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Optimization analysis of teachers' professional growth path based on artificial intelligence technology

Qiuyan LU

Zhengzhou Normal University, Zhengzhou 450044, China

Abstract: With the rapid development of artificial intelligence technology, the field of education is undergoing profound changes. As the core of educational innovation, college teachers need to closely integrate their professional growth path with intelligent technology to meet the challenges and opportunities of the new era. Based on the systematic combing of existing literature, this study proposes the optimization path for the professional growth of college teachers empowered by artificial intelligence technology. First, the potential of AI technology in promoting teachers' professional development is explored from three aspects: personalized growth path design, intelligent training platform construction, and educational data analysis and performance evaluation. Second, the challenges in the process of technology application are analyzed, including the difficulty of technology integration, ethical and privacy issues, and the adaptability of teachers' role transformation. Finally, the study summarizes the key directions for optimizing the professional growth path of college teachers, emphasizing the construction of a theoretical framework and practical strategies for AI-centered teacher growth. In conclusion, this paper provides theoretical support and practical reference for teachers' professional development in the era of artificial intelligence.

Key words: artificial intelligence; teacher professional growth; educational technology; path optimization; personalized growth

1 Introduction

With the rapid iteration of information technology and the wide application of artificial intelligence (AI) technology, the field of education is undergoing an unprecedented transformation. From smart classrooms to virtual teaching, AI technology is profoundly affecting the teaching mode, learning environment and management of education. However, compared with the technology's support for student learning, the professional growth of college teachers in the AI environment has not yet received enough attention. Teachers in colleges and universities are important promoters of educational innovation, and the improvement of their professional ability is not only related to their own development, but also directly affects the quality of education and the effect of student training. On the traditional path of professional growth for teachers, they rely more on experience accumulation and offline training, which lacks personalized support and is difficult to adapt to the complex needs of modern education [1]. The emergence of AI technology can provide new possibilities for optimizing the professional growth path of teachers. Through AI technology, teachers can obtain precise

teaching feedback, personalized growth planning, and dynamically adjusted training resources. Therefore, studying the optimization of the professional growth path of college teachers based on artificial intelligence technology can not only fill the gaps of existing research, but also provide a scientific basis for the improvement of the quality of education in colleges and universities [2].

2 Research on the application of artificial intelligence technology in education

The application of AI technology in education has covered many aspects of teaching, management and evaluation, providing strong support for the innovation of education models. First, in terms of teaching support, intelligent tutoring system (ITS) is widely used to provide students with personalized learning guidance through natural language processing, deep learning and other technologies. For example, the system can generate customized learning content based on students' knowledge map to help students master knowledge efficiently. In addition, the virtual learning environment (VLE) provides teachers with rich teaching resources and an online interactive platform, which enhances teaching efficiency [3]. Second, in learning analytics and educational data mining, AI provides teachers with real-time feedback and decision support by processing large-scale data to identify students' learning behaviors, preferences, and needs. For example, AI can predict students' possible learning difficulties and intervene in a timely manner by analyzing learning data. Further, in teaching evaluation and management, AI technology can optimize educational assessment methods. Traditional teaching evaluation often relies on manual labor, which is inefficient and subjective, while intelligent evaluation systems achieve objective and precise evaluation through data mining and machine learning. For example, intelligent marking systems are able to recognize keywords in open-ended answers and assess the quality of the answers, saving a lot of human resources [4]. However, current research focuses more on student learning support, and there is a lack of systematic research on how AI can help teachers' professional development.

3 Theoretical models and practical exploration of teachers' professional growth

Teachers' professional growth is an important topic in educational research, covering the comprehensive improvement of knowledge, skills and attitudes, and the exploration of theoretical models and practice paths provides theoretical support for its development [5]. Traditional models of teacher growth emphasize that teachers improve their professional competence through continuous learning and practice accumulation. For example, Fullan (1991) proposed a three-stage model of teacher development that emphasizes the importance of individual learning, peer cooperation, and organizational support. With the changes in the educational environment, dynamic developmental models of teacher growth are emerging. Day (1999) argues that teacher growth should be centered on individualized and continuous development, emphasizing the contextual and differentiated nature of the growth process. In recent years, the technological pedagogical content knowledge model (TPACK) has become a research hotspot, emphasizing the organic integration of technology, pedagogy and subject knowledge, which provides a guiding framework for the professional growth of teachers in a technological environment. In practice, the ways in which teachers grow are constantly diversifying [6]. From offline training to online learning platforms, the role of modern technology in teacher growth has become increasingly prominent. For example, through microgrid teaching, teaching reflection videos and online training platforms, teachers are able to realize independent learning and competence enhancement. However, these traditional paths are still insufficient in the face of the in-depth application of AI technology, providing a research opportunity to build a more personalized and dynamically adaptable growth model [7].

4 Artificial intelligence technology to empower teachers' professional growth

Artificial intelligence (AI) technology provides new tools and paths for teachers' professional growth, significantly

enhancing the personalization, precision and efficiency of teachers' growth. From the design of personalized growth paths, the construction of intelligent training platforms to educational data mining and performance evaluation, AI technology shows great potential [8].

4.1 Design of personalized growth paths

Artificial intelligence (AI) technology can design personalized growth paths based on teachers' professional characteristics and growth needs. By collecting and analyzing teachers' teaching behaviors, classroom performance and professional development data, AI systems can generate personalized growth reports to help teachers understand their strengths and weaknesses. For example, deep learning models are able to perform pattern recognition on teachers' teaching data to identify their teaching blind spots, so as to make targeted suggestions for improvement. In addition, knowledge mapping technology can correlate teachers' areas of specialization with the latest academic developments, so as to formulate precise learning plans for them and achieve dynamic updating of knowledge [9].

4.2 Intelligent training and support platform

Intelligent training platforms based on AI technology are becoming an important support tool for teachers' professional development. These platforms provide teachers with immersive learning experiences and real-time feedback by integrating natural language processing, virtual reality (VR), augmented reality (AR) and other technologies [10]. For example, the virtual teaching training system can simulate real classroom situations and help teachers improve their teaching skills in a safe environment, while intelligent assistants can answer teachers' questions about curriculum design and teaching feedback in real time through voice recognition and semantic analysis technologies. In addition, the AI recommendation algorithm can push personalized training resources based on teachers' learning behaviors and preferences to enhance learning results.

4.3 Educational data mining and teacher performance evaluation

AI technology has a significant advantage in educational data mining, and through the processing and analysis of large-scale teaching data, teachers' teaching performance can be assessed more scientifically. Machine learning algorithms can identify key behavioral patterns in the teaching process, such as student engagement and the quality of teacher interactions, and thus provide teachers with data-based suggestions for improvement. For example, certain intelligent assessment systems can analyze classroom videos in real time to quantitatively evaluate teachers' speed of speech, frequency of interactions, and classroom atmosphere. In addition, the results of these data analyses can be used to develop targeted training programs to help teachers continuously optimize their teaching abilities [11].

It can be seen that AI technology empowers teachers' professional growth with multiple advantages. First, AI technology makes teacher development more personalized, and can provide accurate services according to individual needs; second, AI can reduce the cost of teacher training and development. For example, through online training platforms, it can reduce the time and cost of offline training; lastly, AI technology provides a scientific basis for teacher growth through data-driven decision-making support, which helps to establish a dynamic professional development system. Through the above empowerment paths, AI technology is gradually becoming an important enabler for teachers' professional growth, providing a strong technical guarantee for education innovation in the new era.

5 Challenges and shortcomings

Although AI technology has shown great promise in empowering teachers' professional growth, it still faces challenges and shortcomings in the process of its application, mainly including the difficulty of technological integration, ethical and privacy issues, and the adaptability of teachers' role change.

5.1 Difficulty of deep integration of technology and education

The complexity and specialization of AI technology make its application in education face technical barriers. Many college and university teachers lack sufficient technical background and operational skills and are confused about the use of AI systems, making it difficult for them to make full use of the relevant technology in their teaching and professional development. In addition, the application of AI technology in educational scenarios is still immature and lacks a complete solution for teachers' professional growth. The limitations of the technology may also lead to a lack of personalization and precision in the design of teachers' growth paths.

5.2 Ethical and privacy issues

AI technologies may involve privacy and ethical issues in the process of collecting and analyzing teachers' data. For example, teachers' teaching behavior data may be over-monitored or misused, resulting in professional stress or privacy leakage. There are also concerns about the transparency and fairness of algorithms. Teachers may be concerned about the potential risks that algorithmic assessment poses to their professional development, which in turn may lead to the rejection of AI technology.

5.3 Adaptation of teacher role transformation

The wide application of AI technology may change the traditional role orientation of teachers. The shift from knowledge transmitter to learning guide requires teachers to have higher technological literacy and cross-disciplinary comprehensive abilities. However, there are differences in the adaptability of different teachers to the role shift. Some teachers may be resistant to the technology or have difficulty in acquiring the relevant skills in a short period of time, thus affecting the effectiveness of the promotion of AI technology.

5.4 Insufficient resource and policy support

AI technology-enabled teacher professional growth requires adequate resource support, including technical equipment, platform development, and teacher training. However, at present, many colleges and universities have insufficient technical resources and funding, which limits the application of AI in teachers' professional development. In addition, the lack of sound policy guidance and laws and regulations has led to a lack of standardization in the promotion and application of AI technology.

The above issues are key to realizing the effective empowerment of AI in teachers' professional growth. Solving these problems requires multi-party cooperation, including technology development, teacher training and policy support, to ensure the efficient application of AI technology in teachers' professional growth.

6 Conclusion

This paper discusses the application and optimization path of artificial intelligence technology in empowering college teachers' professional growth, aiming to provide theoretical and practical guidance for teacher development in the new era. By systematically combing the relevant literature at home and abroad, this article first analyzes the wide application of AI technology in the field of education, especially its potential in personalized learning support, intelligent training platforms, educational data analysis and performance evaluation. Then, the article delves into the theoretical models of teacher professional growth, including the traditional theory of teacher development stages and the modern model of technology integration, highlighting how AI technology can provide teachers with personalized growth paths and professional improvement support. However, despite the promising application of AI in teacher growth, it currently faces challenges such as the difficulty of deeply integrating technology and education, ethical and privacy issues, and the adaptability of teachers' role transformation. Future research should further focus on solving these problems and promoting the efficient application of AI technology in teacher development. In conclusion, AI technology brings unprecedented opportunities for the professional growth of college teachers, and the research in this paper provides a theoretical framework and a practical

path for the deep application of AI technology in teacher growth in the future, as well as a reference basis for the intelligent transformation of the education field.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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