without necessarily replacing learner control. Four recurring functions were

identified: acting as a learning tutor or scaffold, supporting planning, facilitating monitoring and self-evaluation, and improving learning efficiency. These functions map onto the cyclical logic of SRL. Planning support corresponds to the forethought phase; feedback and checking can support performance monitoring; and explanation, error identification, and reflection prompts can contribute to self-reflection (Zimmerman, 2002; Lan & Zhou, 2025). This interpretation is also consistent with wider evidence showing that conversational agents most often support strategy enactment and monitoring, even though support for goal setting and reflection remains less comprehensive (Guan et al., 2025).

Table 2. Synthesis of Findings on Generative AI Support for Self-Regulated Learning

No.	Theme	Supporting articles	Synthesized finding
1	Learning tutor or scaffold	Abbas et al. (2024); Aprianingrum et al. (2026); Klar (2025)	GenAI may provide explanations, examples, and adaptive feedback that support understanding.
2	Learning planning	Hashmi et al. (2026); Junaedi et al. (2025); Lan & Zhou (2025)	GenAI may assist goal setting, strategy selection, prioritization, and organization of learning activities.
3	Self-monitoring and evaluation	Abbas et al. (2024); Klar (2025); Lan & Zhou (2025)	Learners may use GenAI to check understanding, obtain practice, receive feedback, and identify errors.
4	Learning efficiency	Abbas et al. (2024); Deng et al. (2025); Fitriani & Arfini (2025)	GenAI may accelerate information access, ideation, and task-related processes, potentially freeing time for deeper learning activities.

The positive pattern should not be interpreted as evidence that AI use automatically strengthens SRL. The reviewed studies vary in design, population, educational level, and the way AI is incorporated into learning. The synthesis instead suggests that GenAI is most compatible with SRL when students remain responsible for goal setting, verification, strategy selection, and reflection. Chiu (2024), for example, positions GenAI-supported learning within motivational and SRL processes rather than treating the tool as an autonomous tutor, while Lee et al. (2024) demonstrates the pedagogical importance of a guidance mechanism in ChatGPT-supported blended learning. In this interpretation, the educational value of AI lies in scaffolding metacognitive activity rather than replacing it.

Risks of Cognitive Offloading and Academic Dependency

A second cluster of findings concerns the possibility that convenience and immediacy can reduce students' direct cognitive engagement. The core literature reports cognitive offloading, academic dependency, reduced critical evaluation, reduced cognitive effort, and weaker learning autonomy as potential risks when GenAI is used intensively or without critical verification. These concerns are reinforced by broader international evidence. Darvishi et al. (2024) found a tendency for students to rely on rather than learn from AI assistance, Zhai et al. (2024) synthesized cognitive risks associated with overreliance, and Zhang et al. (2024) examined problematic AI use as a dependency-related behavior in higher education.

The evidence base for these risks is not uniform. Some claims come from primary empirical studies, whereas others are synthesized in scoping or systematic reviews. Accordingly, the findings support a pattern of concern rather than a single causal pathway. The distinction is important because a narrative review cannot establish that GenAI itself causes dependency or reduced critical thinking across all learners and contexts. Zhang and Xu (2025) illustrate this complexity by showing that GenAI use can be associated with greater self-efficacy while also intensifying technological dependence, reinforcing the need to distinguish immediate task performance from longer-term autonomy.

Table 3. Synthesis of Reported Risks Associated with Generative AI Use

No.	Theme	Supporting articles	Synthesized finding
1	Cognitive offloading	Hashmi et al. (2026); Mahmud et al. (2026)	Learners may shift portions of information processing and problem solving to AI, reducing direct cognitive involvement.
2	Academic dependency	Abbas et al. (2024); Aprianingrum et al. (2026)	Easy access to generated answers may increase reliance on AI for academic task completion.
3	Reduced critical evaluation	Sardi et al. (2025)	Uncritical acceptance of AI output may weaken independent analysis, evaluation, and argument construction.
4	Reduced cognitive effort	Hashmi et al. (2026); Mahmud et al. (2026)	Intensive AI use may decrease students' effort in processing information or solving problems independently.
5	Weakened learning autonomy	Abbas et al. (2024); Aprianingrum et al. (2026)	Reliance on AI may reduce initiative and independent regulation of academic tasks.

Integrating the Paradox: A Synthesis-Derived Framework

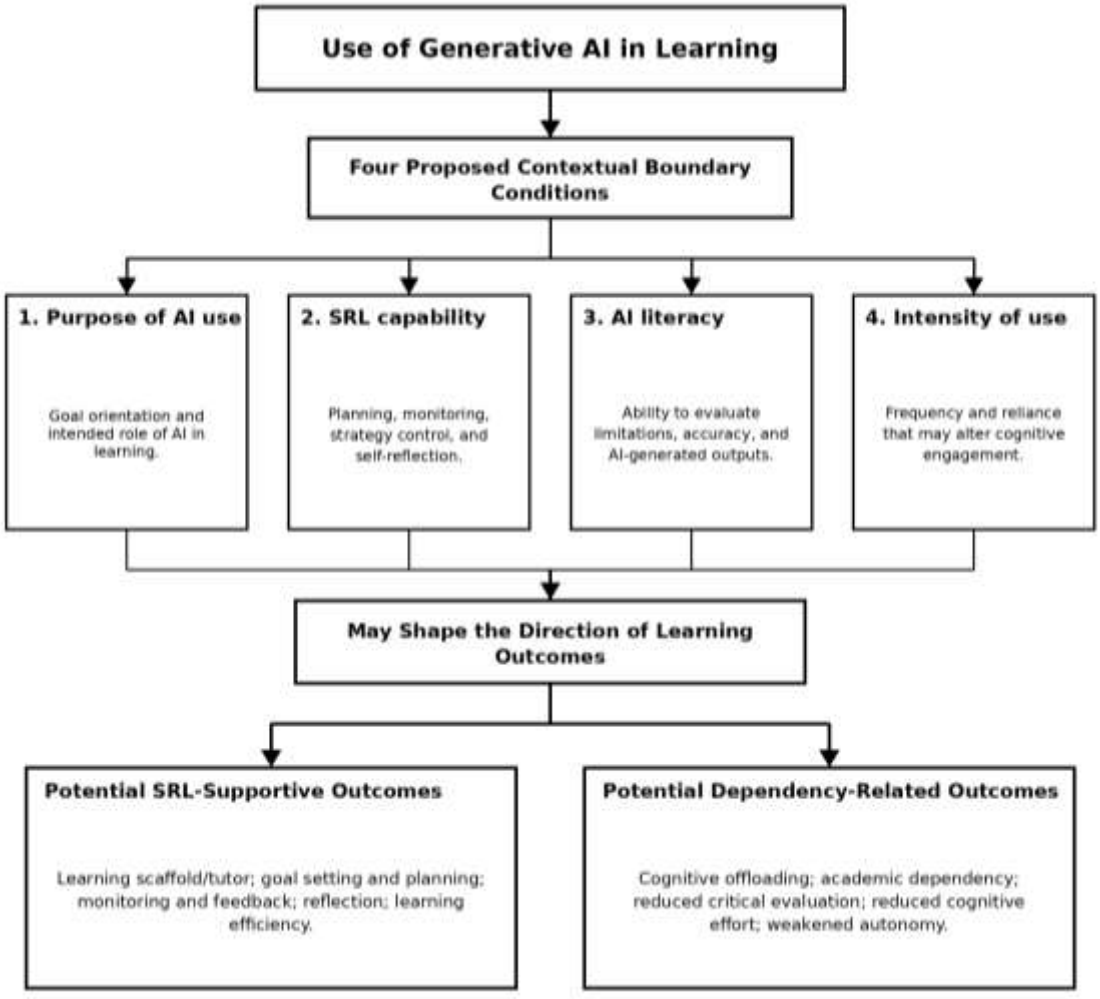

Figure 2. Synthesis-Derived Conceptual Framework of the Generative AI Paradox in Learning

The central paradox emerges because the same technological affordance can support or displace self-regulatory activity. A prompt that helps a student clarify a concept, compare strategies, or reflect on an error can function as scaffolding; the same system can become a substitute for reasoning when it is used primarily to produce final answers that are accepted without verification. This distinction reconciles apparently conflicting findings by shifting

attention from the presence of AI to the manner and context of its use. It also aligns with broader analyses that describe GenAI as simultaneously offering personalized support and creating educational weaknesses or threats when its outputs are trusted without sufficient evaluation (Farrokhnia et al., 2024; Kasneci et al., 2023).

The synthesis therefore proposes four contextual boundary conditions: purpose of AI use, SRL capability, AI literacy, and intensity of use. These conditions are not presented as empirically validated moderators or causal determinants. Rather, they are recurring contextual propositions distilled from the reviewed literature and offered as a framework for future empirical testing. Their theoretical value lies in linking the SRL cycle with the logic of cognitive offloading.

Proposed Boundary Conditions Shaping GenAI Outcomes

Purpose of AI use is most closely associated with the forethought dimension of SRL because goals shape how learners select and use learning strategies. When AI is used to clarify concepts, explore alternatives, or obtain formative feedback, it can remain subordinate to a learning goal. When the primary purpose is to bypass reasoning or simply obtain a finished answer, the likelihood of cognitive substitution may increase. Thus, purpose of use is proposed as a contextual condition rather than a deterministic cause.

SRL capability concerns the learner's capacity to plan, monitor, regulate strategies, and reflect on outcomes. Students with stronger self-regulatory routines may be better positioned to use AI selectively and retain control over the learning process. Conversely, limited monitoring and reflection may make unverified reliance more likely. Evidence that AI guidance can support SRL and higher-order thinking (Lee et al., 2024), together with systematic evidence on chatbot-supported regulation (Guan et al., 2025), supports the plausibility of this condition while also showing that technology does not automatically cover all phases of SRL.

AI literacy refers not only to operational skill but also to understanding limitations, evaluating accuracy, recognizing uncertainty, and verifying generated content. Student research shows that learners perceive both substantial benefits and significant risks in GenAI, making evaluative literacy central to responsible use (Chan & Hu, 2023). In SRL terms, these competencies are especially relevant during performance monitoring and self-reflection because they determine whether AI output is interrogated or passively accepted.

Intensity of use concerns the frequency and degree of reliance on GenAI. Proportionate use may support efficiency without necessarily displacing cognitive work, whereas sustained dependence may increase opportunities for offloading and reduce independent effort. Evidence on student agency, overreliance, and problematic AI use supports treating intensity as a plausible boundary condition (Darvishi et al., 2024; Zhai et al., 2024; Zhang et al., 2024), although the present narrative synthesis does not establish a threshold at which beneficial use becomes harmful.

Analytical Interpretation of Divergent Findings

Differences across the reviewed studies can plausibly be understood in relation to design, educational level, task type, and pattern of AI use. Experimental and meta-analytic evidence emphasizes measurable learning outcomes, qualitative work foregrounds students' experiences and patterns of reliance, and conceptual or systematic reviews integrate broader mechanisms. Likewise, K-12 and secondary-education evidence may illuminate general processes of scaffolding or dependency but cannot be transferred directly to university populations. The wider literature similarly shows that the impact of AI support depends on how assistance is designed and how learners engage with it (Chiu, 2024; Darvishi et al., 2024; Lee et al., 2024). These differences help explain why the literature can report both efficiency and autonomy-

supporting effects on the one hand and cognitive offloading or dependence on the other. The framework therefore emphasizes conditional interpretation rather than a universal positive or negative effect.

Theoretical Contribution of the Paradox Framework

The theoretical contribution of the proposed framework lies in connecting two processes that are often discussed separately. SRL explains how learners intentionally organize learning through goal setting, strategy use, monitoring, and reflection, whereas cognitive offloading explains how cognitive work can be transferred to external tools. GenAI can participate in both processes. When it is used to generate prompts, explanations, alternative examples, or feedback that students subsequently evaluate, the tool can extend the informational environment in which self-regulation occurs. When the same tool is used to replace analysis, synthesis, or verification, external support can become cognitive substitution. The paradox is therefore better understood as a change in the functional relationship between learner and tool rather than as an inherent property of GenAI itself.

Within this interpretation, the four proposed boundary conditions occupy different theoretical positions. Purpose of AI use is most closely related to goal orientation and strategy choice in the forethought phase. SRL capability represents the learner-level capacity to maintain control across forethought, performance, and self-reflection. AI literacy supports evaluative monitoring because it enables learners to question accuracy, detect limitations, and compare generated information with other sources. Intensity of use reflects the degree to which external support becomes routine or dominant and therefore provides a plausible connection to cognitive offloading. The conditions may interact rather than operate independently: high-frequency use, for example, may not necessarily be problematic when students have strong SRL and AI-literacy practices, whereas even occasional use can undermine learning if the purpose is simply to avoid reasoning.

Practical and Policy Implications

For higher education, the synthesis suggests that responsible GenAI integration should preserve student agency and make cognitive engagement visible. Instructors may require students to articulate learning goals before AI use, use AI primarily for formative explanation and feedback rather than final-answer substitution, verify AI-generated information against credible sources, and document what they accepted, rejected, or revised after interacting with AI. Such guidance is consistent with evidence that structured support matters for SRL (Lee et al., 2024) and with students' expressed need for responsible, educationally meaningful GenAI integration (Chan & Hu, 2023).

Assessment design should also distinguish assistance from authorship and efficiency from demonstrated learning. Process evidence, staged drafts, reflective commentary, oral explanation, and transparent disclosure of AI use can help preserve accountability for reasoning. Academic-integrity scholarship emphasizes that institutions require clear policies, training, and proactive responses rather than relying exclusively on detection (Cotton et al., 2024). More broadly, balanced integration should acknowledge both the strengths and weaknesses of GenAI, including personalized support, efficiency, misinformation, and overdependence (Farrokhnia et al., 2024; Tlili et al., 2023).

At the institutional level, AI guidance should combine access with explicit development of AI literacy, critical evaluation, academic integrity, and SRL, consistent with international guidance emphasizing human-centered and responsible educational use of generative AI (UNESCO, 2024). Policies that focus only on prohibition or unrestricted adoption are unlikely to address the underlying learning mechanism. A more educationally coherent approach is to

define acceptable uses by learning purpose, encourage verification and disclosure where appropriate, and support faculty in designing tasks that use AI as scaffolding while retaining meaningful student decision making.

Directions for Future Research

Future research should test the framework using designs capable of distinguishing support from substitution. Longitudinal and experimental studies could examine whether changes in purpose of use, SRL capability, AI literacy, and intensity predict subsequent cognitive engagement, academic dependency, and learning performance. Such studies should operationalize GenAI use beyond simple frequency measures by distinguishing activities such as planning, explanation seeking, feedback, verification, content generation, and answer substitution. This is particularly important because current research indicates that gains in task completion or confidence can coexist with stronger dependence on technology (Zhang & Xu, 2025).

Cross-context research is also needed because the present corpus does not support universal generalization. Comparative studies across academic disciplines, countries, learner levels, assessment formats, and GenAI platforms could evaluate whether the proposed boundary conditions function similarly in different environments. Intervention studies may further test whether explicit SRL prompts, AI-literacy instruction, verification requirements, or reflective assessment practices reduce dependency-related risks while preserving useful scaffolding. These directions would move the proposed model from a narrative synthesis toward a falsifiable and empirically testable educational-psychology framework.

Limitations

This review has several limitations. First, the search relied on a single broad source, Google Scholar accessed through Publish or Perish, which may have omitted relevant records indexed elsewhere. Second, the final corpus was small (10 articles) and restricted to 2022-2026. Third, the included evidence was heterogeneous in design, educational level, country or context, and type of GenAI use; in particular, the corpus contains cross-level evidence from secondary and K-12 education that is used only for conceptual support. Fourth, the available search record did not preserve intermediate screening counts, the exact historical Boolean string, or documented inter-reviewer validation, limiting reproducibility. Fifth, as a narrative review, the study did not conduct a formal risk-of-bias assessment or meta-analytic estimation and therefore cannot establish causal effects or universal effect sizes. Finally, the proposed four-condition framework is synthesis-derived and requires empirical validation before it can be treated as a tested explanatory model. The additional international references incorporated in the revised introduction and discussion strengthen theoretical positioning but are contextual literature rather than retrospectively reclassified members of the ten-study corpus.

CONCLUSION

This narrative review suggests that GenAI can operate either as a scaffold for self-regulated learning or as a pathway toward academic dependency, depending on how it is used and on learner and contextual characteristics. Across the reviewed literature, GenAI was associated with planning, feedback, monitoring, reflection, and learning efficiency, while intensive or uncritical use was linked to cognitive offloading, reduced cognitive effort, weaker critical evaluation, and diminished autonomy. The synthesis therefore proposes purpose of AI use, SRL capability, AI literacy, and intensity of use as contextual boundary conditions that may shape the direction of outcomes. These conditions should be treated as propositions rather than validated causal determinants because the review is based on a small, heterogeneous narrative

corpus. For higher education, the practical implication is to integrate GenAI with pedagogical practices that preserve student agency, verification, reflection, academic integrity, and cognitive engagement, while future empirical studies test the proposed framework across disciplines and educational settings.

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