

Peer Review

Review of: "Metacognition and Pedagogy in the Era of Artificial Intelligence"

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Reviewer Comments

1. General Impression

The article addresses a timely and important topic: the role of metacognition in education within the context of rapid AI development. The authors argue convincingly that traditional content-heavy pedagogies are insufficient in an age where AI is reshaping knowledge acquisition and labor markets. They advocate for metacognitive approaches that build adaptability, reflection, and lifelong learning.

The paper is **clear, well-structured, and theoretically grounded**, but it also has areas where depth, methodological rigor, and critical engagement could be improved.

2. Strengths

Relevance and timeliness: The intersection of AI and pedagogy is highly topical, and the focus on metacognition as a “final human frontier” is compelling.

Clear structure: The article flows logically, moving from the need for new pedagogy → metacognition → current AI landscape → classroom applications.

Interdisciplinary approach: It combines perspectives from education, psychology, and computer science, which strengthens its appeal to a broad readership.

Practical orientation: The section on classroom practices (reflection journals, self-assessment, collaborative reflection) adds value by showing how theory can be applied.

Integration of examples: References to *Deep Blue*, *AlphaGo*, *AlphaZero*, and *DeepSeek* make the AI discussion concrete and relatable.

3. Weaknesses and Limitations

Lack of empirical evidence: The article is primarily conceptual and review-based. While this is acceptable for a review article, it would benefit from integrating empirical findings or case studies demonstrating the effectiveness of metacognitive pedagogy in AI-driven contexts.

Over-reliance on descriptive narrative: Many sections summarize known AI milestones (e.g., Deep Blue, AlphaGo) but offer limited critical analysis of their pedagogical implications.

Limited engagement with critical debates: The article assumes metacognition is the “last frontier” without deeply considering counterarguments (e.g., whether AI could also develop forms of metacognition, or whether human metacognition itself has limits in fast-changing digital ecosystems).

Contextual gaps: While the focus is global, there is little discussion of cultural or regional variations in applying metacognitive pedagogy. Education systems differ widely; a one-size-fits-all claim may not hold.

Reference base: Although relevant, the reference list is somewhat narrow. Stronger engagement with recent education and learning sciences research (post-2020, beyond the authors’ own work) would strengthen credibility.

4. Suggestions for Improvement

Deepen the critical discussion: Move beyond describing AI milestones and explicitly analyze their implications for pedagogy and metacognition.

Include evidence or case studies: Even brief summaries of experimental or observational studies on metacognitive teaching in AI-enabled environments would strengthen the article.

Address limitations: Acknowledge that implementing metacognitive pedagogy can face barriers—teacher training, cultural resistance, assessment constraints.

Expand the literature base: Incorporate more diverse perspectives, including critiques of metacognition as a universal solution, and literature from cognitive science and educational technology journals.

Clarify contribution: The article sometimes reads like a broad overview. A sharper articulation of *what is new* in the authors’ perspective (e.g., linking DeepSeek to metacognitive debates) would make the contribution clearer.

5. Recommendation

Decision: Publish with major revisions

The article is highly relevant and well-written, but it currently reads more as a **broad essay** than as a **rigorous scholarly review**. Strengthening its empirical grounding, expanding critical engagement, and situating the argument within a wider literature base would make it publishable in a strong academic outlet.

The article has strong potential, especially in framing *metacognition as a human advantage in the AI era*. However, before publication, it should integrate more evidence, broaden its references, and refine its critical depth.

Declarations

Potential competing interests: No potential competing interests to declare.