



The Evolving Educational Landscape: AI-Driven Virtual Classrooms and the Changing Role of Human Teachers

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Letter to the Editor

In recent years, the emergence of generative artificial intelligence (AI) platforms, such as ChatGPT, has ignited fervent discourse over the future of education¹. The evolution of technology thus demands a fundamental reassessment of the classical teaching methods and practices in an AI-supplied and closely-knit learning environment.

AI and machine learning (ML) indeed have the chance to considerably empower and, in some cases, even change the role of human teachers in worldwide education². Rather than outright replacement, the more immediate and likely scenario is one in which the role of the teacher is significantly redefined³; however, this redefinition may differ substantially across educational contexts, including primary, secondary, and higher education, where pedagogical objectives and learner autonomy vary^{4,5}.

Generative AI is increasingly capable of addressing diverse educational needs across different learning stages. In primary and secondary education, AI-driven systems such as Khan Academy⁶ and Duolingo^{7, 8}, demonstrate the potential to support foundational skill development through personalized instruction at scale. These systems provide real-time feedback and tailored learning paths, marking an important frontier in the personalization of education, particularly in large-scale and resource-limited educational settings⁹.

Enhanced natural language processing (NLP) enables AI tutors to engage students in meaningful, context-dependent dialogue, providing detailed explanations aligned with individual learning styles and cognitive profiles¹⁰. AI teaching assistants can adapt instruction for learners of different ages and proficiency levels¹⁰. At the beginning of each session, mood and energy levels may be assessed using voice tone analysis and video cues, supporting a more emotionally responsive learning environment. Students can set learning objectives, monitor progress, and receive motivational feedback, fostering engagement and a sense of achievement. When thoughtfully designed, AI-driven educational frameworks can help overcome conventional constraints. For example, large language model (LLM) based tutoring systems

can provide personalized education across multiple languages and subject areas, thereby improving access to quality education for diverse learner populations. With this technology, learners from all walks of life can move through the material at their own speed; thus, the long-standing barrier of access is being broken.

The constraints and drawbacks of AI are significant and require urgent attention, particularly in educational practice and policy design. AI systems may reinforce societal biases present in unrepresentative training data, leading to algorithmic bias and potentially inequitable educational outcomes, especially for marginalized groups¹¹. Moreover, generative AI models could also prove to be sources of very believable yet non-existent information ("hallucinations"), which would worsen the distribution of false information. Key technical and ethical challenges include data privacy concerns, reliance on opaque AI models for making decisions (the "black box" problem), and the absence of robust governance frameworks, all of which complicate accountability and regulatory oversight in educational systems¹¹.

In contrast, the promise of this technology is riddled with several problems: using AI, instead of human teachers, can spark highly contested debates related to teaching and student development. Increased reliance on AI may alter traditional teaching roles, particularly in knowledge delivery and assessment. Such shifts are likely to transform student-teacher interactions and necessitate substantial changes in teacher education and professional development.

Discourse on this shift often neglects the invaluable contribution human relationships make to education. Indeed, the salient features of a learning experience that machines cannot replace are collaborative discussions, emotional support, and mentorship. In this future, we will also need to address pragmatic and moral issues accompanying the integration of AI. We must make sure that AI improves, instead of shrinking, the role of human educators. The aim is not to build classrooms without teachers but to create classrooms where teachers are supported by better tools.

Currently, we are in an important era of collaboration among educational professionals, legislators, technologists, and



students. As AI becomes more integrated into society and part of everyday life, it raises many questions about the effects of generative forms of AI on the role of teachers and on the changing nature of education as a whole. We welcome the many opportunities presented by AI; however, we also want to ensure that the things we value most still exist in education - those aspects that only humanity can fulfil.

In conclusion, generative AI is a great opportunity for education systems. However, its implementation calls for utmost care, collaboration, and good administration. As stakeholders in education, we share responsibility for shaping a future in which technology supports teaching without diminishing the essential human relationships at its core. Our success in this merger will depend on our ability to utilize the scalability and personalization of AI while still protecting ethical and socio-emotional pillars of education.

Ethical Considerations

Not applicable. This Letter to the Editor does not involve human participants, animals, or the collection or use of personal data.

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Conflict of Interest

The authors declare that they have no competing interests.

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