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Analysis of the Current Application of Artificial Intelligence in High School Education: A Case Study of Yutan Middle School in Ningxiang City

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Abstract:

In the trend of educational digitalization, this study focuses on the current application of artificial intelligence in high school education, using Yutan Middle School in Ningxiang City as a case study. The research employed interview methods to conduct in-depth discussions with four interviewees, exploring the current status and existing issues of AI application in high school education at Yutan Middle School and proposing targeted countermeasures. The study finds that the application level of artificial intelligence in high school education at Yutan Middle School is relatively low and still in the exploratory stage, primarily influenced by factors such as subject nature, teaching concepts, high costs, operational complexity, and knowledge accuracy. To address these issues, the research suggests optimizing AI software to enhance technological maturity, strengthening teacher training to improve digital literacy and skills, and establishing an AI teaching technology exchange platform to share resources and promote educational innovation. Although this study has a small sample size and limited interview scope, it provides insights for future research directions.

Keywords: High school education; Artificial intelligence; Smart education; Interview.

1. Introduction

In the era of digital media, the rise of artificial intelligence (AI) has profoundly impacted people‘s lives, work, and learning methods, playing a crucial role in reshaping operational models across multiple industries, including education. This technological revolution has not only introduced new educational tools and methods but also significantly influenced teaching concepts and learning experiences. For the first time, the 20th National Congress of the Communist Party of China incorporated „educational digitalization“ into its report, proposing to „advance educational digitalization and build a learning soci-

ety for all and a country of lifelong learners." Since the Ministry of Education proposed the „Implementation of the Educational Digitalization Strategy Action" in 2022, educational digitalization has gradually become the focus of educational reform and innovation. In the field of education, the integration of artificial intelligence (AI) has notably enhanced teaching efficiency and enriched the learning experience. Furthermore, AI facilitates the customization of educational pathways, thereby catering to the individual learning preferences and needs of students. This application of technology in education not only optimizes instructional methods but also significantly personalizes the educational experience. Internationally, representative products in the field of educational AI, such as ChatGPT, Claude, and Gemini, have demonstrated AI's powerful capabilities in language understanding and generation. Domestically, products like Wenxin Yiyan and Kimi have also shown their unique advantages and potential in educational scenarios, offering new possibilities for educational content generation and teaching resource optimization. This study will use Yutan Middle School in Ningxiang City as an example, employing interview methods and case analysis to conduct semi-structured interviews with four teachers of different subjects in the first year of high school at Yutan Middle School. It aims to investigate the degree of AI application in high school education in Ningxiang City and provide insights for advancing the integration of AI and education. This paper analyzes the case of Yutan Middle School to explore its digital transformation in education. The goal is to provide empirical evidence supporting the deep integration of AI into educational practices. By presenting feasible paths, this study aims to serve as a reference for educators and policymakers. Ultimately, it contributes to the ongoing modernization of educational systems

2. Literature Review

A series of generative artificial intelligence technologies, led by ChatGPT, are being widely applied in various forms as tools in the educational process, to some extent reshaping various behaviors in the teaching and learning process. Researchers' discussions on ChatGPT in the field of education mainly focus on three aspects: opportunities, challenges, and countermeasures.

In teacher-led processes, Timms explored the application of artificial intelligence as a teaching tool or platform, such as using virtual reality to demonstrate concepts or materials, providing students with practical learning experiences [1]. Sharma et al. observed that integrating AI with other technologies in education and its use as a teaching tool has promoted the development and effective utilization of teaching tools [2]. Klamma et al. suggested that AI is not limited to being just a tool; it can also directly serve as a virtual tutor to help students set and achieve learning goals [3]. Mufdalifah's research found that AI systems can work independently according to instructions, understand student habits, and provide personalized learning services [4]. The learning process centered on learners is another aspect of education. Mikropoulos and Natsis argued that technology itself does not directly lead to learning but can provide certain tasks that may result in learning [5]. Different articles were evaluated and analyzed through literature analysis methods to identify various ways in which AI is adopted, implemented, or utilized to facilitate student learning [5]. A critical way AI improves students' learning abilities is by customizing and personalizing curricula and content according to learners' needs, abilities, and capabilities [5]. From another perspective, AI in education also removes some barriers to learning opportunities, such as national and international boundaries, enabling global learning through online and network platforms [5].

The widespread integration of artificial intelligence into educational activities has significantly restructured both teaching methods and evaluation systems. However, this technological advancement has also introduced challenges and sparked competitive crises within the traditional teaching profession. Based on role theory, Du Chunjuan analyzed the challenges to teacher-student relationships caused by the entry of artificial intelligence into the educational field from teacher-student role-playing, teacher-student role expectations, and teacher-student role conflicts [6]. She pointed out that the introduction of ChatGPT would weaken the authority of teachers, balance the power relationship between teachers and students, challenge traditional teacher-student relationships, and trigger conflicts in values, attitudes towards technology application, and academic ethics [6]. Li Shuying and Feng Siyuan deepened research in this direction from the perspective of the transformation of educational realms. Under the guidance of new technologies, the educational realm of teachers has continuously developed from „teaching by words and deeds" and „imparting knowledge" to „teaching how to learn," „empowering learning," and even „education as life" [7]. Furthermore, this study also suggested that the future role of teachers might transform into competitors of artificial intelligence and analyzed the crisis faced by teaching positions [7].

To address a series of challenges brought about by artificial intelligence in the field of education, researchers have provided solutions from different perspectives. Du Chunjuan proposed adjusting teacher-student role-playing to promote equality and cooperation between teachers and students, clarifying teacher-student role expectations to

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emphasize the value of both teachers and students as subjects, and resolving teacher-student role conflicts to enhance the moral level of both teachers and students [6]. Li and Feng emphasized the need to leverage the educational wisdom of educators that cannot be replaced by artificial intelligence, guiding education back to its original humanistic intent [7]. Liao Jian proposed a human-machine co-teaching system with digital avatars and constructed a teaching process, emphasizing that in the future human-machine symbiotic relationship, human-machine collaborative intelligence must be built with humans at the core [8].

Currently, research perspectives on artificial intelligence in education are diverse. For example, Roll and his colleagues employed literature analysis and library research methods to review and analyze the developmental history of AI applications in education [9,10]. Liu Xiangyu used interview methods, classroom observation, questionnaire surveys, and experimental methods to construct, test the effectiveness, and improve English classroom teaching strategies based on human-machine collaboration [11]. Therefore, research in this field covers multiple levels, from theoretical exploration to practical application, but it still primarily focuses on theoretical discussions. In comparison, empirical research and quantitative analysis remain insufficient. There is an urgent need for more in-depth and systematic exploration in these areas in the future to ensure that theoretical findings can be effectively verified and applied in actual educational settings. To address this gap in empirical research, this study adopts the interview method to investigate the application of artificial intelligence in high school teaching at Yutan Middle School. The aim is to provide insights for formulating relevant secondary school policies and improving teaching methods for related teachers.

3. Research Methods

Given the scarcity of empirical research on this topic in the existing literature, this study seeks to address this gap by investigating the practical application of artificial intelligence in high school teaching at Yutan Middle School. Through this investigation, the study aims to provide empirical data that supports advancements in this field. Considering the complexity and diversity of this topic, this study adopts a qualitative research method using semi-structured interviews and case analysis to obtain in-depth, detailed first-hand information and proposes corresponding solutions in combination with actual cases. The researcher designed a semi-structured interview guide covering key topics, aiming to address crucial themes while allowing interviewees to freely express their views. The interviews were conducted via an online platform, with the entire process being fully recorded to ensure the authenticity of the data and the openness of communication. After data collection, the researchers organized and analyzed the interview records, extracting key information relevant to the research questions. The study selected four interviewees sequentially numbered as A, B, C, and D in this research. They are all first-year high school teachers from the high school department of Yutan Middle School in Ningxiang City, teaching English, History, Biology, and Politics, respectively. This selection helps to understand the application of artificial intelligence in high school teaching from multiple disciplinary perspectives.

4. Research Process

This section distills key information from interviewees‘ responses according to the questions, summarizing the application level of artificial intelligence in high school education at Yutan Middle School in Ningxiang City, identifying existing issues, and proposing corresponding solutions.

4.1 Application Level of Artificial Intelligence in High School Education

When asked about the use of AI tools in their teaching process and the frequency of use, the interviewees responded as follows:

„Yes, with moderate frequency“ (C); „As a teacher, I am inevitably influenced by AI in my work. The frequency of use is gradually increasing, which is a trend for future development“ (B); „Yes, although it‘s not used much currently, I can see its potential“ (A); „I use it occasionally, but not frequently“ (D).

Regarding students’ acceptance level, the interviewees responded:

“Students are very interested because these involve current cutting-edge biotechnology knowledge, which can broaden students’ horizons and stimulate their interest in biology” (C); “Students like it because it’s interesting, and they find the AI-generated images and video materials impressive” (A).

The interview results indicate that artificial intelligence has been applied to a certain extent in high school education at Yutan Middle School. The frequency of use varies among teachers, reflecting that the application of AI in education is still in an exploratory and developmental stage. The high level of student acceptance suggests that AI technology has significant advantages in providing interactive and intuitive learning materials, consistent with the observations of Sharma et al.

When asked, “Do teachers of other subjects use AI tools?”

the interviewees' responses included:
"Most tend to use traditional, searchable presentations and videos, so I've encountered few colleagues who use AI in their teaching" (A); "As far as I know, physics and chemistry teachers also use AI tools in class, as they involve some experiments and new technological principles" (C); "Younger teachers use it more frequently than older ones" (B); "From what I understand of other humanities subjects, this need is relatively weak" (D).
This interview reveals that science teachers in the high school department of Yutan Middle School use AI to assist in teaching slightly more frequently than humanities teachers. This difference may stem from science education content often involving complex and abstract principles and concepts. AI, as an auxiliary tool, can present these knowledge points to students more intuitively and easily understandable, thereby effectively enhancing teaching effectiveness and students' learning experiences. This finding aligns with Timms' research results, further supporting the view that AI has unique advantages in science teaching. Additionally, this study found a correlation between AI usage frequency and teacher age, with younger teachers being more inclined to accept and adopt emerging teaching technologies and concepts compared to older teachers. Older teachers may be more inclined towards traditional teaching methods and concepts and may encounter some difficulties in learning and becoming proficient with AI teaching tools.
When asked to provide specific examples of using artificial intelligence to assist teaching, the interviewees responded as follows: "In the introduction part, AI can be used to create images or short videos related to the text. When you want to create a grammar fill-in-the-blank exercise for students that exclusively uses attributive or noun clauses, such texts are difficult to find online, so AI can be used to create one" (A); "I use ChatGPT to find model diagrams and animations to present the latest knowledge points to students more objectively" (C); "AI can help me analyze the learning situation, better tailor teaching to individual needs; it can also help me identify and address gaps in lesson preparation; for post-class assignments and test analysis, AI can help us better analyze historical materials" (B); "After class, using AI to find practice questions and modifying them on this basis can greatly improve work efficiency. After exams, it can also help analyze class situations and grades, obtaining learning situation data" (D).
Through analysis of this part of the interview, it can be summarized that teachers have applied artificial intelligence in the following aspects, including teaching content creation and auxiliary teaching design, visualization of teaching materials, and personalized teaching and learning situation analysis. Fitria's research also categorized the application scope of AI in education, covering similar aspects [12]. Teachers' flexible use of AI technology encompasses three processes: before, during, and after class. This not only enriches teaching resources and optimizes the teaching process but also achieves personalized teaching and efficient management, significantly enhancing the quality and efficiency of high school education.

4.2 Challenges and Issues in the Application of Artificial Intelligence in High School Education

When asked about problems encountered while using AI tools, the responses were as follows:
"The AI output cannot meet your requirements; an untrained AI cannot immediately produce the results you want. Secondly, most AI software is primarily paid" (A); "Currently, many AI software are quite specialized, presenting operational challenges; some AI can only understand simple instructions and fail to produce desired results for complex instructions" (C); "Occasionally, there are minor errors in knowledge points that need careful scrutiny" (B); "Currently, there is no specialized AI that fits educational characteristics or aligns with subject-specific features" (D).
From the interview results, it can be concluded that teachers generally face the following issues when using AI: uncertainty of AI outputs, high costs, and operational complexity. Chen Lingbai also mentioned similar technical challenges in his research, such as issues with the accuracy and reliability of algorithmic models. He proposed the need to research and develop more precise and flexible personalized education algorithm models to adapt to different students' learning needs and characteristics [13]. These challenges, to some extent, limit the comprehensive application of AI in the education field but also provide direction and food for thought for the future optimization and development of AI technology in education.

4.3 Response Strategies

The application of artificial intelligence in high school education currently holds enormous potential and prospects for development. However, it faces many challenges in practical application. To address these issues, we need to actively seek response strategies.

4.3.1 Optimize AI tools, enhancing their user-friendliness and professionalism

Overcoming the software barriers inherent in AI tools is key to promoting the deep integration of AI technology with the education field. This requires developing more AI tools specifically designed for education that accurately reflect subject characteristics and adapt to educational

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needs. Simultaneously, providing detailed usage tutorials and operation guides ensures that teachers can easily adopt and efficiently utilize these tools. This reduces teachers' learning costs and encourages more teachers to try AI technology, thereby advancing the application of AI in education.

4.3.2 Cultivate teachers' digital literacy awareness and capabilities

Most teachers have not yet realized the potential of AI tools in teaching or are still in a wait-and-see state, primarily due to their general lack of digital literacy awareness and relevant professional knowledge. Therefore, teacher training is undoubtedly a crucial and indispensable link in promoting the application of AI in education. Through systematic training, teachers can master effective methods of using AI tools, thereby improving teaching efficiency and providing students with more diverse and personalized learning experiences. The education system should incorporate digital literacy training as a compulsory course in contemporary teacher training, teaching teachers how to use AI tools to optimize instructional design, search for teaching resources, implement personalized education, and conduct intelligent assessments through offline training or online courses. Through continuous learning and practice, teachers can more confidently integrate AI technology into their teaching, thereby improving teaching quality and efficiency.

4.3.3 Build a platform for teacher exchange and collaboration

To advance the application of artificial intelligence in education, it is crucial to build a platform for teacher exchange and collaboration. This platform can provide a space for teachers to share experiences using AI tools, successful teaching cases, and encountered problems, promoting exchange and learning. Furthermore, this platform can also serve as an online shared resource library, collecting various AI teaching tools, tutorials, and case studies, facilitating teachers' learning of this emerging technology and promoting the development and dissemination of AI educational technology.

5. Conclusion

In promoting educational digitalization, this study took the application status of artificial intelligence in high school teaching at Yutan Middle School in Ningxiang City as a starting point. It analyzed the problems and challenges teachers encountered in using artificial intelligence tools and proposed a series of coping strategies. The main research conclusions are as follows:

The application level of artificial intelligence in high school teaching at Yutan Middle School remains low. The main reasons include differences in subject nature, variations in teaching concepts, high costs, operational difficulties, and limitations in processing complex instructions. Based on this, this paper proposes corresponding solutions. Firstly, optimising AI software is crucial; only by resolving existing technical barriers can the integration of artificial intelligence and education be more effectively advanced. Simultaneously, there is a need to continue deepening educational reform, as traditional educational concepts can no longer meet the educational needs of the new era. Teachers need to enhance their digital literacy, which can be achieved through offline or online training. Lastly, building a platform for teacher exchange, gathering AI teaching resources, and promoting the application and sharing of AI technology in the education field is recommended.

This study has limitations, such as insufficient sample size and limited coverage of subjects and grades in the interviews. Future research can start from these aspects to further explore the application of artificial intelligence in education. In conclusion, it is believed that with the efforts of all parties, the application of artificial intelligence in the education field will become increasingly mature, ultimately realizing personalized and intelligent educational models and paving new paths for future educational development.

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