

The Shared Scaffold: A Metacognitive Framework of AI's Influence on Self-Regulated Writing

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DOI: <https://doi.org/10.47772/IJRISS.2026.102100088>

Received: 09 July 2026; Accepted: 14 July 2026; Published: 25 July 2026

ABSTRACT

The integration of Artificial Intelligence (AI) tools such as ChatGPT and writing needs systematic self-regulation to encourage authentic learning despite transforming the writing process in the fast-changing field of digital pedagogy. Although current studies have extensively documented AI capabilities, there is a theoretical gap in our knowledge of how learners systematically regulate their cognition and behaviour when working with generative AI. This conceptual paper proposes an integrated model of Pintrich Self-Regulated Learning (SRL) and Raoofi et al. taxonomy of L2 writing strategies. The framework maps four phases of regulation, forethought, monitoring, control and reflection, against specific cognitive and metacognitive writing strategies adapted to AI environments that describes how learners can design prompts intentionally, check the accuracy of AI-generated responses, guide the path of their writing, and think about their revised writings. Ultimately, the framework offers a theory-based template for AI transforming change from a shortcut into a cognitive scaffold. This paper foregrounds active learner agency as a priority, rather than passive dependence on AI, and provides educators and researchers with a framework for promoting critical thinking, maximizing writing performance, and supporting autonomous and digitally mediated literacy learning in higher education.

Keywords: (self-regulated learning, writing strategies, AI)

INTRODUCTION

Self-Regulated Learning (SRL) has long been established as a cornerstone of academic success, particularly in complex, multi-stage tasks like academic writing. SRL traditional models emphasize the learner's internal control over their cognitive, metacognitive, behavioural, and affective states. However, the rapid integration of Generative Artificial Intelligence (AI), specifically Large Language Models like ChatGPT, has fundamentally altered the writing ecosystem. While classic writing strategies focus on cognitive planning, drafting, and revising, the introduction of AI introduces a co-creative agent into the loop. This study integrates Pintrich (2002) SRL Framework with Raoofi et al. (2017) writing strategies while evaluating the transformative influence of ChatGPT. The proliferation of AI tools challenges the traditional boundaries of learner autonomy. When an AI can instantly generate outlines, brainstorm ideas, or draft paragraphs, the lines between human self-regulation and machine-driven regulation blurs. Therefore, this study explores the influence of ChatGPT on writers' self-regulating strategies in writing.

LITERATURE REVIEW

Self-regulated learning

Pintrich (2002) SRL framework provides a triadic, cyclical sense of self-regulation across forethought, performance, and self-reflection, with distinct cognitive, motivational or affective, and behavioural components driving goal-oriented writing activity. When situated in a writing ecosystem, forethought processes (task analysis, goal setting, planning) interface with ChatGPT's capacity to generate outlines,

propose rhetorical structures, and surface relevant sources, thereby shaping learners' cognitive strategies and the overall planning horizon (Lai, 2024). During performance, self-control and monitoring interact with AI-provided feedback loops, prompting students to regulate process such as cognitive load, revise arguments, and manage time which ChatGPT can scaffold through iterative drafting cycles. In the self-reflection phase, learners evaluate writing quality, monitor progress, and adjust strategies, while ChatGPT can prompt reflective questions, model meta-commentary, and assist in calibrating self-efficacy and strategic choices. These dynamics align with empirical work showing AI-enabled environments can mediate cognitive, metacognitive, and behavioural engagement in SRL cycles and extend the triadic reciprocity of learning to human AI collaboration (Dahri et al., 2024; Hauske & Bendel, 2024).

Writing strategies

Writing is a multi-phase process characterized by planning, translating, and reviewing, with cyclical revisiting of drafts to refine content, structure, and linguistic choices. This conceptualization aligns with process-writing perspectives that depict writing as iterative rather than linear, necessitating revisiting and editing stages as integral to producing coherent discourse. The cycle underscores the centrality of revision as a strategic activity where writers reallocate cognitive resources to enhance macro-structural decisions such as organization and argumentation while micro-level features grammar and diction. Process-oriented approaches encourage writers to manage their writing through structured steps, often employing scaffolds or feedback mechanisms to sustain progression through planning, translating, and reviewing.

Writing is not only a linguistic output but also a strategic cognitive process as proposed by Khairuddin et al. (2021) that integrates self-regulation of cognitive procedures in text production, connecting planning, translating, and reviewing to purposeful control over writing tasks. Self-regulatory practices which include planning ahead, monitoring comprehension, evaluating evidence and structure are strongly associated with writing quality, especially in longer or more complex genres. Writers use metacognitive planning to activate topic knowledge, audience considerations, and organizational schemas, and then employ self-regulation during translation and revision to align content which supports better strategic deployment of both content and linguistic resources, particularly in academic or professional writing contexts.

Writers deploy rhetorical devices to shape text types, structures, and audience engagement that distinguishes between text-type or genre-aware strategies and self-regulatory strategies as complementary pillars of writing. Skilled writers use rhetorical techniques to enhance persuasiveness and coherence. Rhetorical strategy is linked to genre awareness and audience adaptation during drafting and revising. These strands collectively argue for instructional practices that cultivate both knowledge of genre-specific conventions and monitoring processes that guide writing decisions.

In the proposed ecosystem, ChatGPT mediates these writing strategies by providing immediate feedback on grammar, coherence, genre conventions, and rhetorical structure, while also eliciting self-regulatory responses e.g., prompting monitoring prompts. This aligns with findings that AI-assisted writing interventions can enhance SRL processes, planning or monitoring, and task-specific writing outcomes, provided there is explicit metacognitive scaffolding to prevent excessive cognitive offloading (Chen & Alibakshi, 2026).

Influence of ChatGPT

ChatGPT has a dual role in higher education as both an adaptive cognitive scaffold and a potential disruptor of critical thinking. ChatGPT acts as an external prompt-driven partner capable of real-time feedback, content generation, and linguistic polishing, thereby acting as a proxy for certain self-regulatory functions. AI-mediated guidance can improve writing achievement and support metacognitive self-regulation when integrated with explicit metacognitive prompts, reflective practice, and safeguards against over-reliance or metacognitive laziness (Li et al., 2026). Concerns about dependence and reduced deep processing highlight the need for design features within the ecosystem that preserve learner agency, foster higher-order thinking, and promote deliberate reflection e.g. guided planning, and scaffolded peer collaboration (Almudara et al., 2026).

Theoretical Proposition

Proposition 1: Metacognitive knowledge and regulation mediate the relationship between forethought and performance phases of SRL as the higher metacognitive awareness predicts more adaptive strategy selection and better monitoring during AI supported tasks.

Proposition 2: Affective factors which includes motivation, self-efficacy and anxiety modulate the initiation and maintenance of SRL processes. The positive affective states predict greater engagement in planning and monitoring, while anxiety can hinder persistence unless mitigated by scaffolding and transparent AI feedback loops.

Proposition 3: Effective cognitive strategies and regulation lead to adaptive behavioural regulation. However, reliance on AI-generated cognitive support risks cognitive offloading that weakens long-term autonomous cognitive control unless accompanied by explicit prompts for active cognitive engagement and justification of outputs.

Proposition 4: Writing tasks provide a diagnostic and developmental lens for SRL development in AI-rich contexts; changes in writing quality, revision behaviour, and self-reported writing strategies reflect underlying SRL dynamics and can serve as practical indicators of SRL progression. Writers with weak baseline knowledge of writing strategies are more likely to engage in maladaptive cognitive offloading when using AI for complex tasks like paraphrasing.

Proposition 5: The inclusion of ChatGPT in the academic writing process shifts the writer's metacognitive load away from text generation and heavily toward evaluative critical thinking and verification strategies. ChatGPT and similar AI tools can support SRL when embedded within deliberate pedagogical designs that promote prompting, self-assessment, and personalization. There is a risk of metacognitive erosion, cognitive offloading, and diminished autonomy ChatGPT acts as an affective cushion that increases short-term writing self-efficacy, however it requires highly developed effort regulation to translate this confidence into genuine academic achievement.

DISCUSSION

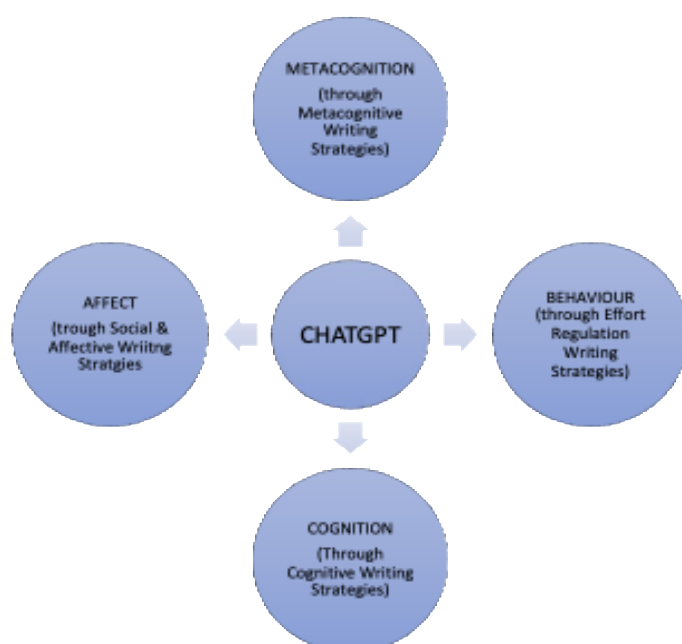


Figure 1 Conceptual Framework of Self-Regulated Learning Writing Strategies and ChatGPT

Figure 1 shows the conceptual framework of the self-regulated learning writing strategies and ChatGPT. This study is rooted in the four areas of Self-Regulation namely; Metacognition, Behaviour, Cognition, and Affective (Pintrich, 2002). These four areas comply to the writing strategies such as metacognitive, effort regulation, cognitive, social, and affective strategies when the writers write (Raoofi et al. 2017). Writers depend on their knowledge of writing strategies while writing to complete the writing task (Khairuddin, et. al, 2021). Nevertheless, a writer needs to make connections between ideas in their research topic for academic writing assignment. Paraphrasing is not an easy task for many writers prompting them to seek the assistance of ChatGPT (Rahmat, 2021). The use of ChatGPT impacts learners' critical thinking abilities as in academic achievement and engagement in writing. Pintrich's model suggested that cognition requires deep strategic elaboration. When writers deploy planning and drafting strategies, they typically rely on internal schema activation (Khairuddin et. al, 2021). However, Youssef et al. (2024) demonstrate that ChatGPT alters this by introducing cognitive offloading. The writer no longer needs to generate language from scratch; instead, their cognitive strategy shifts from generation to curation and synthesis. The most critical transformation occurs in metacognition. In traditional writing, monitoring is inward-looking e.g. "Does this sentence reflect my thought? In an AI-influenced environment, metacognition becomes dialogic and outward-looking e.g. "Is the AI prompt specific enough?". A higher order of metacognitive evaluation may be compromised if there is blind trust in using ChatGPT.

CONCLUSION

This theoretical framework provides a holistic roadmap for understanding how Generative AI transforms the psychological and practical architecture of academic writing in examining the SRL trajectories, metacognition, affect, and writing performance in GenAI-enabled contexts. By synthesizing Pintrich (2002) and Raoofi et al. (2017), AI is no longer viewed as either a cheating tool or a productivity booster. ChatGPT is instead framed as an active co-regulatory agent that defines a self-regulated writer as ChatGPT can catalyses planning, monitoring, feedback, and reflective practice across diverse writing tasks. The proposed visual model places writing as an adaptive, AI-mediated activity area in SRL domains and writing strategies mutually configure learning trajectories, with ChatGPT serving as a dynamic mediator that can both scaffold and challenge the writer's self-regulatory processes. This reframing sets the stage for empirical interrogation of how AI-guided writing ecosystems influence literacy development, metacognition, and self-regulation in higher education.

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