



The Role of Artificial Intelligence Technology in Improving the Quality of Education

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Abstract

The future of education is aligned with advances in artificial intelligence (AI) technology that significantly change how we learn, teach, and manage educational systems. This article reviews the critical role of AI technology in improving the quality of education in the digital era. AI technology allows for better personalization of education according to each student's needs and interests and changes how teachers teach and students learn. By using machine learning algorithms and data analysis learning algorithms and data analysis, education systems can identify patterns in student learning behavior, predict individual needs, and provide timely interventions. The article also highlights the challenges and opportunities in implementing AI technology in schools, including data privacy concerns, digital divides, and new skills required by educators. By understanding AI technology's role in improving education quality, we can design a more inclusive, responsive, and effective education system for a better future.

Keywords: Artificial Intelligence; AI Technology; Digital Divide

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SDGs: Quality Education (4); Decent Work and Economic Growth (8); Peace, Justice and Strong Institutions (16)

1.0 INTRODUCTION

In today's digital era, access to information has become easier and faster thanks to the internet (Jose et al., 2020). Students are no longer limited to textbooks in their school libraries but can access learning resources from various online sources, including scholarly articles, learning videos, and e-learning platforms. The scope of education is by what is in the curriculum. Teaching has also undergone significant changes. Teachers can now use multimedia, such as PowerPoint presentations, animated videos, and interactive simulations, to explain complex concepts more visually and engagingly. Students can understand the material well to make learning more enjoyable (Wi. Susanti et al., 2022).

One of the most significant impacts of technological advancements is distance learning or online. When schools must be closed for various reasons, such as the COVID-19 pandemic, the education system can quickly switch to online platforms to continue teaching and learning (Verawardina, 2020). It changes the traditional way of learning in the classroom and introduces new challenges, such as ensuring stable internet access for all students.

Not only that, but technology also supports personalized learning (Hardika et al., 2020). Teachers can adjust the curriculum using machine learning algorithms and provide materials that suit each student's learning pace. Education becomes adaptive, and individual needs become responsive.

Global collaboration has also become easier with the help of technology. Students can interact with their peers from different countries through online platforms, broadening their horizons about global cultures and perspectives (W. Susanti et al., 2021). Overall, the changes in education due to technological advancements include not only the use of new tools and platforms but also stimulate critical thinking about how education should be structured and implemented to prepare future generations for the challenges of an increasingly complex and rapidly changing future (W. Susanti et al., 2020).

Education is the foundation for a nation's social, economic, and cultural progress. However, in the ever-evolving digital era, new challenges arise in meeting complex and diverse educational needs (Oliveira & Saraiva,

2023). Resource constraints, access gaps, and changes in job market demands highlight the need for innovation in education systems to improve the quality of learning and ensure equal access for all individuals (Hailu, 2024).

Meanwhile, the development of artificial intelligence (AI) technology has fundamentally changed the educational landscape. AI promises the potential to transform the way we learn, teach, and manage education by providing innovative solutions to the challenges faced by today's education system (Li & Su, 2020). With advanced data analysis and intelligent machine learning, AI technology enables better personalization of education, more intelligent decision-making, and more efficient monitoring of student learning progress (Zhang et al., 2023).

However, despite its great potential, the application of AI technology in education also raises various challenges and ethical questions. Data privacy, the digital divide, and the ability of educators to adapt to technological developments are some of the aspects that need to be considered in developing an AI-based education system (Milicevic et al., 2024).

Chatbots in education are one concrete example of how AI improves the learning experience (Lai, 2024). Students can ask questions whenever they need help, and AI quickly provides accurate and helpful answers (Alam & Asmawi, 2024). Chatbot not only helps complete academic tasks but also develops independent skills in problem-solving (Yu et al., 2023). Not only that, but AI has also revolutionized the way assessments are conducted. From tests to assignments, AI systems can assess student outcomes quickly and objectively, eliminating bias and allowing teachers to focus on providing in-depth feedback to improve student understanding (Aloqayli & Abdelhafez, 2023).

On the administrative side, AI helps manage schools with in-depth data analysis. From predicting exam results to planning for special education needs, this technology aids in making strategic decisions that can improve the efficiency and effectiveness of the education system (Angelyn & Putri, 2021). Overall, artificial intelligence technology is changing how we teach and learn and opening up new opportunities to improve the overall quality of education, preparing students for an increasingly connected and complex future (Delcker et al., 2024).

In this context, a deep understanding of AI technology's role in improving education quality is becoming increasingly important. This article aims to explain the basic concepts of AI technology, identify its practical applications in education, and outline the challenges and opportunities faced in applying AI technology in an educational environment. As such, this article aims to provide a holistic view of the future of education aided by AI technology.

2.0 RESULTS AND DISCUSSION

Personalized Learning

Personalized learning is a new educational approach that adapts teaching to each learner's needs, interests, and abilities (Perisic et al., 2023). It optimizes learning outcomes by considering genetic, neurological, and behavioral factors (Cavus, 2015). This approach typically involves four main components, including collaborative goal-setting between students and teachers (Delcker et al., 2024). Personalized learning systems can leverage machine learning and adaptive technologies to deliver contextual knowledge based on evolving learners' preferences, experiences, and understandings (Giannakos et al., 2022). This approach is particularly relevant in fields with a rapidly growing knowledge base (Nazara & Nasien, 2024), such as radiology (Wei et al., 2023). The concept of personalized learning is rooted in the understanding that learning is a natural and individual process shaped by personal experience, cognitive awareness, and cultural background (Krismadinata & Susanti, 2021). Technology integration is crucial in effectively implementing personalized learning models (Balliu et al., 2024), (W. Susanti et al., 2023)

Increased Student Engagement

AI technology has significant potential to increase student engagement in learning through interactive and engaging methods. AI can increase students' learning motivation by providing real-time assistance and reducing frustration (Effendy & Gusrianty, 2024). The use of AI in creating interactive videos can develop students' talents and interests and increase their motivation to learn (Susanto et al., 2024). AI also enables the personalization of learning by tailoring materials based on individual abilities and learning styles (Susanti et al., 2024). However, implementing AI in education also faces challenges, such as data privacy issues and the need to invest in teacher training and infrastructure (Chen & Gustientiedina, 2024). In addition, excessive use of AI can reduce students' interest in learning because they rely too much on technology (Dinata & Marlim, 2020).

The Role of AI

Artificial Intelligence (AI) technology is revolutionizing education by increasing student engagement and personalizing the learning experience. AI-based platforms, intelligent tutoring systems, and immersive virtual reality can transform passive learning into an interactive and engaging environment (Andra & Hajjah, 2020). Machine learning algorithms can predict student engagement, identify at-risk students, and provide adaptive content and personalized feedback (Martin & Johan, 2021). In hybrid learning environments, AI facilitates real-time communication, collaboration, and feedback, addressing challenges in education and fostering a more interactive learning environment (Zuhairra & Putri, 2020). A study found that 88% of students strongly agree with

the importance of AI in learning, and 74% view it as an alternative to self-paced learning. However, 57% strongly disagree that AI can replace teachers, highlighting its role as a complementary tool rather than a substitute (Setiawan & Nasien, 2020). Although AI has great educational potential, challenges such as data privacy and ethical implications must be addressed.

AI technology has an essential role in improving the accuracy of assessments and providing timely feedback to students. AI can personalize learning, tailor materials to individual abilities and learning styles, and provide real-time assistance to reduce frustration and increase learning motivation (Sinaga & Hajjah, 2020). In assessment, AI enables fast and accurate automated data processing, helps teachers focus on the teaching-learning process, and enables integrated assessments that can be done at any time (Nopendri & Nasien, 2020). Practical assessment technology can provide constructive feedback, motivate students, and create a positive learning environment, ultimately improving academic achievement (Yanto & Putri, 2020). However, AI implementations face challenges, such as data privacy and the need to invest in teacher training and infrastructure (Nasien et al., 2024). Figure 1 Shows Applications of AI in Education.

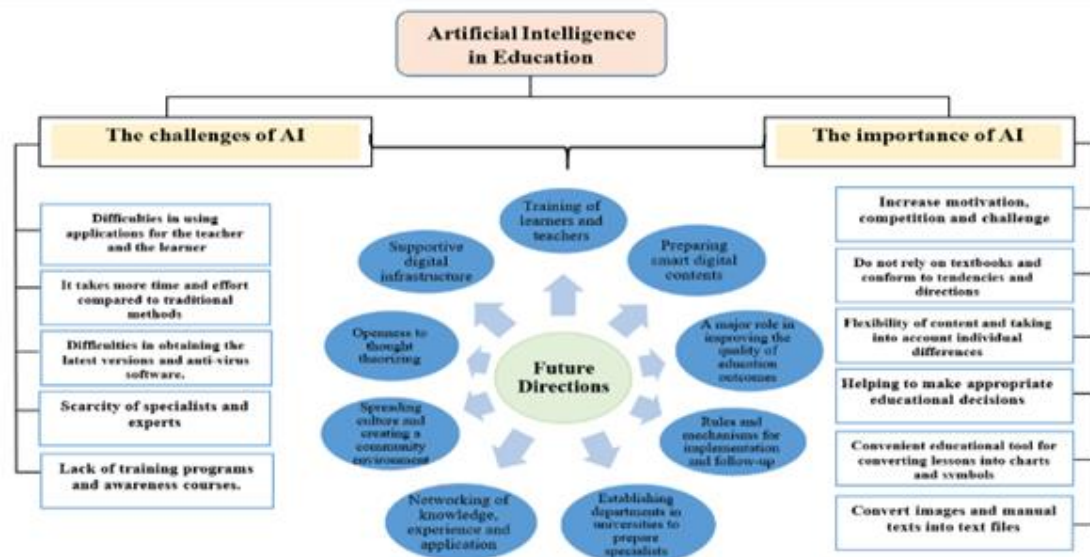


Figure 1. Artificial Intelligence in Education

Challenges and Opportunities

The application of AI technology in schools faces various challenges, including the lack of understanding and skills of principals and teachers in implementing this technology, which is the main obstacle. Although AI offers more adaptive and interactive learning, there are concerns about its negative impacts, such as a decrease in students' interest in learning due to relying too much on AI. This challenge requires improving competence through training and practical skills development for educators. Early introduction to AI technology, especially at the primary school level, is also essential to provide an understanding of its good and bad impacts. In addition, increased technology accessibility, a focus on inclusive education, and collaboration between schools, governments, and the tech industry are necessary for effective implementation.

3.0 CONCLUSION

Artificial intelligence (AI) in schools offers an excellent opportunity to transform learning and teaching. AI can personalize the learning experience for each student, improve evaluation and feedback, and assist in school administration. This technology also opens the door for more effective game-based learning. Data privacy is a challenge that needs to be taken seriously. With a thoughtful approach, the integration of AI in education has great potential to improve the quality and accessibility of education worldwide.

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