

Exploring the Path of Empowering Teachers' Professional Development with Deep learning

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Abstract

This paper explores the application of deep Learning of artificial intelligence in the field of education and its impact on teachers' professional development in the digital age. The research has found that this technology brings opportunities for the professional development of teachers, such as integrating resources to provide teaching materials, assisting personalized teaching based on student data, optimizing teaching evaluation and feedback through intelligent assessment, assisting teaching decisions through data analysis, and using online platforms to support teacher training and growth. At the same time, the challenges faced by Chinese teachers in using artificial intelligence in teaching were analyzed in depth, and corresponding solutions were proposed, aiming to provide useful references for promoting teachers' professional growth in the era of artificial intelligence.

Keywords

Artificial intelligence, deep learning, teacher professional development, educational applications.

1. Introduction

In today's digital age, the deep learning of artificial intelligence is changing various fields of society at an unprecedented speed, and education is no exception. Deep learning, with its powerful data processing and intelligent analysis capabilities, has brought innovative teaching methods, abundant teaching resources, and personalized learning experiences to education. The teacher as the core force of education, who's professional development is crucial for improving the quality of education. With the support of deep learning in artificial intelligence, teachers are gradually entering a new era of human-machine collaboration. In the human-machine collaboration mode, teachers and intelligent machines work together to complete teaching tasks, fully leveraging the professional advantages of teachers and the technological advantages of intelligent machines to provide students with more personalized and efficient educational services. The application of deep learning has provided new opportunities and avenues for the professional development of teachers, but at the same time, it has also brought a series of challenges. Thoroughly studying these challenges and exploring effective solutions is great practical significance for promoting the intelligent transformation of education and enhancing teachers' professional competence.

2. Overview of Deep Learning in Artificial Intelligence

2.1. The Development History and Current Status of Artificial Intelligence

The development process of artificial intelligence is full of twists and turns and breakthroughs. Since the term "artificial intelligence" was officially proposed at the Dartmouth Conference in 1956, artificial intelligence has gone through three waves of development. In the first wave, semiotic methods based on abstract symbols and logical reasoning prevailed, and formal methods such as mathematical proofs, knowledge reasoning, and expert systems were applied

in human-computer interaction processes. However, due to the limited computing speed of electronic computers at that time, the development of artificial intelligence was severely restricted.

In the 1980s, artificial intelligence ushered in a second wave. The traditional semiotic school has developed slowly, and new methods based on probability and statistical models have been boldly attempted. Significant progress has been made in speech recognition and machine translation, and artificial neural networks have begun to emerge in fields such as pattern recognition. However, artificial intelligence during this period was limited by the amount of data and testing environment, and was still in the academic research and laboratory stage, lacking practical value in a universal sense.

The third wave of artificial intelligence originated from the deep learning proposed by Hinton et al. in 2006. In 2015, artificial intelligence algorithms based on deep learning achieved a leap forward in image recognition accuracy, surpassing the human eye for the first time. Subsequently, deep learning has made breakthrough progress in fields such as speech recognition, data mining, and natural language processing. Nowadays, artificial intelligence has been widely applied in various fields such as autonomous driving, intelligent assistants, news recommendation and writing, search engines, robots, etc., and has entered people's social life. At present, the application of artificial intelligence in the field of education is becoming increasingly widespread, bringing new opportunities and challenges to education and teaching. The emergence of intelligent education platforms, intelligent teaching aids, and intelligent learning evaluation systems provides students with more personalized and accurate learning services, and teachers with more intelligent and efficient teaching support.

2.2. Principles and Characteristics of Deep Learning

Deep learning is a machine learning technique based on artificial neural networks, which works by constructing multiple layers of neural networks to enable machines to automatically learn features and patterns from large amounts of data. Deep learning networks typically consist of an input layer, a hidden layer, and an output layer, with the hidden layer having multiple layers. During the training process, data enters the network from the input layer, undergoes processing and transformation in the hidden layer, and finally obtains the predicted results in the output layer. By continuously adjusting the parameters in the network, the error between the predicted results and the actual results is minimized, thereby achieving learning and understanding of the data.

The characteristics of deep learning can be summarized into four points, namely automatic feature extraction, powerful expressive power, data-driven, and end-to-end learning. Firstly, deep learning can automatically extract features from data without the need for manual feature design. This gives deep learning a great advantage in processing complex data, as it can discover hidden patterns and patterns in the data. Secondly, deep learning networks have a multi-layer structure that can perform complex nonlinear transformations on data, thus possessing strong expressive power. It can learn very complex functional relationships and is suitable for various complex tasks. Thirdly, deep learning relies on a large amount of data for training, and the larger the amount of data, the better the performance of the model tends to be. By learning from massive amounts of data, deep learning models can continuously optimize their parameters and improve the accuracy of predictions. Finally, deep learning can achieve end-to-end learning, that is, learning directly from raw data to the final output results without the need for intermediate human intervention and feature engineering. This learning method simplifies the process of model construction and training, improving the efficiency and accuracy of the model.

2.3. The current application status of deep learning in the field of education

At present, the application of deep learning of artificial intelligence in the field of education is becoming increasingly widespread, covering multiple aspects. Intelligent education platforms, with the help of deep learning, can provide personalized learning plans and guidance for students based on their learning behavior and data, such as the National Smart Education Platform and NetEase Youdao. Intelligent teaching aids can help teachers conduct teaching more efficiently, such as Xiaoyuan Souti, Konwbox, etc. By analyzing students' learning data, accurate teaching suggestions can be provided to teachers.

In terms of intelligent learning assessment, deep learning has achieved more accurate and objective evaluation of students' learning outcomes, such as the intelligent learning assessment systems developed using this technology, such as Alibaba Cloud Tianchi and Tencent Classroom. In addition, the combination of virtual reality (VR) and augmented reality (AR) technology with deep learning creates immersive and experiential learning environments for students, and applications such as VR classrooms and AR textbooks continue to emerge. Intelligent robots and intelligent control technology have also brought new vitality to education. Smart learning partners such as Xiaoi classmate can interact with students and cultivate their language, logic, and social skills.

3. Deep learning empowers teacher development

3.1. The provision of intelligent teaching resources

The deep learning of artificial intelligence can integrate various educational resources and provide teachers with rich and diverse teaching resources. Through the analysis and mining of massive educational data, intelligent education platforms can accurately recommend suitable teaching courseware, videos, test questions and other resources based on teachers' teaching needs and students' learning characteristics. The emergence and improvement of generative artificial intelligence with deep learning models as its core, such as Deepseek ChatGPT、Gauth: AI Study Companion and other artificial intelligence platforms can collect the latest teaching resources for teachers in the shortest possible time, automatically generate teaching outlines, teaching processes, and teaching resource recommendations based on the teaching objectives and content input by teachers, and provide lesson preparation references for teachers. These resources not only cover a wide range of subject knowledge, but also have diverse presentation forms that can meet the needs of different teaching scenarios and student learning styles.

3.2. Personalized teaching assistance

The deep learning of artificial intelligence can collect and analyze students' learning data, including academic performance, learning behavior, learning preferences, etc., in order to gain a deeper understanding of each student's learning status and needs. Intelligent teaching systems can establish personalized learning models for each student. Through these data, teachers can provide personalized teaching support for students, such as developing personalized learning plans, recommending suitable learning resources, and providing targeted tutoring. For example, Seewo Easinote can accurately classify students into different levels based on their learning data, such as test scores, completion of daily assignments, etc., and design assignments that focus on consolidating basic knowledge, increasing difficulty and expansion, and being more challenging and innovative for students with weak, medium, and high-level foundations.

3.3. Optimization of Teaching Evaluation and Feedback

The deep learning of artificial intelligence provides strong support for teachers in teaching evaluation and feedback. Traditional teaching evaluation mainly relies on teachers' subjective

judgment and limited exam scores, making it difficult to comprehensively and accurately assess students' learning situation. With the help of intelligent learning assessment systems, teachers can obtain more objective and comprehensive student learning data. These systems can monitor and analyze students' learning process in real time, not only evaluating their knowledge mastery, but also analyzing their learning attitude, effort level, and progress trend. At the same time, the system can provide detailed feedback and suggestions to teachers based on the evaluation results, helping them adjust teaching strategies and improve teaching methods in a timely manner.

3.4. Adjustment of teaching decisions

By utilizing deep learning, teachers can conduct comprehensive and in-depth analysis of students' learning data, understand their learning status, progress, and difficulties, and provide a basis for teaching decisions. By analyzing students' homework completion status, exam scores, classroom performance, and other data, teachers can accurately identify students' learning problems, adjust teaching strategies in a timely manner, and provide personalized tutoring and support for students. Teachers can also use learning analysis techniques to understand students' learning styles and preferences, provide reference for the selection of teaching methods, and improve the pertinence and effectiveness of teaching. Based on students' learning data, teachers can discover that some students have difficulties in mathematical operations, so they adjust the teaching schedule, increase relevant exercises and tutoring, help students overcome difficulties, and improve academic performance.

3.5. Teacher training and professional growth support

The development of deep learning in artificial intelligence has driven changes in the field of education and prompted teachers to constantly update their professional knowledge. Teachers need to understand the principles, applications, and development trends of these new technologies, master relevant teaching tools and methods, in order to better adapt to the new requirements of education and teaching.

Artificial intelligence provides new ways and avenues for teacher training. Online learning platforms and intelligent training systems can customize personalized training courses and learning plans for teachers based on their professional development needs and personal characteristics. These courses are rich and diverse in content, covering various aspects such as educational theory, teaching methods, subject knowledge, etc. Teachers can learn anytime and anywhere. The intelligent training system can also simulate teaching scenarios for teachers to practice and provide real-time feedback and evaluation, helping teachers improve their teaching skills. Teachers can conduct teaching demonstrations in virtual classrooms, and the system will analyze their teaching performance, point out their strengths and weaknesses, and provide improvement suggestions to promote their professional growth. If DingTalk online classroom is used, multiple teaching modes can be selected. Teachers can perform screen sharing, file transfer, online homework grading, and other operations. They can also use its clock in and sign in functions to simulate attendance management in offline classrooms.

Meanwhile, the deep learning of artificial intelligence provides teachers with abundant learning resources and platforms, which they can use for self-directed learning and professional development. For example, teachers can learn about the application cases and practical experience of deep learning of artificial intelligence in the field of education through online courses, academic papers, educational forums, and other channels, and enhance their professional competence.

4. The realistic dilemma of popularizing artificial intelligence teaching

4.1. Teachers lack the ability to accept and apply new technologies

Although deep learning has shown great potential in the field of education, some Chinese teachers still have shortcomings in their ability to apply the technology. On the one hand, some teachers have limited understanding of artificial intelligence technology, lack basic technical knowledge and operational skills, and do not know how to choose and use AI tools and platforms suitable for teaching. On the other hand, even though some teachers have some understanding of artificial intelligence technology, there are still difficulties in deeply integrating it into teaching, and they cannot fully leverage the advantages of artificial intelligence technology to improve teaching effectiveness. For example, when using intelligent teaching platforms, some teachers simply use them as display tools for teaching resources, without utilizing the platform's data analysis functions to understand students' learning situations and provide personalized teaching.

Some teachers lack understanding of deep learning techniques in artificial intelligence and have a low acceptance of new technologies. They are accustomed to traditional teaching methods and models, believing that the application of new technologies will increase the teaching burden and have doubts about the improvement of teaching effectiveness. In addition, some teachers, although recognizing the importance of new technologies, encounter difficulties in practical application due to a lack of relevant technical knowledge and skills, and are unable to fully leverage the advantages of new technologies.

4.2. The cost of technology application is relatively high

The application of AI deep learning needs certain hardware and software support, such as high-performance computers, intelligent teaching platforms, data analysis software, etc. The purchase, maintenance and update costs of these equipment and software are high, which may be difficult for some schools and educational institutions to bear. In addition, today's AI technology is developing rapidly, the version update iteration speed is extremely fast, and the cost of personnel training is also high. In addition, technical application also needs professional technical personnel to support and maintain. The current information technology maintenance personnel of the school still cannot meet this technical requirement, which increases the human cost of technical application.

4.3. Data privacy and legal issues

The application of deep learning cannot be separated from the support of data, and the data literacy of teachers is crucial for effectively utilizing artificial intelligence technology. However, the data literacy of some teachers currently needs to be improved. Some teachers lack data awareness and do not attach importance to collecting and analyzing students' learning data, making it difficult to obtain valuable information from the data to guide teaching. Some teachers, although able to collect data, lack the ability in data processing and analysis, and do not know how to effectively process and interpret data using data analysis tools, making it difficult to make scientific teaching decisions based on data results.

In addition, with the widespread application of artificial intelligence in the field of education, ethical and legal issues have gradually become prominent, causing difficulties for teachers. In the application process of deep learning in artificial intelligence, a large amount of student learning data and teacher teaching data will be involved. The privacy and security issues of these data are of great concern. Some teachers also have a lack of awareness, which may lead to security risks such as student data leakage. If data is leaked or abused, it may cause harm to the rights and interests of students and teachers. Students' academic performance, learning behavior, and other data may be used for commercial purposes or leaked to third parties,

affecting their personal privacy and future development. In the process of AI assisted teaching, there may also be algorithmic bias issues, such as the possibility of unfair evaluation of certain student groups by intelligent evaluation systems, which can affect the fairness of education. In addition, when using teaching content generated by artificial intelligence, teachers need to pay attention to copyright issues and avoid infringement.

4.4. The impact on traditional teaching concepts

The application of deep learning in artificial intelligence has brought tremendous impact to traditional teaching concepts. In traditional teaching, teachers are the disseminators of knowledge and occupy a dominant position, while students receive knowledge relatively passively. In the era of artificial intelligence, students can acquire rich knowledge through intelligent learning platforms, and the role of teachers is gradually shifting towards being guides and facilitators. The transformation of this role requires teachers to change their traditional teaching concepts. However, some teachers find it difficult to adapt to this change in their mindset and are still accustomed to traditional teaching models. They have doubts or resistance towards the application of artificial intelligence technology in teaching and are unwilling to try new teaching methods and models, which to some extent hinders the promotion and application of artificial intelligence technology in the field of education

4.5. Educational equity issues

The popularization of deep learning of artificial intelligence involves the issue of educational fairness. In the long run, the popularization of AI technology has the long-term potential to promote education equity. The progress and popularization of AI technology can promote the large-scale coverage of high-quality educational resources, enable excellent educational resources to be shared across regions, and enable students in remote areas to synchronously access the resources of famous urban schools. In addition, in areas where teachers are weak, AI can undertake standardized knowledge teaching tasks, such as experimental video analysis, explanation of basic knowledge points, and release teachers' energy for high-level ability training, such as critical thinking training. This "human-computer cooperation" mode can systematically improve teaching efficiency.

However, in today's technology promotion stage, AI technology may aggravate the imbalance of education. First of all, from the hardware level, the application of technology requires certain equipment and network conditions, and some schools in remote areas or economically underdeveloped areas may not be able to meet these conditions, leading to students being unable to enjoy the educational resources and teaching services brought by new technologies. Secondly, from the perspective of teachers, the application of technology may lead to a further widening of the gap between teachers' teaching levels. Those teachers who can skillfully use technology can provide better teaching for students, while those teachers who lack the ability to apply technology may not be able to keep up with the pace of teaching reform. Finally, from the technical level, the "student portrait" generated by AI system relying on learning data may lead to algorithm bias, such as over optimization of specific learning mode. In the absence of manual intervention, it may solidify the differences in academic performance and form a "data cocoon room", resulting in hidden stratification driven by data. In addition, teachers in remote areas are weak, and it is difficult to provide effective learning guidance, which may exacerbate the urban-rural education gap.

5. Countermeasures for solving the dilemma of popularizing artificial intelligence teaching

5.1. Strengthen teacher training and promote the deep integration of technology and teaching

5.1.1. Conduct targeted training

Education departments and schools should organize deep learning training for teachers on artificial intelligence. In order to improve teachers' technical application abilities, education departments and schools should strengthen technical training for teachers. The training content should cover the basic concepts of artificial intelligence, common educational application tools and platform usage methods, and strategies for integrating technology and teaching. For example, offering specialized courses to teach teachers how to use artificial intelligence technology for teaching analysis, designing personalized teaching plans, and so on. The training methods can be diversified, including online training courses, offline workshops, expert lectures, etc., to meet the learning needs of different teachers. At the same time, schools can establish technical support teams to provide timely assistance and guidance to teachers in the process of applying artificial intelligence technology. In addition, teachers are encouraged to carry out teaching practices and research based on artificial intelligence technology, continuously improving their technical application ability and teaching level through practice.

5.1.2. Case demonstration and practical guidance

At present, China is actively promoting pilot schools for artificial intelligence, and the results of these schools can serve as excellent cases of the integration of artificial intelligence technology and teaching, providing practical references for teachers. At the same time, professional personnel are arranged to guide teachers' practical applications and help them solve problems encountered during the application process. For example, organizing teachers to observe efficient classroom teaching using artificial intelligence technology, and then allowing teachers to imitate and innovate in actual teaching, with experts providing on-site guidance and feedback.

5.1.3. Establish incentive mechanisms

Schools and education departments can establish incentive mechanisms to commend and reward teachers who actively integrate artificial intelligence technology into teaching and achieve good teaching results, stimulating their enthusiasm and initiative to participate. For example, establishing the "Artificial Intelligence Teaching Innovation Award" to reward teachers who effectively apply artificial intelligence technology in teaching and improve teaching quality.

5.1.4. Layered classification training

Before conducting training, conduct a comprehensive assessment of teachers' technical application abilities to understand their technical foundation and needs. Teachers can be classified into different levels and categories, such as technical novices and skilled individuals, through questionnaire surveys, skill tests, and other methods. Develop personalized training programs based on the different levels and categories of teachers. For technical beginners, focus on training in basic knowledge and skills; For technically proficient individuals, provide more advanced technical application and innovation training. For example, offering basic courses on artificial intelligence for novice technical teachers, including the use of intelligent teaching tools, simple data processing, etc; Provide advanced courses such as the application of artificial intelligence in educational research and the secondary development of artificial intelligence teaching platforms for technically proficient teachers. Establish a mechanism for continuous learning for teachers, provide online learning resources, technology exchange

communities, etc., so that teachers can access technical knowledge and exchange application experience at any time. At the same time, the school has established a technical support team to provide timely assistance and support for teachers who encounter problems in the process of technology application.

5.2. Optimize the technology application environment and reduce the cost of technology application

In view of the high cost of technology application, the government and schools should increase the investment in educational technology, optimize the technology application environment, reduce the cost of technology application, and help AI technology popularize in teaching.

5.2.1. At the government level

The government can encourage schools and educational institutions to purchase and apply deep learning related equipment and software for artificial intelligence through financial subsidies, policy support, and other means. At the same time, the government can also guide enterprises to develop low-cost, high-performance technology products suitable for the education sector, reducing the threshold for technology application.

5.2.2. At the school level

Schools can improve the utilization rate of technology equipment and reduce the cost of technology application by integrating resources, sharing devices, and other means. For example, schools can establish a shared intelligent teaching platform for teachers and students to use together, avoiding redundant construction and resource waste.

5.3. Improve data security and privacy protection mechanisms

5.3.1. Strengthen the publicity of laws and regulations

The education department and schools should strengthen the publicity of laws and regulations on data security and privacy protection, enhance teachers' awareness of data security and legal awareness, and make them consciously abide by relevant norms in teaching practice. For example, organizing teachers to study relevant laws and regulations such as the Cybersecurity Law of the People's Republic of China and the Personal Information Protection Law of the People's Republic of China, so that teachers can clarify their legal responsibilities and obligations in the process of data collection, use, and storage.

5.3.2. Standardize the data management process

In response to legal issues arising in artificial intelligence teaching, relevant departments should establish and improve corresponding norms and systems. Develop clear data usage rules to regulate teachers' behavior in data collection, storage, use, and sharing processes, ensuring students' privacy and data security. For example, in the data collection process, explicit consent from students and parents must be obtained, and the purpose and method of using the data must be communicated; In the data storage process, encryption technology is used to ensure the security of data; Strictly limit data access permissions in the data usage process to prevent data abuse. Strengthen the supervision of artificial intelligence algorithms, ensure the fairness and impartiality of algorithms, and avoid adverse effects of algorithm bias on students. At the same time, we will improve intellectual property protection laws and regulations, clarify the copyright ownership of AI generated content, and provide legal protection for teachers to legally use AI teaching resources.

5.3.3. Strengthen technical support

Schools and educational platforms should strengthen technological investment and adopt advanced data security technologies such as firewalls, intrusion detection systems, and data encryption techniques to ensure the security of data during storage and transmission. At the

same time, regular security assessments and vulnerability fixes are conducted on data systems to promptly identify and resolve potential data security issues.

5.4. Establishing ethical and moral standards to prevent ethical risks

5.4.1. Develop ethical guidelines

The education department and relevant institutions should establish ethical guidelines for the application of artificial intelligence in the field of education, clarify the ethical standards and behavioral guidelines for the application of technology. For example, it is stipulated that the design of artificial intelligence algorithms should follow the principles of fairness, impartiality, and transparency to avoid algorithmic bias; Emphasize that teachers should maintain humanistic care in education when using artificial intelligence technology and not overly rely on technology.

5.4.2. Carry out ethical education

Conduct ethical and moral education for teachers to enhance their understanding and judgment ability on ethical issues related to artificial intelligence. For example, adding artificial intelligence ethics courses in teacher training, through case analysis, discussions, and other methods, to enable teachers to understand the ethical risks that artificial intelligence technology may bring, and learn how to prevent and respond to these risks in teaching practice.

5.4.3. Establish an ethical review mechanism

Establish an ethical review mechanism for artificial intelligence education applications, conduct ethical reviews on newly developed artificial intelligence education products and applications, and ensure that they comply with ethical and moral standards. At the same time, regular review and evaluation of applied artificial intelligence technologies should be conducted to promptly identify and correct potential ethical issues. For example, establishing a dedicated ethics review committee to review the introduction of intelligent teaching platforms, intelligent evaluation systems, etc. in schools, and only technologies that pass the review can be promoted and applied in schools.

5.5. Promote educational equity and promote balanced technological development

5.5.1. At the government level

In order to promote educational equity and promote the balanced development of deep learning of artificial intelligence in different regions and schools, the government should increase investment in education in remote and economically underdeveloped areas, and improve the educational technology conditions in these areas. For example, the government can provide technical equipment and network support to schools in these areas to help them establish intelligent teaching environments.

5.5.2. At the school level

At the same time, schools should strengthen technical training and support for teachers, improve their technical application abilities, and narrow the technical gap between teachers. In addition, activities such as educational assistance and distance learning can be carried out to promote the flow of resources between schools, so that students in remote areas can also enjoy high-quality educational resources and teaching services.

6. Conclusion

In the wave of digital age, deep learning of artificial intelligence has become a key driving force for the transformation of the education field, and has had a profound and complex impact on the professional development of teachers.

From a positive perspective, the deep learning of artificial intelligence has opened up vast opportunities for the professional development of teachers. It integrates a massive amount of educational resources, accurately pushes suitable teaching courseware, videos, and test questions for teachers, and also uses generative artificial intelligence to assist teachers in preparing lessons quickly. By deeply mining student learning data, personalized teaching assistance can be achieved, and learning plans and resource recommendations can be customized for students at different levels. The intelligent learning evaluation system makes teaching evaluation more objective and comprehensive, providing real-time feedback to help teachers adjust teaching strategies in a timely manner. Based on data analysis, it provides powerful basis for teaching decisions and enhances the pertinence and effectiveness of teaching. Meanwhile, online learning platforms and intelligent training systems provide new avenues and abundant resources for teacher training and professional growth, helping teachers update their knowledge and enhance their skills.

However, we must also face the numerous challenges faced in the process of popularizing artificial intelligence teaching. Some teachers lack the ability to accept and apply new technologies, making it difficult to deeply integrate them into teaching; The high hardware, software, and maintenance costs required for technological applications limit their promotion and popularization; The frequent occurrence of data privacy and legal issues, such as the risk of data leakage, algorithmic bias, and copyright disputes, has brought many troubles to teachers; Traditional teaching concepts have been strongly impacted, making it difficult for teachers to transform their roles and affecting the application of new technologies; The issue of educational equity has intensified, and the gap in technology application levels between regions and teachers has led to unequal access to educational resources for students.

To effectively address these challenges, promote the intelligent transformation of education, and enhance teachers' professional competence, we have proposed a series of targeted solutions. By conducting targeted training, case demonstrations, practical guidance, establishing incentive mechanisms, and hierarchical training, we aim to comprehensively enhance teachers' technical application abilities and promote the deep integration of technology and teaching. The government and schools will increase investment, optimize the technology application environment, reduce application costs, and provide guarantees for the implementation of technology. Improve data security and privacy protection mechanisms, strengthen the promotion of laws and regulations, standardize data management processes, enhance technical support, and safeguard data security. Constructing ethical and moral standards, formulating ethical guidelines, conducting ethical education, establishing review mechanisms, and preventing ethical risks. In addition, the government has increased investment in education in remote and underdeveloped areas, and schools have strengthened their support for teacher technical training to promote educational equity and promote balanced technological development.

Looking ahead to the future, with the continuous development and improvement of deep learning in artificial intelligence, the education field will usher in more profound changes. Teachers should actively embrace change, continuously improve their professional abilities, fully utilize technological advantages, and provide students with higher quality and personalized educational services. At the same time, education departments, schools, enterprises, and all sectors of society need to collaborate to create a good technology application ecosystem, solve various problems in the process of technology application, ensure the sustainable and healthy development of deep learning of artificial intelligence in the field of education, and lay a solid foundation for cultivating innovative talents that meet the needs of the times.

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