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Research on the Mechanism of AI Empowering the Improvement of Educational and Teaching Quality

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Abstract. With the deep integration of artificial intelligence (AI) with education, its role in enhancing educational quality is receiving increasing attention. This paper focuses on the mechanisms through which AI contributes to educational improvement, systematically analyzes the current status and associated challenges, and proposes implementation strategies in combination with domestic and foreign research and practical cases. The research shows that AI technology can effectively enhance educational quality in multiple dimensions, including personalized learning path design, intelligent teaching resource development, teacher role transformation and professional development, intelligent teaching management, and integrated school management. To fully realize the potential of AI in education, efforts should be made in areas such as updating educational concepts, standardizing technical standards, delving into the value of data, and strengthening professional support systems. These strategies can help build an intelligent, efficient educational system and driive comprehensive improvements in teaching and learning quality.

Keywords: Artificial intelligence, teaching and education quality, personalized learning, intelligent teaching resources, intelligent education management

1. Introduction

The era of artificial intelligence (AI) has arrived, bringing unprecedented opportunities for transformation in education. The report of the 20th National Congress of the Communist Party of China explicitly emphasized the need to accelerate the digitalization of education, underscoring the fundamental and strategic supporting role of education in building a modern socialist country in all respects [1]. As a core driver of digital transformation, AI technology is profoundly reshaping the structure, processes, and models of education and teaching. AI empowering the improvement of educational quality is not only an inevitable trend in the development of educational modernization but also an important way to meet individualized learning needs and cultivate innovative talents. By enabling personalized learning, enhancing instructional management, and supporting data-driven decision-making, AI holds great promise for improving the quality and efficiency of education. Therefore, delving into the specific paths through which AI empowers the improvement of teaching and educational quality is of great theoretical and practical significance for promoting high-quality

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development of education. It provides a roadmap for realizing high-quality educational development in the digital era and offers actionable insights for policymakers, educators, and researchers alike.

2. The theoretical basis of AI empowering teaching and educational quality

2.1. AI technology

AI is a branch of computer science and one of the core drivers of current technological development, aiming to enable computers to simulate human intelligent behavior, covering aspects such as learning, reasoning, perception, and language understanding [2]. In recent years, significant progress has been made in AI technology, such as breakthroughs in areas like deep learning, natural language processing, and computer vision, providing solid technical support for the application of AI in education. AI technology can process and analyze large amounts of data, discover patterns from it, and provide precise decision support for education and teaching.

2.2. The connotation and evaluation indicators of educational teaching quality

Educational teaching quality is the core objective of educational activities, covering multiple aspects such as students' learning outcomes, teachers' teaching abilities, and schools' management levels [3]. The system of indicators for evaluating educational and teaching quality is rather complex and usually includes students' academic performance, comprehensive quality development, learning interest and motivation, teachers' professional competence, the effectiveness of teaching methods and means, and the efficiency of educational resource allocation and management in schools. The introduction of AI technology offers new possibilities for the quantification and optimization of these indicators. For example, the English listening and speaking AI assessment system generates multi-dimensional reports in real time through speech recognition and sentiment analysis when students read aloud or have conversations, replacing the traditional "good, good, medium, poor" fuzzy evaluation and helping teachers precisely identify training priorities.

2.3. Theoretical model of AI empowering teaching and educational quality

In contemporary times, AI technology in the field of education has been applied to multiple levels of education and teaching. Based on the characteristics of modern educational theory and AI technology, theoretical models of AI empowering the improvement of teaching and educational quality have been constructed for various educational stages in China. Different models are student-centered, teacher-guided, and supported by AI technology, achieving a comprehensive improvement in educational quality through personalized learning path design, intelligent teaching resource development, teaching process optimization, and precise evaluation feedback [4]. For example, the ClassIn multimodal model in Dongcheng District, Beijing, uses seamless transition between online and offline, integrates voice, expression, and interaction data, marks the low periods of students' concentration, optimizes the design of classroom rhythm, and quantifies the efficiency of classroom interaction. The models emphasize the deep integration of AI technology with education and teaching, focusing on data-driven teaching decisions and personalized educational services, aiming to build an intelligent, efficient, and sustainable educational ecosystem.

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3. Specific paths for AI to empower teaching and educational quality

3.1. Synergistic development of personalized teaching and learning

AI technology can open up diverse and personalized paths for teachers to improve the quality of education and teaching, provide teachers with in-depth analysis of students' learning data, help teachers understand the learning habits, ability levels, and interest characteristics of each student, design personalized learning paths for students, and match personalized teaching resources [5]. For example, teachers can use AI assistants to assign English reading and oral conversation tasks. The AI assistants can not only score intelligently but also help students correct pronunciation and intonation, and at the same time capture students' learning emotions and provide feedback to teachers so that teachers can make personalized supplements and detailed explanations. This synergistic development of personalized teaching and learning can effectively stimulate students' interest and intrinsic motivation in learning, promote the differentiation of education, and provide each student with educational services that are more tailored to their needs and characteristics.

3.2. Development and application of intelligent teaching resources

By leveraging AI technology to develop intelligent educational software and tools, such as smart teaching systems and smart question banks, it is possible to automatically count the types of mistakes made by students based on their learning situations and needs and provide personalized learning methods and teaching guidance [6]. For example, teachers can import student lists into the AI assistant, tick targeted tags, and the AI assistant will provide customized learning content and educational methods based on students' individualized learning characteristics and ability levels to achieve individualized education. The AI assistant can also optimize the resources at the teacher's disposal to better meet the individualized learning needs of students and comprehensively enhance the level and quality of education and teaching. For example, teachers can use tools such as AI intelligent assessment systems and teaching management platforms to provide personalized tutoring for students, reduce the workload of teachers, and improve teaching efficiency. In addition, AI technology can generate dynamic teaching resources, such as the dynamic process of cutting a parallelogram along its height and translating it into a rectangle, to help students understand knowledge intuitively and improve teaching efficiency.

3.3. Teacher role transformation and professional development

With the application of AI technology in the field of education, the role of teachers will shift from knowledge transmitters to mentors and facilitators [7]. Teachers need to constantly learn and update their knowledge, master the latest educational technologies and teaching methods, better achieve human-machine synergy, and use AI technology to solve repetitive physical labor and complex mental labor in teachers' daily work. Teachers also need to develop their data analysis skills and be able to use the data provided by AI technology to analyze and evaluate students' learning situations so as to better guide students' learning. Schools can regularly organize information-based teaching training for teachers, inviting experts and professors from universities in the field of artificial intelligence to conduct training for teachers, allowing teachers to learn certain information-based intelligent technologies during the training process and combine them with the characteristics of their own subject work to better assist in education and teaching.

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3.4. Intelligentization of education and teaching management

Through data analysis and predictive models, AI can provide decision support for school leaders, helping them better plan courses, allocate teachers and students, and achieve rational use and balanced distribution of resources. For example, schools can import information such as students' class participation, awards, and club signings into an AI assistant, which will automatically generate a comprehensive report on clubs for the current semester, providing a reference for school leaders or club teachers to make new decisions. At the same time, students can also gain personalized learning experiences and guidance through intelligent learning platforms to enhance their learning motivation and performance.

In addition, AI technology enables integrated management of school education, such as the integration of BIM (Building Information Modeling) and GIS (Geographic Information System) to achieve full life cycle management of equipment assets, equipment operation monitoring and control, energy operation management, etc., providing technical support for efficient management of school education [8].

In intelligent management, AI technology can facilitate communication and information sharing between home and school and help parents understand and tutor their children. Take Dongcheng District, Beijing, as an example. Wecom Smart Campus enables real-time synchronization of students' learning situations and automatically pushes data on homework submission rates and classroom performance. It has covered 116 schools, with 187,000 parents connected, and parents can view it at any time [9]. The "Data Brain" digitizes students' growth profiles, and AI generates digital portraits of students covering information such as academic trends and club participation, allowing parents to view the complete growth trajectory of their students at any time.

3.5. Integrated management of school education

AI technology combined with the Internet of Things can achieve integrated management of school education, break down information silos among various links in traditional education, and enable data interconnection and resource sharing [10]. For example, through the intelligent management of multimedia devices, AI assistants can rank the multimedia devices of each class based on information such as their usage years and problem conditions, in combination with the life cycle of the devices, providing a reference basis for the procurement and maintenance of school logistics. This integrated management not only enhances the efficiency and scientific nature of school management but also provides more precise support and services for education and teaching, promoting the overall development of school education.

4. A case study of AI-enabled teaching and educational quality improvement

4.1. Typical cases of AI-enabled teaching and education

Many educational institutions at home and abroad have made active explorations in AI-enabled teaching and education and achieved remarkable results. For example, the Hopkins School research team created the ChemBot agent zero-code on ChatGPT using OpenAI's GPTs platform to solve the problem of students' initial learning of chemical nomenclature. The agent was customized to be trainable according to the course and the student's situation, and it was efficient in tutoring students and reliable in promoting personalized and differentiated teaching [10].

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Beijing's Dongcheng District, relying on the "1+7+N" smart education ecosystem, continues to promote the in-depth development and application of the "data brain" covering all school stages, but the core is the in-depth application in the primary and secondary stages of compulsory education. In addition to implementing the modern education governance capacity enhancement project, it has taken the lead in carrying out a series of innovative practices in education informatization by building a new model of digital governance [9].

Relying on the resources of the "Jiaowosuan" intelligent computing platform, Shanghai Jiao Tong University has fully opened DeepSeek V3/R1 to teachers and students and is focusing on building a new generation of AI application platforms. At present, more than 20 general AI tools have been deployed on the platform to serve the diverse needs of teaching, research, office work, and management within the university. Among them, the "HI+AI" course innovatively adopts the concept of "human-centered heuristic AI teaching (HI)," innovating at the level of teaching mode and learning experience, aiming to maximize students' potential through adaptive learning [11]. These practical cases provide valuable experience and reference for AI-enabled teaching and educational quality improvement.

4.2. Case insights and lessons learned

The following insights and experiences can be drawn from practical cases at home and abroad:

First, we should focus on the deep integration of AI technology with education and teaching, give full play to the advantages of AI technology, and provide precise support and services for education and teaching. Second, it is necessary to enhance the training of teachers' AI literacy and improve their ability to use AI technology for teaching. Third, establish norms and standards for the application of AI in education to ensure the safe and effective use of AI technology in the field of education. Fourth, policy support and financial input should be strengthened to provide a favorable policy environment and resource guarantee for AI to empower the improvement of teaching and educational quality.

At the same time, the application of technology should focus on local adaptation and fairness guarantees and can be advanced in layers: developed regions such as Shanghai Jiao Tong University explore innovative models such as adaptive learning; In less developed areas, AI can be used to address the issue of uneven teaching staff, such as the dual-teacher classroom in Dongcheng District. In terms of fairness, the data is tilted towards the weaker schools in Dongcheng District, with priority given to pushing AI question banks; Promote offline versions of AI teaching assistants to narrow the digital divide between urban and rural areas. Establish a dynamic monitoring mechanism and set fair indicators (such as the difference in AI usage between urban and rural areas <15%) for precise regulation.

5. Challenges and strategies for enhancing the quality of education through AI empowerment

5.1. Challenges

Although AI technology has a promising future in education and teaching, it still faces many challenges in practical application. Firstly, the stability and reliability of AI technology need to be further improved to ensure its stable operation in education and teaching [12]. Secondly, there are differences in the adaptability of teachers and students to AI technology. The degree of students' reliance on technology may reduce their autonomous learning ability and critical thinking ability. This dependence may lead to learning difficulties for students in the absence of technical support,

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some teachers may feel uneasy or resistant to new technologies, and students may be unable to make full use of AI technology for learning due to a lack of necessary technical literacy.

In addition, the application of AI in education involves issues such as data security, privacy protection, and ethics, which need to be given high attention and addressed.

5.2. Countermeasures to address

Considering the above challenges, efforts can be made in the following aspects: First, enhance technological research and development and innovation to improve the stability and reliability of AI technology and reduce the impact of technical failures on education and teaching; Second, Conduct information technology literacy training for teachers and students to enhance their understanding and application of AI technology and promote the effective implementation of human-machine collaborative teaching; Third, establish and improve data security and privacy protection mechanisms, strengthen the management and protection of educational data, and ensure the security of personal information of students and teachers. Fourth, strengthen research on AI education ethics, formulate corresponding ethical standards and norms, guide the rational application of AI technology in the field of education, and avoid situations that violate education ethics.

6. Conclusion

The rapid development of AI technology has ushered in unprecedented opportunities as well as considerable challenges for the enhancement of educational quality. AI is no longer a supplementary tool but a transformative force that is reshaping educational practices, teaching paradigms, and institutional operations. From persoanlized learning path design and intelligent development of teaching resources, to the transformation and professional development of teachers, and from intelligent instructional management to the integrated governance of school systems, AI is playing amultifaceted and increasingly critical role in driving educational reform.

However, to fully harness the potential of AI in education, systemic and coordinated efforts are eseential. This includes increasing investment in AI-driven educational research and infrastructure, integrating AI technologies into curriculum design, and fostering interdisciplinary collaboration. Educational institutions must also rethink traditional pedagogical models and develop new frameworks that align with AI-enabled learning environments. Moreover, ethical considerations, data privacy, and inclusivity must be given due attention to ensure that AI applications promote equitable access and avoid reinforcing existing inequalities. Effective policy-making and governance frameworks are required to support responsible innovation.

In conclusion, the research found that only through the joint efforts of educators, technology researchers, policymakers, and others, starting from multiple aspects such as technology research and development, teacher training, policy support, and ethical norms, can an AI-led innovative education ecosystem be constructed, enabling AI to better empower the improvement of teaching quality.

References

[1] Na Lijuan. Exploring New Paths of Information Technology Empowering Smart Education [J]. Liaoning Education, 2023, (8): 25-27.

[2] Wang Zhenglu, Zhang Bo. The connotation and path of AI empowering teacher education evaluation [J]. Shanghai Educational Evaluation Research, 2022, (6): 50-55.

DOI: 10.54254/2753-7048/2025.NS27527

[3] Lin Qian. Research on Strategies for Improving the Teaching Quality of Open Education Guided by the Spirit of the National Education Conference [J]. Modern Vocational Education, 2025, (06): 21-24.
[4] Li Lei, Zhang Shumin. Deep Exploration of AI Education Innovation Represented by DeepSeek: A Case Study of Dongcheng District, Beijing [J]. Feature Article, 2025, (10): 5-7.
[5] Cao Peijie. The Triple Realms of AI Education Transformation [J]. Educational Research, 2020, (2): 1-10.
[6] Zhao Meina. Exploration and Practice of Formative Evaluation Mechanism Based on OBE [J]. Heilongjiang Education (Theory and Practice), 2020, (10): 1-5.
[7] Huang Danxia, Liu Jin, Li Haoliang. New Approaches to Improving the Quality of Education and Teaching: Data Fusion Systems Facilitate Precise Student Management [J]. China Informationization, 2024, (12): 66-68.
[8] Song Jiaming, Guan Lu, Zuo Xuebin. Research on the Path of Artificial Intelligence to Enhance Educational Teaching Quality [J]. Governance STRATEGY, 2024, (1): 42-45.
[9] Zhou Lin, Zhang Shumin, Li Lei, Li Yushun. Practice of Building a Sustainable Ecosystem for the Digital Transformation of Education Driven by Artificial Intelligence: A Case Study of Dongcheng District, Beijing [J]. Research on Digital Development of Regional Education, 2023, (6): 64-73.
[10] Wang Xiaobo, Zhang Yujiang. Generative Teaching Agents: A New Form of AI Empowering Large-Scale Personalized Education—Experiences and Insights from Abroad [J]. Digital Teaching in Primary and Secondary Schools, 2025, (01): 22-26.
[11] Ye Weiyu, Chen Jing. Science & Technology Wind, 2025, (04): 68-70.
[12] Chen Rong. AI brings the ideal of transforming higher education into reality [J]. China Education Network, 2025, (Z1): 19-22.