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Artificial intelligence: shortcuts, assistive technology and extended cognition

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Research Domains

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Abstract

The rise of Artificial Intelligence (AI) in higher education is shifting from concerns over assessment and academic integrity towards exploring its role in teaching and learning. However, there is a lack of a conceptual model to guide decisions about AI's contributions to education. This paper builds on prior work on two uses of technology: as a shortcut in sports and as assistive technology in education. The first highlights the potential pitfalls of shortcuts that bypass mastery, while the second emphasises the value of assistive technologies to support cognitive tasks. Drawing on work in extended cognition, the paper argues that effective AI in education requires overall human executive control, its use in socially positive ways, and its integration with human cognition. The paper concludes with examples of educatively useful AI systems and the learning needs of students for them to appropriately use AI.

Full paper

The rise of Artificial intelligence (AI) continues unabated. In higher education, there is a move from an overriding concern with assessment and academic integrity to broader issues of the role of AI in teaching and learning. Much of this is speculative, individual academics and teams innovating their teaching practices. What remains absent is a conceptual model to support decision making as to what AI systems can contribute to learning, and in what ways.

In this paper, I discuss two distinctive ways in which technology in general has been conceived to support human endeavours: in sports (Schermer, 2008a; 2008b), and as an assistive technology in education (Pritchard, English and Ravenscroft, 2021). Schermer discusses the role of technology as a shortcut to achieving the results of elite sportspeople.

She identifies the potential damage that taking such technological shortcuts might cause, dismissing some and defending others. For example, she notes that taking a shortcut with technology can efficiently achieve desired outcomes but at the cost of fully engaging in the journey towards mastery and the learning that comes from it. Pritchard, English and Ravenscroft are concerned about those situations in which individuals are unable to perform certain tasks, and the kinds of assistive technologies that enable them to do so. Following Pritchard's other work (see Pritchard 2014; 2018) they are concerned with tasks with a distinct cognitive dimension. Whilst this previous work is in technology rather than directly in AI, is provides a foundation for developing a conceptual model for using AI in education.

It is worth noting that AI identifies a very broad range of different technologies. Rather than a single system, AI ought to be conceived in a similar way to 'games'. Just as Rugby, Tiddlywinks and Poker are all games and yet very different, so different types of AI systems are very different. Narayanan and Kapoor (2024) specifically mention the need to distinguish predictive from generative AI. They further argue that AI systems ought to be categorised in terms of their effectiveness at doing what they claim to do, and their potential impact on society. Their analysis of real-world AI systems shows that many, mainly predictive AI systems do not live up to the claims made about them and are often socially damaging. In part, this is a result of predictive AI systems rarely being under the supervision of a human user, they are designed to be autonomous. Generative AI shares several of the flaws of predictive AI but, from an educational perspective, has the advantage of being open to appraisal by the human user. For example, using an AI text creator/editor system usually allows the user to decide whether the edit is preferable to the original text and expresses the ideas in a way the human user sees as appropriate.

This distinction foregrounds the important of the location of executive control: is this in the AI system or the human user? Pritchard, English and Ravenscroft's (2021) analysis of assistive technologies draws upon the extended cognition thesis. Extended cognition argues for the importance of material cognitive tools external to the human brain to be seen as part of the individual's cognitive structure. The effectiveness of these external cognitive tools is dependent on the ways they integrate with the internal cognitive tools of the person using them. Simple cognitive tools include pen and paper, electronic calculators and post-it notes. Assistive technologies are more advanced tools, often for supporting the completion of cognitive tasks.

In this paper, I argue that this account offers an educatively fruitful conceptualisation of AI in supporting learning. Not all AI systems can be characterised in ways that are supportive of learning, and different AI systems may have different roles depending on the age of the human user and the focus of the

learning. Nevertheless, there are three significant characteristics. Firstly, the AI system must be under the executive control of the human user. The final output is their responsibility not the technology's. Secondly, the AI system, as it is used by the human, must be broadly socially positive, for example, by not supporting cheating or undermining other students. Thirdly, the AI system and human user must have developed a form of integration such that the AI system is designed to be used by such humans and the human user has learnt to use the AI system.

In conclusion, I identify some real-world AI systems that can be used educatively and the necessary educative experiences that students need in order to use such systems appropriately.