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"AI Enhanced My Critical Thinking": Investigating the Paradox of Student Perceptions and Cognitive Offloading in GenAI Use

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Keywords: Generative AI, Cognitive Offloading, Critical Thinking, Metacognition, Epistemic Confinement, Higher Education

Abstract

While students frequently claim Generative AI enhances their critical thinking, recent research warns of skill atrophy and metacognitive laziness. This study explores this paradox using a mixed-methods analysis of 188 postgraduate student workflows. We introduce a novel Four-Tiered Cognitive Offloading Framework (4COF) to reveal how students distribute cognitive load. Our findings show that while approximately half of the cohort believes AI acts as an intellectual partner, they actually fall into an efficiency trap, bypassing foundational learning. We define a state as Epistemic Confinement, where students experience an illusion of competence, feeling as though they are thinking independently while operating entirely within AI-constructed analytical boundaries.

Background

The integration of Generative AI (GenAI) in higher education has sparked intense debate regarding its impact on student cognitive development, directly aligning with this symposium's sub-theme of GenAI and critical thinking. While emerging student narratives and empirical surveys report that GenAI enhances analytical reasoning and simplifies complex information (Alghamdi, 2025; Crompton & Burke, 2023), cognitive psychology warns of the systemic dangers of cognitive offloading (Risko & Gilbert, 2016). When students delegate mental processing to external tools, they risk long-term skill atrophy (Macnamara et al., 2024) and metacognitive laziness (Fan et al., 2025). This study explores the tension between students' perceived cognitive enhancement and the risks of cognitive offloading, questioning whether these students are experiencing genuine intellectual expansion or a metacognitive illusion of competence (Koriat & Bjork, 2005) fuelled by the structural fluency of AI outputs.

This study investigates the paradox of perceived enhancement versus actual engagement by examining the relationship between postgraduate students' perceptions of GenAI-supported learning and their actual behavioural interaction strategies. Specifically, our research is driven by three intersecting aims: (1) to map how students conceptualise and justify GenAI as a critical thinking enhancer; (2) to systematically track the locus of cognitive agency across their actual interaction workflows; and (3) to measure instances of metacognitive miscalibration, where students conflate the AI's structural fluency with their own conceptual mastery. By answering these questions, we aimed to decode the systemic behavioural patterns of human-AI collaboration to understand exactly how and why students distribute cognitive agency across the critical thinking workflow, and to identify the specific developmental traps that occur when learners over-rely on GenAI for academic tasks.

We employed a sequential mixed-methods exploratory design analysing 188 authentic reflective essays from postgraduate Information Systems and related discipline students detailing their self-directed workflows using GenAI (Creswell, 2024). To bridge qualitative self-reporting and quantitative behavioural mapping, we developed a gap analysis protocol anchored in Facione's (1990) Delphi consensus framework of critical thinking. Student workflows were coded into a novel Four-Tiered Cognitive Offloading Framework (4COF): Tier 1 (Foundational/Sense-Making), Tier 2 (Executive/Decision-Making), Tier 3 (Expressive/Articulation), and Tier 4 (Metacognitive/Self-Correction).

Our initial findings challenge the traditional AI-as-Surrogate cheating narrative. While students fiercely protected their executive reasoning (Tier 2) to avoid losing their intellectual agency, the analysis revealed that over 95% of the cohort still fell into an efficiency trap. As developing learners, these students fully offloaded foundational interpretation and analysis (Tier 1) to AI. In addition, approximately 17% of the cohort were highly susceptible to Epistemic Confinement, a structural trap where students delegate the initial problem framing to GenAI and subsequently fail to evaluate this AI-generated foundation. Because the student ultimately draws the

final conclusion, they experience an illusion of competence, feeling as though they made independent, high-level decisions while actually operating entirely within an intellectual reality pre-constructed by GenAI.

This research provides educators with a common vocabulary and an empirical framework to measure how cognitive load is distributed in GenAI interactions. It argues that the pedagogical impact of GenAI is highly dependent on existing domain expertise. Consequently, we propose a shift from a binary AI use or no-use discussion toward a developmentally staged approach. This involves intentionally restricting Tier 1 offloading for novices to mandate foundational schema building, while deliberately scaffolding higher-order GenAI use for advanced learners, supported by process-oriented assessments and explicit metacognitive training.

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