

The Application of Artificial Intelligence in Classroom: Advantages, Challenges, and Suggestions

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Abstract. The application of artificial intelligence (AI) in education has received widespread attention, especially in personalized learning and teaching management, where it has shown significant potential. However, current research still has limitations, especially in addressing the ethical and privacy challenges of AI technology and the decline in students' self-discipline. This paper analyzes the application of AI in the classroom and explores its positive impacts on enhancing teaching efficiency, personalized learning, enhancing teaching tools, and supporting special education. The study found that although AI has significant advantages, its widespread use has also led to problems such as technological dependence, academic dishonesty, privacy breaches, and moral bias. Based on this, the paper suggests that AI literacy and critical thinking should be cultivated when introducing AI technology in the classroom to ensure the rational use of technology. Additionally, clear ethical norms and privacy protection strategies should be established to balance the relationship between technological progress and educational ethics, thereby driving the comprehensive improvement of educational quality.

Keywords: Artificial Intelligence, classroom teaching, personalized learning.

1. Introduction

Artificial intelligence (AI) is machine intelligence beyond natural intelligence displayed by humans and other animals. It is intended to perform voice recognition, learning, planning, and problem-solving [1]. As a disruptive technology, AI is gradually integrating into the field of education, bringing profound changes to the teaching and learning process. AI not only personalizes the learning experience but also improves teaching efficiency. However, the widespread application of AI in the classroom has sparked extensive discussions about its impact. Firstly, technology dependence is an important issue in the application of AI in education. With the popularization of AI tools in the classroom, there is a concern that students may become excessively dependent on these tools, thereby lacking the necessary autonomy and critical thinking in the learning process. Secondly, there is a decline in self-discipline and ethical issues. With more empirical studies and practical advancements, this paper will better showcase the role of AI in education and how to effectively address the challenges arising from it. In the future, research should further explore how to maximize the advantages of AI while overcoming its potential drawbacks, and develop reasonable policies and practice guidelines to ensure the effectiveness, safety, and equality of AI technology in classroom education.

2. The Positive Impact of AI in the Classroom

2.1. Real-time Feedback and Teaching Management

AI tools can provide students with real-time feedback, helping them adjust their learning strategies in time and generate personalized learning, for example, AI can analyze students' homework and test results in real-time and provide personalized feedback. In this way, students can continuously optimize their learning path. In addition, AI can assist teachers in teaching management, improving the overall efficiency of classroom teaching. Coursera and EdX online course platforms use automatic scoring engines, while the Gradescope tool simplifies the grading and evaluation process for university teachers [2]. These functions of AI not only improve the overall efficiency of classroom

teaching but also provide teachers and students with richer data support. Through data analysis, teachers can more accurately understand students' learning progress and difficulties, and thus make targeted teaching adjustments. This combination of AI and classroom teaching application makes AI's use in education not just the use of tools, but also a revolution in teaching methods, driving the overall improvement of educational quality.

2.2. Personalized Learning

AI can provide personalized learning paths by analyzing students' learning data. To date, there have been many practical personalized tutoring classes in the classroom using AI. This data-based personalized education helps improve students' learning outcomes. In the current application of artificial intelligence in education, artificial intelligence integrates educational theory and AI technology into a single intelligent electronic tutoring system to provide personalized advice to students based on their background and experience [3]. Using AI in the course includes but is not limited to checking the application status of rules during tutorial interaction, and selecting appropriate presentation methods. Using rules to improve students' academic performance and help students decide their learning content based on their learning profiles and requirements. With AI's real-time interactive functions and powerful resource library, AI can help students achieve personalized learning support and adjust their learning strategies according to their situation.

2.3. Enhancing Teaching Tools

The application of AI has expanded traditional teaching methods, including the use of virtual reality (VR) and augmented reality (AR) technologies to help students better understand complex concepts more intuitively. VR technology creates a three-dimensional immersive environment that allows students to experience and explore complex content hands-on. For example, in history classes, students can "visit" ancient sites or "experience" major historical events through VR, thus deepening their understanding of historical context and culture and enhancing their memory and comprehension [4]. AR technology further enhances the intuitiveness and engagement of learning by overlaying digital information in the real world. For example, in biology classes, students can use AR applications to overlay three-dimensional models of human organs onto actual anatomical specimens, thus gaining a clearer understanding of the structure and function of organs. This mixed reality learning environment enables students to directly manipulate and observe virtual objects in the real world, thus providing knowledge in a more natural learning environment. In summary, the combination of AI with VR and AR technologies has enhanced the interactive and effective nature of classroom teaching, changing traditional teaching modes and making education more vivid, intuitive, and productive.

2.4. Supporting Special Education

In addition to the use of AI in regular education classrooms, AI technology can provide a barrier-free learning environment for students with special educational needs, such as being studied for diagnosing learning disabilities, such as dyslexia, through screening and automated tasks, such as scoring articles and identifying reading and writing difficulties, which provides them with a more fair learning opportunity. Using AI technology to analyze students' facial expressions to predict their level of engagement with educational content, thus providing insights into the level of student participation and the effectiveness of teaching activities. In terms of supporting special education, AI can also use chatbots to communicate with students and provide accessible resources and personalized feedback, especially for students with dyslexia and those with language and written expression difficulties, using AI technology to enhance their communication skills. Microsoft has launched an assistive device called Microsoft Translator, which converts the speaker's voice into subtitles through headphones to help deaf learners understand. In addition, Zeng Fan-Gang developed "Beyond Hearing Aid," which utilizes deep learning and AI technologies, such as virtual and augmented reality, to enhance the hearing experience, including sound analysis, protection, and real-time translation [5].

In summary, AI technology not only meets different learning needs but also provides innovative solutions to improve the accessibility and participation of students with special educational needs, promoting inclusive and equal educational opportunities.

3. The Challenges of Artificial Intelligence in the Classroom

3.1. Limitations of AI

Since personalized learning depends on a large amount of student data, if the data is incomplete or inaccurate, it may result in poor personalized recommendations. Additionally, AI may not be as sensitive and flexible as human teachers in handling complex or unstructured problems such as student behavior problems. Although AI has many advantages in the classroom, such as personalized learning, immediate feedback, improved efficiency, and support for special needs, it also faces some challenges, such as the lack of emotional interaction, potential inequality, and excessive reliance on technology. Teachers need to balance these advantages and limitations when introducing AI to ensure that technology serves education rather than dominating it.

Moreover, the quality of AI applications depends mainly on the available technical infrastructure. Many schools, especially those in resource-poor areas, may lack the technical and internet connectivity required for the effective implementation of AI tools [6].

Secondly, the lack of transparency and explainability makes it difficult for educators to understand the decision-making process of AI models, which may prevent them from making effective interventions. Finally, these systems primarily rely on correlation rather than causation. Machine learning models typically identify correlations to make predictions, but correlations do not always represent causal relationships. If incorrect correlations are mistakenly viewed as the root cause of failure, inappropriate or inadequate interventions may be taken, which cannot effectively address the potential educational challenges [7]. When researching a deeper understanding of causal relationships in the educational environment often requires considering the complexity of education, which often goes beyond the scope of technological solutions. Furthermore, educational systems are dynamic, and students' needs and performance change over time. Therefore, understanding causal relationships in education requires constant observation and adjustment, and relying solely on static data analysis may not reflect these changes promptly.

3.2. Decreased Student Autonomy and Dependence on Technology

Excessive reliance on AI tools may lead to a lack of autonomy and creativity in students' learning process, reducing their exploration of new knowledge. Because they may rely more on AI-provided solutions. They will use technology without critical thinking, delegating cognitive work to machines instead of learning new materials [8]. This will result in students not deeply understanding the problem-solving process and basic principles, but simply copying answers to take shortcuts. AI literacy in the classroom is commonly used, such as ChatGPT, a concerning issue is the possibility of academic dishonesty, such as plagiarism and cheating in assessment tasks using ChatGPT [1]. The convenience of ChatGPT may tempt students, such as those who complete their assignments at the last minute, to rely on the tool rather than engage in analytical thinking [9]. Additionally, there are some problems with ChatGPT itself, such as the generated results not being cited or referenced, which increases the likelihood of plagiarism, and sometimes inaccurate answers are given to learners. And limited results, the answers to some problems are very narrow [1].

The predetermined path of AI not only reduces students' autonomy but may also limit the breadth and depth of their knowledge exploration. Furthermore, excessive reliance on personalized learning may reduce students' interaction opportunities with peers, and affect the development of social skills, and for teachers, excessive reliance on AI for management may result in insufficient attention to individual student needs.

3.3. Ethical and Privacy Issues

There may be privacy and ethical issues in the use of data by AI, such as whether the collection and use of student data is transparent, and whether there is bias such as gender discrimination. Privacy is one of the most ethical issues in the application of AI, and many people agree without knowing or considering the extent of the information shared [2]. This raises the issue of the extent to which students and parents need to be concerned about personal information sharing and the consent issue regarding AI systems accessing user data. These are potential privacy risks. Therefore, educational institutions need to implement strict data management strategies, including encrypting the storage of student data, limiting access to data, and regularly reviewing data usage.

Moreover, one of the most obvious ethical issues with AI is gender bias. AI systems may make decisions based on biases in their training data, leading to biases such as gender discrimination. For example, if an AI system is primarily trained on data from one gender group, it may not be accurate or fair when processing data from other gender groups. In 2018, a group of researchers at the Federal University of Rio Grande do Sul in Brazil decided to test whether there was gender bias in artificial intelligence, especially in automatic translation [10]. In automatic translation, machine translation tends to favor the male gender, while women account for 35.94% of US Bureau of Labor Statistics occupations, but only 11.76% of the time are sentences translated with female pronouns. These moral issues that AI may encounter in the classroom will affect the cultivation of students' values and moral norms, so teachers need to ensure that using AI tools does not replace human moral and ethical teaching.

4. Strategies and Recommendations

4.1. AI Literacy and Critical Thinking Development

With the changing times, the assessment method of students' knowledge needs to be reevaluated in education, Sok suggests that action research can check the effectiveness and efficiency of intelligent applications in education [8]. Action research provides a mechanism for a dynamic research framework, allowing educators to test and adjust the application of intelligent technologies in real-time educational activities. This method ensures real-time feedback and continuous improvement, making it a flexible experimental approach. Through this method, educators can directly observe and evaluate how AI technology affects teaching efficiency and student learning. Regarding the advantages of AI in helping to improve classroom management efficiency and reduce teachers' administrative burdens, allowing them more time to focus on teaching and student interaction, AI's capabilities align with the rule that educational policies should place more emphasis on supporting students' development of new knowledge, which means people need to enhance their AI literacy in the classroom. While introducing AI into the classroom, educators should also focus on cultivating students' AI literacy and critical thinking to help them maintain rationality and independent thinking when using AI tools. Excluding ChatGPT from the classroom would deprive students of the opportunity to familiarize themselves with the capabilities and limitations of generative AI tools and effectively utilize this technology in a controlled educational environment [11].

When educators and policymakers jointly focus on the responsible use of generative AI systems in educational environments, they can ensure that students can acquire knowledge while also understanding and responding to the limitations of these technologies. By combining practical activities and projects, students can not only enhance their AI literacy but also deepen their understanding through real-world applications, promoting a positive attitude towards new technologies. Educators need to balance technology utilization and technology critique when introducing new technologies, ensuring that technology applications truly serve educational goals rather than simply replacing traditional learning processes. In this way, effective navigation of AI

integration in education can be achieved through implementing AI literacy, prompt engineering expertise, and critical thinking skills.

4.2. Integration of Diversified Teaching Methods

To cope with the possible negative impacts of AI, it is recommended to integrate AI technology with traditional teaching methods to promote the overall development of students. It is critical to take an interdisciplinary approach, integrating AI literacy across disciplines to demonstrate its broad impact [7]. AI technology is not a complete substitute for traditional teaching methods such as face-to-face interactions, group discussions, and experimental manipulations. These traditional methods are important for developing students' social skills and teamwork abilities, and since solving complex problems and innovations often requires interdisciplinary knowledge and in-depth critical thinking, by integrating AI literacy across disciplines and assisting in a multifaceted pedagogical process, students can be better equipped to learn holistically and to face the challenges of the future.

4.3. Ethics and Privacy Protection

The introduction of Artificial Intelligence (AI) technologies in the classroom must be accompanied by consideration of both ethical norms and privacy protection strategies. The use of AI requires a deep understanding of its ethics and morals to ensure benign applications in education. Developing and implementing strict norms for AI use ensures that students' privacy rights are not violated while raising their awareness of potential AI risks. First, using AI-assisted instructional systems in the classroom protects students' personal information throughout the lifecycle of using the AI model (both raw data provided by the student and new data generated during interaction with the AI system) [12]. Throughout this process, the AI system must ensure data security against unauthorized access and data leakage. Especially for sensitive data, encryption measures, and strict access control must be implemented. At the same time, the final destruction process of the data should also be emphasized to ensure that the data will not be misused after the system ends its use.

Second, AI systems need to be transparent and minimize data. Transparency is one of the most important principles of privacy protection, and the operation process, algorithmic logic, and data processing of AI systems must be completely transparent to students, teachers, and parents. This transparency includes not only the explanation of the functions of the AI model but also covers possible flaws and risks. For example, when AI is used to assess student performance, teachers and students should be informed of the basis on which the AI makes its judgments and possible algorithmic biases. To enhance transparency, schools should establish accountability mechanisms to ensure that data used and decisions made in AI systems can be tracked and verified. This helps to clarify accountability and prevent pitfalls caused by inappropriate use of data and technology. To protect students' privacy, AI technologies should follow the principle of data minimization, i.e., only the minimum amount of necessary data should be collected, stored, and processed. The scope of student data use should be strictly limited and used only for educational purposes.

During use in the classroom, there is a need to ensure that AI models are taught to protect the personal information and privacy of students, who actively consent to the way data is collected and used.

5. Conclusion

Integrating AI in the classroom offers unique opportunities, but also poses challenges of privacy and ethical issues, the need for ongoing training support, and technological and digital skills inequality.

The development of AI requires more empirical research. AI innovation is still in the early stages of experimentation, and there has been little collaboration with educational institutions on relevant interventions such as AI adaptive systems. As a result, there is a gap between what AI technologies can do and how they can be implemented in real-world educational settings. AI technologies can

provide a more personalized learning experience and help students better acquire knowledge and skills. Therefore, AI will likely have a positive impact on education in the future. However, the exact impact needs further research and discussion.

The application of AI in classroom teaching has great potential, but the challenges it brings should not be ignored. Through reasonable strategies and norms, AI can become a powerful tool in education, promoting the improvement of teaching quality and the overall development of students.

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