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# *Construction of an Individualized Teaching Model and Research of Practice Approach in Modern Education in the Artificial Intelligence Era*

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***Abstract.*** With the combination of artificial intelligence and the education field continuously deepening, AI energizes individualized teaching, has become an important direction of the Digital transformation of education, but in practice, there are still some issues like the boundaries of AI capabilities, students' dependence on AI, and ethical risks. Therefore, this article is themed by "Construction of an individualized teaching model and research of practice approach in modern education in the artificial intelligence era" and focuses on studying and exploring the troubles that the application of AI in education is facing currently, by using the case analysis method and reference analysis method. Selecting the practice of Deepseek's individualized teaching model in medical education and the application of blended teaching of AI and Knowledge graphs in math lessons as examples, respectively, analyzing the advantages and disadvantages of models, and on top of that, combining related articles to find a systematic solution for "AI + Education". The research shows that the way to balance technology and education needs to improve technology, rebuild the teaching framework, and construct an AI ethical system, so that the individualized teaching mode can be sustainably developed in the AI era.

***Keywords:*** Application of artificial intelligence in education, boundaries of AI capabilities, reconstruction of the teaching framework, AI ethical governance, digital transformation of education

## 1. Introduction

This study focuses on the era of artificial intelligence (AI) , the education field is facing the transformation from "Standardized instruction" to "Individualized teaching", which is meaningful to balance enabling technology and education essence, and to push individualized teaching development and promote digital transformation of education. In theory, it clarifies the boundaries for the application of AI in education; In practice, it provides a reference for new teaching model reconstruction. This study mainly elaborates on three key points specifically: Firstly, improving the application of "AI + Knowledge Graph" in individualized teaching; Secondly, exploring teaching methods with the goal of independent students' thinking, constructing the collaborative model between AI and teachers; Thirdly, building a prevention strategy for ethical risks in AI education.

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This research uses the reference analysis method to find and read related information and references, which can integrate the core theories and academic achievements currently available in this field systematically, providing a theoretical foundation and experience reference for analyzing the boundaries of AI capabilities and hammering out a solution. At the same time, combining the case analysis method, analyzing the issues, and optimizing space in the application of technology from AI teaching practice cases specifically, to enhance the practical pertinence of the research result. The final study goal is to propose an individualized teaching optimum proposal that focuses on techniques of optimization, teaching framework reconstruction, and construction of an AI ethics system. To achieve the goal, it is necessary to clarify the advantages and disadvantages of AI-assisted teaching through case analysis, and then point out common problems when transforming digital education by sorting the literature. After that, combining advanced theory to break through the core contradictions one by one, and finally integrating into a systematic solution.

## 2. Background

In this day and age, AI technology has developed rapidly, and machine learning, natural language processing, and big data analysis are reshaping the education field. Helen Crompton and Diane Burke in Artificial intelligence in higher education: the state of the field had pointed out that the application of AI in higher education has witnessed explosive growth in recent years, increasing by nearly twice to three times compared to previous years, which illustrates great concern about educational artificial intelligence (AIEd) in the academic world. This growth not only relates to the improvement of AI technologies like natural language processing and machine learning, etc but also closely relates to the current demand for digital transformation in education [1].

ChatGPT, as an example application of AI's development to the stage of large language models, in less than half a year since its launch, has been widely applied in online chatting, email writing, translation, code writing, draft copy, and course papers around the world [2]. Based on these practical functions, various large language AI models have also been applied in the education field. In one TED presentation, Salman Khan, the founder of Khan Academy, showed the essential application of educational artificial intelligence based on ChatGPT-4. Firstly, AI can interact with students by imitating characters in books, thus providing an immersive reading and understanding experience for students, transforming passive learning into active learning. Moreover, AI can provide one-on-one individualized learning tutoring, guiding students to think independently and correct their mistakes in time. Besides, AI can act as a High-quality debater, debating with students on certain controversial topics, thereby cultivating students' critical thinking skills. At last, AI can provide interdisciplinary learning guidance for students as a Virtual mentor, explaining the meaning and application prospects of different subjects [3].

Nowadays, traditional teaching modes and application tools can no longer meet the diverse and individualized demands of modern education. However, the intelligence, real-time performance, and interactivity of AI can break this deadlock. With the assistance of AI technology, the digital transformation of education is just around the corner. Nevertheless, the rise of AI in the education field has also put teachers in a career crisis. AI has replaced part of educational responsibilities, promoting the diversification and individualization of education as an auxiliary means. This has led to the original teaching system having to find appropriate methods to adapt to this transformation, and it also means that the education industry will face a huge change [4]. From the traditional sense of unified teaching management in the past to the current digital transformation of education, how to integrate artificial intelligence technology with modern education and build and develop new

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individualized teaching modes and practical approach is a problem worthy of attention in today's society.

## 3. Case analysis

### 3.1. AI individualized teaching practice

In the practice of exploring how artificial intelligence empowers individualized teaching in modern education, the medical department in Xi'an Jiaotong University used “Jiaoxiaozhi Platform” to deploy the DeepSeek agent for aseptic technique course, constructed three-stage teaching mode, including" intelligent guidance before class - precise teaching during class - data-based evidence-based learning after class", which provides practical case for integrating AI into medical education and promoting individualized learning [5]. This practice closely matches the concern of “the construction of individualized teaching models in the AI era” in this article.

The intelligent pre-class guidance session serves as the starting point of the three-stage model; its core relies on the natural language processing and knowledge graph capabilities of the DeepSeek agent to provide students with a diverse and individualized learning platform. To be specific, “Jiaoxiaozhi Platform” uses DeepSeek V3 as a language model, adds course handouts, teaching plan, and aseptic operating procedures, etc, constructs a conversational agent, and publishes it one week before the class for students to freely access and preview [5]. This not only breaks the limitation of traditional previewing, but also satisfies the individualized demands of students from different levels. In addition, it also provides data support to promote the following course.

In the guiding teaching section of the class, three different large language models (DeepSeek, Kimi, and Doubao) are used to answer the development history of aseptic technique, and students are asked to compare the differences among the three answers, point out the advantages and disadvantages. Therefore, it can cultivate students' critical thinking in the process of using AI. Moreover, the teacher also provides practice opportunities for students by presenting how to use AI to make different kinds of teaching materials to further enhance students’ understanding of knowledge [5]. The meaning of this practice is teaching students how to use AI to improve learning efficiency and keep self-thinking in the process correctly, so that they can use their critical thinking to judge the rationality of AI’s answer rather than relying on AI blindly.

After class, to verify teaching results and know more about the usage of AI during students’ daily lives, this practice uses the Wenjuanxing platform to collect survey data. The questionnaires evaluated the effectiveness of AI-assisted teaching from three aspects: students' understanding of knowledge, teachers' acceptance of teaching methods, and adaptation to the course schedule [5]. It shows that the teacher in class is no longer that of a traditional teacher, but transforms into a learning designer who needs to innovate teaching methods to improve interactivity in class and construct a feedback mechanism to follow up on students' learning needs and progress to further enhance the quality of teaching and students' learning experience. The result also shows that, compared with the after-class research results of the 2023 grade students who did not use AI-assisted teaching, the students who used AI-assisted teaching had a higher understanding of knowledge and were more satisfied and accepted with the teaching methods [5].

This teaching practice demonstrates that generative AI can cultivate students’ critical thinking and exploration skills and help students identify the potential gaps in current knowledge. This proves that the value of AI in education is no longer confined to being a tool for knowledge transmission; instead, it is gradually becoming a partner that can help students build cognitive systems in specific

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fields [5]. This understanding can also provide a reference for the subsequent "construction of individualized teaching models in the AI era".

However, there are also some shortcomings. As mentioned in the case, “Students cannot ask questions independently when using agents” [5]. This phenomenon shows the potential Contradiction between the technical convenience and the initiative of thinking in AI individualized teaching, which means that when agents replace thinking overly, it may weaken students' self-thinking. This is highly relevant to the core viewpoint discussed in this article that “individualized models need to balance technological empowerment and capability cultivation.” How does AI-assisted teaching control the usage boundaries? Does it influence students’ subjective initiative learning? These questions have not been solved yet. In the future, it is necessary to establish a human-machine collaborative education framework and design a “cognitive safety threshold” for AI intervention to effectively balance technological assistance and self-thinking [5].

### 3.2. Practical application of blended teaching integrating AI and knowledge graphs

With the in-depth advancement of the digital transformation of education, the integrated application of “AI + Knowledge Graphs” is becoming a necessary way to satisfy the demand of students’ individualized learning. In The Application of Artificial Intelligence (AI) + Knowledge Graph in Blended Teaching, Liu Shuang, taking the teaching practice of Shandong Huayu Institute of Technology as the research object, elaborated in detail on the construction and application of the "AI + Knowledge Graph" blended teaching model in the Advanced Mathematics course [6]. This practice combines the capabilities of intelligent analysis and assessment ability in AI technology with the advantages of knowledge structuring and visualization, providing a reference case for the construction of a systematic and individualized teaching model.

So, how is “AI + Knowledge graph” implemented in this practice? Firstly, AI can makes individualized learning plan based on students’ demands, teachers can collect the data of students’ learning and behavior, then uses AI to analysis the information to provide targeted tutoring; Besides, AI can help students to improve learning efficiency, such as virtual laboratories, online teaching resources (courseware, videos), etc. In this way, whether in class or after class, students can use AI for self-study; Furthermore, AI can also evaluate students’ homework and tests automatically, which not only reduces the workload for teachers but also enables students to receive individualized learning reports in time to identify and fill in their knowledge gaps [6].

AI injects vitality into teaching through data-driven and intelligent interaction, while a knowledge graph, with its advantages of structured knowledge and visualized association, complements and collaborates with AI. When teachers are sorting out the knowledge system, the constructed logic and application value of knowledge graphs can become another important pivot. Knowledge graphs can achieve three kinds of visualization effects: the visualization of learning content, the visualization of learning methods, and the visualization of students' learning situations [6]. Thus, students can establish relationships with different knowledge through knowledge graphs to get a deeper understanding of the course content. The individualized learning project created by knowledge graphs based on errors automatically can not only further improve students’ learning effects but also assist teachers’ teaching, letting them know about students’ learning situations to adjust teaching methods in time.

However, the beautiful vision of technology empowerment needs to be put into practice based on a clear teaching model. How to transfer the construction of teaching from knowledge graphs in theory into a specific process that is operable in class? Focus on the transformation of “AI + Knowledge graph” from concept to practical operation, this practice establishes an “AI +

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Knowledge graph" blended teaching model (online + offline education model). It has four stages: First is course preparation stage, collecting corresponding course information, and then discussing the construction of blended teaching model to ensure construction plan; The second stage is course construction, to make targeted knowledge graphs (a relational network that relates with all different kinds of information ), it needs teachers to sort out knowledge roundly and make sure knowledge quantity is fitness for students' needs; The third stage is implementation of teaching. Unlike traditional face-to-face teaching, this stage will adopt a blended teaching model of online and offline, matched with technical assistance of "AI + knowledge graph", to implement theories in practice. Students can use a knowledge graph to learn by themselves while teachers can use AI to monitor and evaluate to follow up students' learning process through data and feedback; The last is continuous improvement stage, teachers can use these data and feedback to adjust teaching method and provide individualized teaching to further improve knowledge graph and teaching model [6].

This practice has played a demonstrative role in the integrated application of AI and knowledge graphs in blended teaching, but in the future, it still needs to face some inevitable challenges such as whether the individualized learning methods provided by AI are reliable and whether the personal privacy involved in the data sources is protected etc., which are also common when technology integrates educational practice. Only by solving technical ethics, data governance, and teaching adaptability challenges can the individualized vision of "AI + Education" move from a class attempt to systematic transformation.

## 4. Discussion

The individualized teaching model driven by artificial intelligence has demonstrated significant advantages in enhancing learning efficiency in practice. Whether it is the three-stage model driven by large models in medical education or the four-stage practice of AI + knowledge graphs in mathematics courses, they all confirm the common value of AI empowering individualized teaching. Whether it is a large language model or a knowledge graph, the two cases are all using the efficient data collecting and analyzing capabilities of AI technology to break the traditional teaching model, that is to shift from "uniform supply" to "on-demand supply", to achieve individualized adaptation of teaching resources and methods. In teaching model design, Xi 'an Jiaotong University's "three stages" and Shandong Huayu's "Four stages" have different processes, but the internal logic is consistent. Both aim to integrate AI into the entire teaching process, build a teaching process of "data collection - individualized design method - feedback optimization", and turn the teaching process into visualized data, thereby further optimizing teaching strategies and promoting the digital transformation of education. From the practical achievements of both, it can be concluded that AI-assisted teaching is more in line with the individualized differences of students, greatly improving the utilization rate of learning resources and the efficiency of knowledge absorption.

However, the technical limitations and pain points in educational ethics exposed in the two cases are also the deep-seated challenges when constructing an individualized teaching model in the AI era, including insufficient accuracy of information from large models, the risk of students' reliance on independent thinking, data privacy protection, and algorithmic bias, etc. [7]. If the new educational model after integrating technology into education is to be implemented and systematically popularized, these are the core issues that must be addressed: Firstly, if AI is to meet the demands of precise knowledge collection and scientific construction of learning methods in the new teaching model, can the accuracy of AI technology and the quality of data be guaranteed? Secondly, in the context of technology-enabled teaching, how to prevent students from overly relying on AI to take shortcuts in study, and instead always maintain critical and independent

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thinking? Although AI data collection and analysis capabilities can provide more individualized teaching services, can they ensure that personal privacy is not leaked?

To solve the problems, balance between technology and education, and provide a systematic solution for the sustainable development of individualized teaching models in the AI era, it is necessary to focus on three parts: technical optimization, reconstruction of the teaching framework, and establishment of an AI ethics system. Specifically, to address issues such as insufficient accuracy of AI large language models and poor data quality in knowledge graphs, one can enhance the professionalism and accuracy of AI responses by training an "Education-exclusive" model and establishing a dedicated knowledge base to improve the professionalism and accuracy of AI answers. At the same time, authoritative databases should be associated with the knowledge graph, and knowledge nodes should be updated regularly to detect vulnerabilities in AI algorithms. After optimizing the two, it is time to integrate technology with education. For instance, large models are responsible for natural language interaction and the generation of individualized learning plans, while knowledge graphs provide structured knowledge verification. This approach not only takes advantage of the flexibility of AI to offer individualized teaching services but also ensures the accuracy of knowledge graphs.

After the technical issues are solved, it is necessary to reconstruct a new teaching process and address the problem of students' excessive reliance on AI in education. AI technology has replaced part of the teachers' work responsibilities. Therefore, teachers are no longer knowledge transmitters but transfer into "midwife" and "study-designer" for students [8]. Guiding students to think independently with AI assistance is the main goal when teachers design teaching assignments. The first is to verify the things that AI can do or cannot do. Bloom' s Taxonomy (Bloom's Classification of Educational Goals) divides cognitive goals into six levels from low to high: memory, comprehension, application, analysis, evaluation, and creation. Among them, AI can complete the first three levels (memory, comprehension, and application), but for the last three levels (analysis, evaluation, and creation), AI cannot replace them. Some research shows that when AI faces high cognitive tasks, it has a lot of limitations. For example, AI lacks data base to refer when it needs to analyze new cases, then the quality of AI analysis would be decrease; When it comes to evaluating the superiority or inferiority of students' problem-solving methods, AI lacks the comprehensive consideration ability based on educational goals and the individual circumstances of students; In the dimension of creation, the mechanism that AI generates content based on probability to predict makes it cannot create or innovate like human-being [9]. Based on this theory, when designing teaching tasks, teachers should fully refer to the theoretical framework of Bloom's Taxonomy, giving some tasks with low level like memory, comprehension and part of application to AI to have more time and energy to devote themselves to the designing and guidance of high level tasks like analysis, evaluation and creation to develop the ability of self-thinking for students.

In terms of how to prevent ethical risk in AI education applications, Guo Qing and Wu Di have already made targeted discussions in Ethical Risks and Governance Strategies of Artificial Intelligence Application in Education from an International Perspective. This article mentions that when AI integrates with education, its power may lead to ethical risks such as algorithmic black boxes, information cocoons, and the loss of a humanistic spirit. The formation of such power is closely related to the generation and wide application of technology [10], which is highly consistent with the logic of constructing an "ethical governance system" in this study. On the one hand, teachers need to review the content in advance before using AI-generated teaching materials and introduce knowledge graphs for cross-validation. In particular, they should strictly examine AI-generated individualized learning plans to avoid misleading errors. Through dual review by teachers

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and cross-validation by knowledge graphs, the application process of AI technology in education can be visualized, transforming from "invisible probability generation" to "traceable knowledge transmission", and avoiding the risks of algorithmic black boxes. On the other hand, it is necessary to limit AI's degree of participation in fields such as humanistic care and value guidance, to forbid collecting irrelevant private data, and to integrate instrumental rationality with the value rationality of education to avoid the risk of the loss of humanistic spirit; Only by enhancing the scientific and precision of educational construction through intrinsically defined digital processes or rules to define the exact operation mode of AI, demarcating the usage boundaries based on ethics and morality, and binding them with laws to protect the legitimate rights and interests of users, can the application of AI technology in the field of education be regulated to a certain extent [10].

## 5. Conclusion

The research findings of this study are as follows: Through the analysis of practical cases of the individualized teaching model driven by artificial intelligence, its significant advantages in enhancing learning efficiency have been identified, while also revealing technical limitations, mental dependence, and ethical issues. These are the core contradictions in the digital transformation of education. Based on these analyses of the cases, the research conclusion is further drawn: The sustainable development of the individualized teaching model driven by artificial intelligence requires clarifying the boundaries of technical capabilities as a prerequisite, reconstructing the teaching framework as the core, and establishing an ethical system as a guarantee. It is necessary to find a balance point between technological empowerment and the essence of education to ensure that the application of technology always serves the educational goal of cultivating students' independent thinking ability and promoting their all-around development. This study also provides many valuable references of significance for future studies in this direction. The main influences are illustrated in providing a systematic solution for balancing technology and education in the digital transformation of education. Future research should focus more on converting theoretical achievements into practical teaching plans and exploring their practical approach and efficiency optimization in real teaching scenarios.

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