

The Potential of Educational Agents for Generating New Possibilities of Education

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“Education is one thing no one can take away from you.”

-Elin Nordegren

IN THE EDUCATIONAL world, the pursuit of innovations and transformation is ongoing to adapt education to ever-evolving societal needs and technological advances. Artificial intelligence (AI), a technology heavily adopted in many sectors, has been treated as a significant instrument for driving educational reform. AI can be applied to multiple areas in education, including personalized learning, intelligent tutoring, digital educational management, and virtual learning spaces. For example, adaptive learning systems, such as DreamBox Learning, can recommend personalized learning paths based on the student’s performance and progress, resulting in enhanced learning outcomes (Huang et al., 2021). Intelligent tools, powered by machine learning and deep learning algorithms, which have the capacity to analyze students’ learning behavior and performance data, can assist the teacher in predicting learning needs of their students and optimizing instructional content accordingly, thereby improving their teaching efficiency (Chen et al., 2020). AI technologies like facial recognition can be used in school administration, such as campus security monitoring and library management (Huang et al., 2021). Additionally, virtual reality and augmented reality technologies can be applied to create virtual classrooms and laboratories to provide immersive learning experiences, facilitating students’ understanding and mastery of complex concepts. Applications of AI technologies like these have markedly elevated the intelligent levels of schooling, creating new possibilities of education.

In recent decades, the use of AI agents in education has garnered much attention of the research community. Research suggests that educational agents can provide students with personalized support through natural language interactions, including helping

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them tackle challenges of schoolwork by acting as virtual tutors or chatbots (Jiang et al., 2024). Martens (2023) investigated the role of AI conversational agents in online collaborative learning to find that they could significantly increase student engagement. Furthermore, AI agents can identify the student's emotional states through affective recognition and offer corresponding emotional support to improve their learning experience. For instance, Dieker et al.'s (2024) study demonstrated how AI agents can support student learning and teacher instruction through affective recognition and biometric technologies. These studies highlight the potential of educational agents.

In addition to single-agent applications, multi-agent systems have undergone significant advancement. Zhejiang University in China developed the platform "chat.zju.edu.cn," applying multi-agent collaboration to teaching, research, and educational management. Chen et al.'s (2025) study provides a detailed description of the platform's architecture and application, showcasing its comprehensive capabilities as a multi-agent system. Regarding its role in teaching, the platform can recommend learning materials and courses catering to the student's progress, interest, and ability level; it can also monitor teacher-student in-class interactions in order to provide instant feedback and personalized Q&A support while also helping the teacher adjust their teaching pace in a timely manner. In the area of scientific research, the platform is used by the researchers to oversee experimental processes in real time, intelligently adjusting parameters to ensure accurate data collection. Additionally, the platform is applied to routine administrative handling, such as reimbursement, leave requests, classroom reservations, etc., to enhance administration efficiency.

At present, the application of AI agents in education remains in its initial stages, facing challenges in terms of cost-effectiveness, data security and privacy, algorithm bias, and the adaptability to the new technology on the part of the teachers and students (Khodorkovskiy, 2024). More research is needed to validate the effectiveness and long-term impacts of educational agents. A Review of Educational Agents: Definitions, Features, Roles and Development Trends in this issue surveys the existing definitions of the educational agent and descriptions of its features, highlight its roles in education, and analyze the development trends of the technology (Zhou, 2025). It is hoped that the article will spark more research on the application and development of AI agents in education.

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