

A Study on the Use of Educational Technology in Beijing Primary Schools Based on Questionnaires and Interviews

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Abstract: The rapid development of technology in the age of artificial intelligence has brought new opportunities to education. However, the problem of applying new technologies and the long-standing contradictions of traditional education have made this empowerment process difficult. The discussion of AI-enabled education is global, with sustained concerns expressed by international institutions and organizations, government officials, and even independent scholars. The study was conducted through questionnaires and interviews with Beijing primary schools as research objects. The three representative issues are selected to discuss, which are the complexity of the operating system, the monotony of the educational content, and the solidity of the teaching model. The study also proposed three solutions: system optimization, diversification of the educational mode, and enrichment of the teaching content.

Keywords: Artificial Intelligence, Learning and Teaching, Future Education, Digital Transformation

1. Introduction

Nowadays, artificial intelligence (AI) has gradually become a global hot topic. Discussions on the application of AI are hot in the field of education, and how to empower learning and teaching in the age of AI has triggered international attention from many parties. At the international level, UNESCO released Artificial Intelligence in Education: Opportunities and Challenges for Sustainable Development, highlighting the potential of AI-enabled education, a new teaching method that is being promoted and tested globally [1]. The State Council's issuance of the New Generation Artificial Intelligence Development Plan, which directs attention to the use of intelligent technology to accelerate the reform of talent cultivation modes and teaching methods [2], also reflects China's emphasis on AI-enabled education.

How to promote AI-enabled learning and teaching in the right way is a common issue. As of May 1, 2023, there were 6141 documents related to "AI education" on CNKI, of which there were more than 490 documents on the topic of "AI-enabled education", which is enough to show that scholars in related fields are concerned about this hotspot. From a comprehensive point of view, the research mainly focuses on educational technology and model reform [3-5], educational ethics discussion [6-8], application level discussion [9-11], etc., But there are few case studies based on specific practical scenarios and operability analysis. At the same time, it focuses on more isolated disciplines, such as information, ideology politics, etc., and interdisciplinary application and

specific analyses rooted in students' age groups are not common. As far as the current research is concerned, there are more suggestions on teachers' teaching and a lack of research and intervention in students' learning. It can be said that the application of AI technology in the field of education is still relatively limited, mainly in the area of teaching aids, such as the use of whiteboards, multimedia teaching materials, etc.[12].

Based on the current research situation, this study is conducted based on questionnaires, and interviews, in which questionnaires are distributed during three months. Besides, in-depth field research is carried out on teachers and students in five primary schools in Beijing to gain insight into the specific problems in education practice, thus speculating on the feasible path of AI-enabled education. Artificial intelligence technology is bound to have a far-reaching impact on education and teaching reform and will be an important entry point for solving current education problems. Based on real cases, this study tries to explore the rational use of AI while analyzing teachers' teaching and students' learning and to establish a synergistic structure of "AI+Education" to improve their personality and alleviate the pressure, to meet the needs of educational equity.

2. Introduction to Experiment Design and Procedure

Beijing, as one of the most developed regions in China in terms of education[13], has a certain superiority and representativeness in the whole range of AI applications. In contrast, primary school students have a greater demand for AI applications in teaching, and AI can also stimulate their interest in learning and cultivate their creativity [14]. Therefore, the survey chooses five excellent primary schools in Beijing (Tsinghua Primary School, Beijing Yuying School, Beijing Second Experimental Primary School, Beijing Huiwen First Primary School, and Haidian Experimental Primary School (Fucheng Road Campus)) as the research objects, carrying out the network sampling questionnaire, and combines with observation and interviews to carry out the research together.

The questionnaire was directed at front-line teachers and school students or graduates of various academic levels in various places to investigate the attitude of students and teachers towards AI technology. Through the analysis of the development of AI applications in education, the research can see the needs of the main targets of educational activities, and better understand the advantages and disadvantages of AI technology, to better analyze and think about how AI technology can be developed for the empowerment of education in the future education.

The five schools were also interviewed, and semi-structured interviews were conducted mainly with teachers as a supplement.

3. Results

222 questionnaires were collected, including 148 questionnaires for students and 74 for teachers. The Cronbach α of the two sets of questionnaires are 0.959 and 0.986 respectively, which proves that the questionnaires are highly credible and can be analyzed. A total of four typical or special interview cases were obtained, which are valuable to analyze as a supplement.

3.1. Analysis of Questionnaires

From the feedback of the two groups of questionnaires, it is learned that both students and teachers are using AI-related technologies in their daily learning and teaching, which can prove that AI has been prevalent in Beijing primary schools.

3.1.1. Analysis of Student Group Questionnaires

According to the questionnaire, 124 out of 148 students mentioned that teachers used intelligent teaching aids in their daily teaching process, accounting for 83.78%. Followed by online learning platforms and learning support software. It can be seen that in the current teaching process of teachers, AI technology is still mainly used in classrooms such as slides or the XIVO whiteboard for presentation. Unlike the AI technologies used by teachers in teaching, students use learning support software to learn the most in independent learning after class, accounting for 86.49%. This was followed by online learning platforms and finally smart teaching aids. In their independent learning, students more often use question-answering software such as Homework Help to answer questions and solve puzzles, or use memorization software such as Hundred Words Chop to consolidate basic knowledge.

Based on the current situation, AI technology in education should center on meeting the diverse needs of students and teachers for mutual advancement and quality education.

When it comes to the impact of AI technology on students' academic progress, 77.7% of students perceive it as beneficial, with 77.39% highlighting its ability to customize learning materials. Moreover, students also believe that AI technology fosters interest and improves efficiency. Thus, it is evident that a majority of students acknowledge the positive influence of AI technology on their educational experience, specifically in terms of personalized content, enhanced engagement, and increased efficiency. However, 22.3% of students expressed reservations, citing the lack of teacher feedback and evaluation as the primary disadvantage, accounting for 75.76% of those concerns. Additionally, some students mentioned difficulties with retaining information and distractions, which adversely affect efficiency. It is worth noting that it is mainly centered around the absence of teacher feedback and evaluation when compared to traditional methods while a small fraction of students raises issues regarding AI technology.

Therefore, the development of artificial intelligence technology should face the feedback and needs of students, strengthen the link between students and teachers to communicate, more timely and accurate adjustments to student problems, while continuing to carry forward its advantages of personalization, fun, and high efficiency.

3.1.2. Analysis of Questionnaires for Teacher Group

The results showed that 47.3% of teachers chose the traditional education method of "textbook, teacher, and classroom-centered". In comparison, 52.7% chose the new three-centered education model of student development, student learning, and learning effectiveness-centered". Another 52.7% chose the new three-centered education model of "student development, student learning, and learning effect", with slightly more students than teachers receiving student-centered education. It can be seen that the student-centered approach has gradually become the mainstay of primary school education philosophy, and the development of artificial technology is also closely related to the progress of education philosophy as the professional level of teachers increases and the learning and training process of teachers becomes more specialized.

The number of teachers with AI interventions in their primary school learning was comparable to the number without interventions, both being 37. Of the 37 samples selected with AI interventions, online learning platforms were used at the primary level in 83.78% of cases, followed by intelligent teaching aids and software in the next. It can be seen that online learning platforms were developed earlier and used more commonly. The results indicate that AI interventions are more suitable for primary school learning as the degree of AI intervention in primary education has gradually deepened,

Nowadays, 85.14% of the teachers surveyed use intelligent teaching aids, followed by online learning platforms and learning support software. It can be seen that the use of intelligent teaching aids as a tool to assist teachers in teaching is more common, reflecting the practicality and convenience of artificial intelligence. Online learning platforms and learning support software are used less, and there is still a need to develop AI platforms and software suitable for teachers and applicable to primary school learning.

Concerning the use of AI technology in teaching, 63.51% believe that there are greater advantages. It can be seen that the intervention of artificial intelligence and the advancement of the education model have made the teachers' group feel the expansion of its advantages. Among the samples that chose "Yes", 76.6% thought that its advantages were that teachers could manage students' learning tasks more intuitively and conveniently, 51.06% thought that students' learning participation was high, 68.09% thought that timely feedback and students' learning efficiency were improved, and 61.7% thought that education and teaching could be more personalized for students. It can be seen that teachers believe that the biggest advantage of AI for education is the intuitive and convenient management of students' tasks, followed by feedback even though it promotes the improvement of learning efficiency as well as personalized education, and then the improvement of students' participation. It can be seen that AI's ability to coordinate and summarise as well as personalized analysis are the advantages of AI in education and teaching.

Another 36.49% of teachers believe that there are certain disadvantages to the use of AI technology. While there are many advantages for teachers to use AI in education, there are also pitfalls that worry the teaching profession, with 76.6% believing that the specific disadvantages are the ease of distraction of students, 87.23% lacking teacher-student interaction, 48.94% of teachers not having an adequate grasp of AI technology, and 61.7% of teachers not having sufficiently perfect educational technology.

It can be seen that distracting teacher-student interaction is the main drawback of AI learning, and teachers' unfamiliarity with AI and its shortcomings also have some influence. The reason is that AI relies on the Internet, which is entertaining and distant, easily distracting primary school students, and the lack of offline teacher-student interaction to complete learning online. Secondly, because the AI system and platform are still developing and perfected, teachers should have foresight in learning about AI, learn more about the use of AI technology, and keep up with the new trends in education.

3.2. Interview Case Studies

In addition to the application issues that arise from the integration of AI technologies, the education sector itself has accumulated certain problems that need to be solved and optimized. The research presents four types of cases to further illustrate the current problems facing AI learning.

3.2.1. Complexity of the Operating System

The first-grade maths teacher from Tsinghua University Primary School emphasized that she often had to spend a lot of time debugging the class's smart devices before class and that the rhythm of teaching could not be carried out properly due to the complexity. It was also found in the questionnaire that 48.94% of the teachers surveyed believed that they were not proficient in AI technology. Instead of providing support for teaching and learning, the complex operating systems disrupted normal classroom teaching, and teachers called for the unification and improvement of relevant smart teaching platforms or systems.

Many teachers mentioned that they did not use them in their normal classroom teaching even though the schools were well-equipped and had advanced systems, but only on special occasions

such as public lessons, due to their lack of skills to operate the software. The issue is ordinary. The Blue Book on Artificial Intelligence in Education 2022 also reported that the hardware equipment in the surveyed schools was generally in good condition, but relevant software systems were relatively scarce [15].

3.2.2. The Monotony of Educational Content

The teacher at Beijing No. 2 Experimental Primary School believes that when teaching abstract knowledge, concepts are often separated from students' lives, and that traditional teaching modes make it difficult to engage students in active understanding and inquiry, but the use of new technologies has not solved the monotony of the content. The author believes that the reasons are as follows. Firstly, abstract concepts are hard to grasp for primary students that seem distant from their real-life experiences. As a result, they may find it difficult to comprehend and apply these concepts. Secondly, primary school students typically have shorter attention spans, making it a challenge to sustain their engagement and focus on abstract topics.

Therefore, it is a big challenge to teach abstract knowledge intuitively and interestingly. Finding innovative approaches that bridge the gap between abstract concepts and real-life experiences while incorporating interactive and captivating teaching methods becomes crucial in promoting active understanding and inquiry among students.

3.2.3. Solidification of the Pedagogical Model

The English teacher at Beijing Huiwen No. 1 Primary School said that she used uniform content for her four classes due to time and a lack of teaching resources, but the results varied. Some students grasped the content quickly and completed the exercises with ease, but some struggled to understand the material and complete the exercises correctly even in the same class period.

This reflects the conflict between homogenized teaching and personalized learning. When faced with a group of students, teachers usually use a set of forward-looking instructional steps. However, students differ in their learning styles and progress. Teachers should adopt appropriate teaching models, clear lesson plans, and varied exercises to meet students' needs.

4. Suggestions and Measures for Improvement

4.1. System Optimization: Building a Unified Intelligent Teaching Platform

It is necessary to build an open and unified national smart platform in public education [16]. Educators in different regions can foster regular learning and interdisciplinary thinking through the sharing of high-quality resources.

To ensure inclusivity, both regular students and those with special learning needs should be supported. In light of this, the following measures are proposed. First, a unified and compatible operating platform should be built, seamlessly integrating multiple software and devices. This platform should have a well-defined indexing system that classifies educational resources based on user authorizations. It should incorporate various resources such as textbook courseware, online exercises and assessments, supplementary materials for exploratory learning, and multimedia files like PowerPoint presentations, Word documents, pictures, audio, and videos. Accessibility to these resources should be ensured for all users. In addition to the unified platform, customized exploratory tasks should be developed. These tailored task assignments can foster interdisciplinary support and cultivate autonomous research and problem-solving skills among primary school students. Furthermore, auxiliary tools and techniques should be provided for students with disabilities, helping them overcome learning barriers. For example, visually impaired individuals

can benefit from screen readers or speech recognition software, while hearing-impaired individuals can utilize subtitles or sign language translation.

The platform which is open unified intelligent effectively supports the sharing and integration of information. Teachers can engage in autonomous learning at any time. In-service training courses and resources are offered through a professional development platform. A dedicated discussion area allows teachers to exchange questions and reflections, and an AI assistant on the platform provides real-time guidance by offering machine-learning-based responses to teacher queries. Additionally, the professional development platform can match teachers with relevant conference or seminar schedules, even in virtual formats. In cases where teachers are unable to attend meetings, an AI secretary records the proceedings and generates reports for the teacher's reference.

Successful teachers and technical experts can be dispatched to model schools throughout the region for public classroom demonstrations and training in new AI-empowered teaching methods.

By leveraging its temporal and spatial advantages, AI reinforces extensive professional cooperation and development among educators.

4.2. Diversification of Education Models: Building Interactive Classrooms with Smart Terminals

According to the National Engineering Research Center of Internet Education[17], interactive smart classrooms can effectively stimulate students' interest in learning, support different learning modes, and improve learning effectiveness. If equipped with appropriate terminals, intelligent classrooms will exert their maximum advantages. In light of this, the following measures have been conceived as viable options.

Equipping the smart classroom with intelligent terminals, such as tablets and electronic whiteboards, etc. opens channels for interactive and exploratory learning activities. Installation of learning management systems facilitates and models discussions, sets learning expectations, provides learning options, and assists in the problem-solving process. Additionally, designing interactive simulations with augmented reality (AR) expands the realm of real-world experiences and transforms abstract demonstrations into dynamic personal encounters is also a good method.

For teachers, the interactive classroom visualizes abstraction and engages students' participation, thus motivating learning and enhancing teaching efficiency. For students, this flexible and immersive learning approach empowers them to interact with knowledge and fosters a deeper understanding.

4.3. Teaching Content Enrichment: Making the Most of AI-enabled Data Analytics Models

Learning can be more personalized with AI algorithms or big data analysis [18]. Big data monitors processes and locates problems to prompt solutions. It can also be integrated with intelligent platforms to push relevant educational resources, collect learners' responses in the virtual learning environment, and provide feedback for educators to improve their work. In light of this, the following measures have been conceived as viable options.

Big data analysis facilitates precise teaching, personalized learning, and scientific management in education. AI-powered data collection enables the creation of multi-dimensional learning portfolios for regions, schools, classes, and individuals. These portfolios support the assignment of adaptive resources and assessments, guiding students in autonomous learning. Teachers can also use the portfolios to design challenging activities that foster student growth without discouragement.

5. Conclusion

This research focuses on the use of educational technology in primary schools in Beijing and presupposes a relevant program about the existing problems. Based on the research, this paper provides the following developmental advantages. Teachers will be empowered by AI to improve their teaching ability and quality, and teachers in remote areas will be able to provide high-level lessons. Each student can have their personalized data report, which enables them to get after-school assignments that match their abilities and have a richer learning experience. With the radiating effect of demonstration schools, as well as the continuous development of economy and technology, technology will spread deeper and wider into the educational wilderness.

However, the observation and interview subjects were mostly concentrated in the areas with rich educational resources in Beijing due to the uneven distribution of sample size. The research lacked certain universality. In the future, the scope will be expanded to carry out stratified investigations in the form of radiation studies to conduct a broader and more practical analysis of the integration of AI and education. With the deep integration of AI into education, the future will have a transformative impact on teachers and students.

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