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Peer Review

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

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The question of what and how we should teach our students so they can thrive in the workplaces of the future is certainly an important topic for debate and one that educators are already having given the current advancements and proliferation of AI technologies and tools.

This paper will certainly stimulate discussion in the education community as we are all finding our way with these technologies and trying to adapt our approaches.

The technical aspects of the paper are clearly explained with good detail of the advancements in deep learning taking place and the use of concrete examples (AlphaGo, AlphaZero, DeepSeek-R1-Zero, and aspects of facial recognition).

I found the structure of the paper difficult at first; it was hard to know where the authors were going in the earlier sections of the paper and who their target audience is for this work. I think the arguments for the need for a new pedagogy could be made more strongly if there was more context setting and more reference to pedagogical literature to support the claim that current practices still focus heavily on content transmission and memorisation. The context setting is rather generic in terms of focus and would benefit from more reference, perhaps to Computer Science education in particular, as I am assuming this paper is intended mainly for educators in this field?

There is a whole body of pedagogical literature in Computer Science relating to the need for metacognitive practices to be incorporated to help ensure that students can transfer their learning to new contexts. Educators in Computer Science know that rapid change is a defining characteristic of the field that requires professionals to be lifelong learners who can adapt, reflect on their skills, and learn as they go, depending on the challenges presented. There also seems to be some confusion over the terminology as the words training and education are used alternately. Whilst these are not mutually exclusive terms, I think it is important to differentiate, again, giving a more concrete outline of context and target audience,

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which would help clarify and ground the work at some educational level so readers can relate to the issues presented more readily.

The paper could use more recognition of wider issues concerning AI development and adoption. There needs to be consideration of how the development of AI systems should be controlled so that our fears about them overtaking us are not realised. Machines will do what we ask them to do, and presently we are in control of how they develop and what problems they solve. I think a new pedagogy is definitely needed, but it should also include more critical thinking about how and where AI is best placed to be used. Professionals of the future need to take ownership of their position on AI and not just view it as something they need to compete with. We need our students to be able to adapt and to reflect not only on their own learning but also on where AI fits in terms of their goals, and where it does not, so some acknowledgement of these issues and the need for the debate to include these would strengthen the authors' arguments for change.

I would have liked more examples of how well the metacognitive practices mentioned in the paper have worked in the past, perhaps from pedagogic case studies where the interventions have been evaluated by educators. The audience needs to know what difference these approaches will have on their students' learning outcomes and whether the changes they make to their practice will be valued by employers who may have the option to use cheap AI alternatives. We need to be clearer on what actually differentiates humans from machines and recognise it is not just our metacognitive abilities. Creativity is one aspect that is mentioned, but only very briefly, so a more rounded view of what skills, competencies, and dispositions we should be fostering in education in the paper would provide a clearer picture of the task educators now face in trying to future-proof our students and make them a preferred choice when compared with AI systems.

The paper is very interesting and very timely, and I think the debate put forward is one we certainly need to have. It is well-written and presented but would be improved with more reference to concrete examples in education and a wider view of our use of AI and how it should be controlled and used for improving education and society rather than these technologies being viewed primarily as something we will need to adapt to and compete with professionally and as citizens in the future.

Declarations

Potential competing interests: No potential competing interests to declare.