

The Impact of Artificial Intelligence-Assisted Teaching on Teachers' Instructional Development

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Abstract. Global attention has been attracted to Artificial Intelligence (AI) due to its rapid development. As a new science technology, AI has not only made remarkable achievements in the business and industrial fields but also gradually affected the education field, bringing far-reaching impacts on the traditional teaching model. However, with the proliferation of AI technology, teachers are facing challenges in terms of role orientation and professional development. This essay analyses the challenges that teachers are facing in the age of AI and proposes strategies to rationally balance the application of AI in education, to provide valuable management ideas and suggestions for educational policymakers. This essay concludes that the impact of AI on education consists of positive effects such as improving teaching efficiency, providing personalized learning, and reducing the burden on teachers, but at the same time, it brings with it challenges such as the change in teachers' professional roles and the need for skills upgrading. Based on this, this essay proposes recommendations to strengthen teacher training to enhance their AI-related skills, formulate policies to safeguard teachers' professional development and promote the application of human-computer collaboration models in education.

Keywords: Artificial Intelligence, personalized learning, assessment and instruction, teacher professional development, teaching optimization.

1. Introduction

As the informatization process of education continues to advance, the current status and development trend of AI applications has grown in popularity as an investigation subject in education. Instruction, learning, and knowledge transfer have experienced radical changes as a result of the advancement of AI technology. Chen et al demonstrated through their study that AI is commonly utilized in teaching in various forms, particularly in educational establishments [1]. The emergence of AI is not only reflected in the upgrading and enhancement of educational appliances such as computers but also gradually turns into an increasingly important teaching aid. Artificial Intelligence in Education is mainly reflected in intelligent tutoring systems, personalised learning, automated assessment, and educational data analysis. These applications improve the efficiency of teaching but also provide students with a more personalized learning experience.

However, with the evolution of technology, teaching methods have been reformed and innovated. On the one hand, AI technology can replace some of the functions of teachers to a certain extent, such as automating the arrangement of daily learning tasks and providing instant feedback [2]. On the other hand, it has also caused extensive discussions about the role positioning and career development prospects of teachers. Teachers need to continuously improve their professionalism to adapt to the new skills, they also need to cope with technological challenges, such as data privacy issues.

2. Application of AI in Education and its Support to Teaching

2.1. Personalised Learning System--Intelligent Education Platform

AI technology is increasingly being used in the education sector, dramatically changing the traditional teaching and learning paradigm. AI is a field of research where innovations and developments generated by AI technology have led to the emergence of appliances such as computers, highly sophisticated machines, etc. AI products are characterized by adequate cognitive, learning,

adaptive, and decision-making abilities [1]. One prominent use of AI technology in education is personalized learning systems, which is worth investigating. Personalized educational programs supported by AI technology are progressively replacing traditional teaching techniques [3]. Firstly, the application of AI on smart education platforms such as online classes and online schools provides students with flexible and individualized learning approaches. For instance, personalized learning systems created based on AI models can increase the freedom and efficiency of learning by making course choices based on students' circumstances. These systems adjust the course content according to the student's learning habits and progress and provide personalized learning resources and advice to enable students to gain better knowledge. VIPKID is a very representative case of an online school where teachers deliver lessons through a unique online environment [4]. In addition, intelligent chatbots like ChatGPT have been applied to assist learning by providing instant answers and guidance to help students solve difficult learning problems, thus improving learning outcomes [5].

2.2. AI Support for Classroom Teaching and Learning

2.2.1. Improvement of teaching management efficiency

The supportive role of AI technology in classroom teaching activities cannot be ignored. In modern instruction, the use of intelligent tools such as roll-call systems and sign-in systems. Zhang et al have improved the efficiency of teaching management [6]. Zhang et al also mentioned that the way it works is basically to manage the learners through new types of technology, like the IC chip, or the face recognition system [6]. These types of systems can automatically record students' attendance, which reduces teachers' management time before and after class, enabling them to focus more on their instructional duties.

2.2.2. Applications of VR and AR technology

Education also makes extensive use of technology like Augmented Reality (AR) and Virtual Reality (VR). Gandedkar et al state that VR, AR, and AI as modern technological phenomena have the powerful ability to transform education and research [7]. These technologies are often applied by creating virtual and immersive learning environments. For example, students are engaged in models of virtual laboratories, research sites, technologically enabled spaces, and other models. Despite the virtual interactions, students can still be hands-on and immersive. This technology also breaks down many of the barriers to real-world learning and helps to increase student engagement [1].

AI technology additionally plays an essential part in educational equity, like the effects brought about by such virtual reality classrooms, where AI can provide students with a wider range of resources, allowing them to have course materials from all over the world. Through distance learning platforms, students in remote areas have access to the same quality of educational resources as their urban counterparts, narrowing the gap of uneven distribution of educational resources [8]. To illustrate, AI can help in the design and implementation of online courses, allowing students to receive a top-notch education wherever they might be. Zhou et al explored massively open online courses (MOOCs) and found that the popularity of this type of online course is high, with participation in online courses increasing gradually from 2012 to the present, courses have gradually increased with an average of over 120,000 people [9]. This means that anyone with a simple electronic device and a good internet environment has the opportunity to join the new learning process.

2.2.3. Improving students' academic achievements

Research has shown that AI technologies can significantly improve student learning outcomes [10]. An outline of common AI and machine learning algorithms used in Hooda et al's research assessment reached the result of promoting students' learning achievement [10]. The advantages of AI systems are mainly because they have a powerful information base that can store more information material than the human brain and have a well-developed self-learning system. The AI systems can learn from past experiences or results, so they can make decisions based on these experiences [10]. Thus, the intelligent application of AI in education can help students come up with better ideas and offer more answers to their problems.

2.3. AI Assistance to Teachers in Teaching

2.3.1. Planning of teaching assignments

AI's big data models can help teachers better plan their teaching tasks by providing comprehensive and targeted teaching guidelines. Dogmus et al illustrated that AI technology can make use of a task planner to develop a task schedule and can also confirm the feasibility of their tasks by motion planning it up secondarily [11]. This also demonstrates that current AI technology possesses the skills to develop learning plans for students in different situations through big data algorithms. For instance, by analyzing students' learning statistics, AI allows specific teaching solutions to be customized for different students, thus better satisfying students' personalized needs [1]. This not only improves the relevance and effectiveness of teaching but also promotes the overall development of students. Such intelligent education platforms can automatically adjust the course progress according to students' learning data and performance, and students can also adjust the course difficulty and choose the most suitable learning materials at any time according to their situation.

2.3.2. Course evaluation and feedback

AI also plays an important role in course evaluation and timely feedback, and this function can also well reduce the teaching burden of teachers. AI can give more objective and accurate evaluation results through the analysis of big data. The automated assessment system can quickly analyze students' classroom performance in online classes, and at the same time provide feedback to teachers, making it convenient for them to adjust personalized teaching strategies at any time. However, it is worth noting that teachers' long-term experience in teaching is subjective, and AI cannot design lessons based on their unique teaching experience [12]. AI technology can be used as a tool for teachers, but there are still differences in thinking between machines and humans.

2.3.3. Educational management and resources allocation

In addition, AI technology can also play an important role in education management and resource allocation. For example, by analyzing school teaching data, AI can help education managers better understand the current state of teaching, maximize the distribution of instructional materials, and enhance the effectiveness of resource use. In teaching practice, AI technology also enables real-time monitoring and analysis of students' learning behaviors. For example, through smart cameras and sensors, AI systems can monitor students' performance in the classroom in real-time, such as concentration, mood changes, etc, to provide teachers with more detailed teaching feedback [13]. These data can not only help teachers adjust the pace of classroom teaching but also be used for subsequent teaching research and improvement.

3. The Disadvantages of AI on Teacher Assistance

3.1. Teacher Over-Reliance on AI

Despite the many conveniences and advantages of the application of AI to learning, there are several problems and drawbacks to assisting teachers in their teaching capacity. Firstly, teachers may become overly reliant on AI technology and thus lose the most direct opportunity to teach with student feedback [14]. Over-reliance on AI may lead teachers to become passive in the teaching process and lack interaction with students, which is not conducive to a good relationship or better teaching atmosphere between teachers and students. Students' personalized needs and emotional states sometimes need to be accurately understood through face-to-face interaction, which is something that AI can hardly replace completely.

3.2. Technical Failures and Limitations of AI Systems

Secondly, AI cannot be guaranteed one hundred percent against any slips or technical glitches, and teachers face the possibility of inaccurate results caused by bugs. AI systems can suffer from algorithmic bias or technical glitches when dealing with complex teaching and learning tasks,

resulting in the provision of inaccurate information and advice [15]. Qadir discusses the limitations posed by AI technology using ChatGPT as an example, where there is a risk that AI may not be able to fully understand a particular technology in problems related to engineering education, resulting in the AI not being able to analyze complex problems, so there is a risk of generating and disseminating incorrect information. With personalized systems, the AI may have bugs in the marking or feedback system, or there may be a deletion of resources due to issues such as software updates [16]. These factors in turn affect teachers' instructional decisions and students' learning experience.

3.3. Data Privacy and Ethical Issues

Furthermore, the transfer of most teaching data into AI systems also requires care about privacy issues as well as ethical issues. Teachers need to be aware of the privacy protection of student data and personal data. For analysis and decision-making, AI systems often require a lot of student data, which include personal information, records of learning behaviors, and academic grades. If not handled properly, these data may be at risk of leakage and misuse, which in turn affects students' privacy and rights. Data collection and storage is the first step in privacy protection in AI systems. Educational organizations need to have a clear data collection policy that only collects data that is directly relevant to teaching and learning and ensures that data collection is transparent and lawful. Students and parents should be informed of the purpose, scope, and possible uses of data collection and their consent should be obtained [17]. Teaching organizations need to ensure the security of personal information to the greatest extent possible.

4. Suggestions for Improvements in AI-assisted Education

To strengthen artificial intelligence's auxiliary function in educational settings, firstly, the cooperation between AI systems and educators needs to be increased to ensure that teachers remain in an active teaching role with AI support, and maintain face-to-face interactions with students [18]. Secondly, the reliability of the AI system must be improved by regularly maintaining and updating the system, fixing possible technical failures, and ensuring its accuracy and stability. At the same time, data privacy protection should be strengthened by implementing strict data protection policies to ensure that all data collection and use comply with privacy requirements. Finally, clear ethical norms should be formulated and implemented to guarantee that AI technology is employed morally and to provide the necessary ethical education to those involved. These measures will help to better utilize the advantages of AI while reducing its possible negative impacts.

5. Conclusion

In summary, the diverse applications of AI in educational institutions have greatly contributed to the transformation of the teaching model, giving learners a more effective and customized educational experience and significantly enhancing the teaching efficiency of teachers. Through tools such as personalized learning systems, intelligent education platforms, and automated assessments, AI not only meets the student's individual needs but also reduces the burden on teachers. Despite the many advantages of AI in assisting teachers in teaching, its potential drawbacks and challenges should not be ignored.

Firstly, teachers may become overly reliant on AI technology, leading to less interaction with students, which in turn affects teaching effectiveness, reduces teacher authority, and establishes good teacher-student relationships. Secondly, AI systems may also be subject to technical failures and algorithmic biases, which might disseminate inaccurate answers, which will affect students' learning outcomes. Additionally, the widespread use of AI technology raises data privacy and ethical issues, and educational organizations and teachers need to put in place stringent protections or policies to ensure the security of student information.

In the future development of education, the advantages brought by AI can continue to be used, but its prospective problems should also be dealt with cautiously. Teachers should remain cautious in the use of AI technology, fully consider its possible negative impacts, and take appropriate measures to cope with them, to ensure the maximization of teaching effectiveness, and to protect students' rights and interests. Education policymakers and practitioners should continue to explore and improve the application strategies of AI technology to ensure that it brings substantial progress to education.

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