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An Analysis on the Reconstruction of "Teaching" and "Learning" in Primary and Secondary Schools by Generative AI

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Abstract. Generative artificial intelligence is becoming a key force driving the digital transformation of primary and secondary education. Based on a systematic review of relevant policies, practical cases, and existing research, this paper summarizes the practical demands, empowerment paths, and potential risks of integrating generative AI into the "teaching" and "learning" processes in primary and secondary schools. The research indicates that the heavy workload of teachers, lack of personalization, and passive learning of students in traditional teaching provide a real need for AI intervention. The multimodal generation and learning situation analysis capabilities of the technology, along with national policy support, jointly form the basic logic of AI empowering education. At the practical level, AI reshapes the role of teachers through intelligent lesson preparation, precise teaching, automatic grading, and home-school communication, while also promoting students to shift from passive acceptance to active exploration, criticism, and creation. However, existing studies also warn of risks such as academic integrity crises, teachers' technological dependence and weakened capabilities, algorithmic bias, data privacy issues, and the loss of humanistic emotions. This paper argues that generative AI should be positioned as an auxiliary tool, adhering to human-machine collaboration, teacher leadership, and people-oriented principles. Only by enhancing the AI literacy of teachers and students, improving school regulations, and strengthening policy supervision can the technology be used for good, and a new educational ecosystem that integrates personalization, intelligence, and humanization be constructed.

Keywords: Generative artificial intelligence, Primary and secondary education, Reconstruction of teaching and learning, Human-machine collaboration, Educational risks

1. Introduction

In recent years, generative artificial intelligence has developed rapidly and has been deeply integrated into educational innovation. The digital transformation of education has been elevated to a national strategy. In 2025, the Ministry of Education of China and nine other departments clearly stated in the *Ministry of Education et al. Opinions on Accelerating the Digitalization of Education* that we should not only comprehensively promote the intelligence of education, leveraging artificial

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intelligence to facilitate educational transformation, but also strengthen the construction of artificial intelligence education models and explore application scenarios where artificial intelligence integrates with education [1].

Currently, the "teaching" and "learning" in primary and secondary schools are undergoing structural changes. Generative artificial intelligence tools such as Qwen Chat, DeepSeek, Dola, and ERNIE Bot are gradually becoming popular, but they are still in the initial exploration stage. In this context, this study will closely focus on the core issue of how generative artificial intelligence restructures "teaching" and "learning" in primary and secondary education. It will analyze the practical needs, technical advantages, and policy support of generative artificial intelligence through methods such as literature review, theoretical analysis, case study, and practical observation. It will also explore the enabling paths of generative AI for "teaching" and "learning", while also addressing the risks brought by generative AI and proposing countermeasures and suggestions. In summary, this study can systematically explore the practical needs, enabling paths, and potential risks of integrating generative artificial intelligence into the "teaching" and "learning" processes in primary and secondary schools, providing optimization ideas for the implementation of intelligent education in these schools.

2. The integration of generative artificial intelligence into the "teaching" and "learning" processes in primary and secondary schools

2.1. The current dilemmas faced by teachers and students in "teaching" and "learning"

In current teaching practices, teachers on the front end encounter multiple challenges: Firstly, repetitive tasks such as lesson planning, creating lesson materials, grading homework, and communicating with parents account for a high proportion, which can easily lead to job burnout [2, 3]. Secondly, affected by the two-child policy, the population in primary and secondary schools has been in an explosive growth period in recent years, with an expansion of class sizes and increased student differences, making it difficult for teachers to provide individualized teaching and personalized guidance [4]. Thirdly, influenced by educational reforms, current interdisciplinary and cutting-edge content is updated frequently, making it difficult for teachers to continuously keep up and integrate innovations [3]. Fourthly, the digital literacy levels of teachers of different age groups, educational backgrounds, and regions are uneven, and technical anxiety is widespread [3, 5].

Meanwhile, students also face numerous challenges: The traditional "one-size-fits-all" teaching model cannot meet the differentiated needs of students. Students with quick thinking will find the content simple, while those with weak abilities will have difficulty keeping up and be reluctant to ask questions [4]. At the same time, the penetration of electronic games and short videos has greatly weakened students' self-control, resulting in a certain degree of decline in their autonomous learning ability, and the accumulation of learning resources is also uneven, leading to a gradually widening gap [6].

In summary, in current primary and secondary school teaching practices, the traditional low-efficiency model still dominates, teachers' innovation capabilities are insufficient, and there is a lack of personalized cultivation for students. The burden on teachers and students continues to increase, and "teaching" and "learning" urgently need technology to break through.

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2.2. Advantages of integrating generative AI into "teaching" and "learning"

Integrating generative AI into primary and secondary school teaching practices has its unique advantages.

Firstly, in terms of technical advantages. Generative AI has multi-modal generation capabilities. It can generate teaching plans, courseware, exercises, explanations, images, and videos, which are all necessary for classes, with just one click based on the ideas and thoughts provided by teachers. It is not only efficient but also the content can be highly complementary [5, 7]. It can also help teachers accurately analyze student situations - as long as the student's practice data is uploaded, it can quickly diagnose the students' weak points and provide personalized tutoring suggestions [7, 8]. Moreover, the human-machine collaboration under the teacher's leadership can significantly reduce the teacher's repetitive tasks and release the teacher's educational energy [3, 8].

Secondly, in terms of policy support. Article 26 of the *Planning Outline for the Construction of an Education Powerhouse (2024-2035)* issued by the Central Committee of the Communist Party of China and the State Council clearly states that we should promote the transformation of education through artificial intelligence, formulate and improve the standards for digital literacy of teachers and students, and create the AI education large model [9]. The Ministry of Education and five other departments have also issued the notice of *the Action Plan for "Artificial Intelligence and Education"*, hoping to promote the deep integration of AI and education, strengthen the basic environment of the integration of artificial intelligence and education, and optimize the development ecosystem of the integration of artificial intelligence and education [10]. In 2025, the Basic Education Teaching Guidance Committee of the Ministry of Education also released the *Guidelines for the Use of Generative Artificial Intelligence by Primary and Secondary School Students (2025 Edition)*, standardizing the corresponding application principles, application scenarios, and proposing guarantee measures to guide the construction of each pilot school [11].

In conclusion, it can be seen that under the joint drive of technical feasibility, policy support, and actual needs, the reconfiguration of "teaching" and "learning" in primary and secondary schools by generative AI is an inevitable trend.

3. Opportunities and concerns brought by generative artificial intelligence to "teaching" and "learning" in primary and secondary schools

3.1. The practice scenarios of generative artificial intelligence empowering "teaching" and "learning"

3.1.1. How generative artificial intelligence reforms teachers' "teaching"

After generative artificial intelligence enters primary and secondary schools, it will bring significant changes to teachers' "teaching". I will divide teachers' "teaching" into four parts: pre-class, in-class, post-class, and management. I will elaborate on how generative artificial intelligence reshapes teachers' "teaching".

Pre-class: Intelligent lesson preparation, enhancing efficiency. Compared to the time-consuming and labor-intensive traditional pre-class preparations, generative artificial intelligence such as DeepSeek and Dola has more advantages in analysis and continuation technologies, which can assist in generating teachers' lesson plans and help teachers analyze students' learning situations, prepare differentiated tasks and corresponding exercises; while Kimi and Qwen Chat are very practical and free lesson presentation artificial intelligence platforms. Although the generated results still have

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obvious deficiencies, they can greatly reduce the burden of teachers' lesson preparation; Dream and other functions that are more inclined to generate images and videos can greatly broaden teachers' channels for searching for images and videos. In a primary school in Binjiang District of Hangzhou, individual learning archives for each student have already been established. Through the collection of students' grades, the artificial intelligence can generate archives, providing very practical assistance to teachers. In Xihu District of Hangzhou, a primary school has also begun to popularize the use of generative artificial intelligence to create theme class meeting lesson presentations.

In-class: Intelligent teaching assistant, precise teaching. Compared to traditional teaching models, the participation of generative artificial intelligence can make knowledge more visual and the form more diverse [7, 8]. For example, the two primary schools in Hangzhou mentioned earlier, during my internship at the school, I attended several classes that integrated generative artificial intelligence - in a Chinese language presentation class at Xihu District's primary school, the teacher used Dola to generate an intelligent entity of Emperor "Qiweiwang", allowing students to experience through question-and-answer dialogues with the intelligent entity the wisdom of Sun Bin optimizing sorting, attacking short with long, and flexible adaptation; in a mathematics class at Binjiang District's primary school, the teacher used a generative artificial intelligence mini-program, and students uploaded answers in groups, with the teacher collecting, statistics, and generating visual pie charts for feedback in real time.

Post-class: Intelligent grading, data diagnosis. The post-class stage is the most repetitive and homogeneous task-intensive part. The participation of generative artificial intelligence can greatly reduce the burden on teachers [5, 7]. It can help teachers conduct automatic and rapid grading of objective questions, and can immediately generate comments, learning reports, and personalized tutoring plans, reducing teachers' burden of homework feedback, allowing teachers to focus more on innovative design and education in the post-class [5, 8].

Management: Home-school communication, administrative burden reduction. Generative artificial intelligence can automatically generate more standardized parent notifications, enrich communication language, and create concise academic reports, avoiding offensive or error-prone language risks [5].

In summary, the participation of generative artificial intelligence in reshaping teachers' "teaching" is generally that it transforms teachers from the traditional "lecturer" role into a "growth guide" role, with artificial intelligence taking on the roles of learning situation analysts and auxiliary teaching designers [2, 3, 8].

3.1.2. How generative AI changes students' "learning"

After generative AI enters primary and secondary schools, it has a significant impact on students' "learning". this paper will elaborate on this from three aspects: learning methods, learning abilities, and learning experiences.

Learning methods: From passive to active, personalized learning. The intelligent agent formed by generative AI comes in various forms. Students can choose the intelligent agent they like as their AI study companion. For example, the current generative AI software Dola is very popular among primary and secondary school students. Students can ask the intelligent agent questions like "Dola, Dola, I want to know... " to achieve intelligent answers, and at the same time, it also enhances their curiosity. Many schools in Hangzhou are also using DingTalk AI preview assistant. Generative AI will conduct personalized evaluations of students based on their accuracy rate and completion degree [7].

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Learning abilities: Focusing on high-level qualities. The data and knowledge provided by generative AI are not necessarily correct. To some extent, it can require students to gradually cultivate their critical thinking skills, learn to distinguish between true and false, and correct mistakes [5, 6, 8]. Students' innovation ability will also improve. A primary school in Xihu District of Hangzhou integrated AI into comprehensive practical activities. Students participated independently, and their "ingenious ideas" could be realized through the planning of generative AI, thereby stimulating students to continuously innovate [7].

Learning experience: Entertaining, visualization and immersion. Generative AI can design many interesting games and also design virtual experiments and other sections. This new form of teaching and entertainment can enhance classroom interest and immersion [7, 8]. It can also make abstract knowledge visual. In a mathematics class at a primary school in Xicheng District of Beijing, the teacher designed a three-dimensional cube box model using generative AI, allowing students to try it hands-on and understand the core knowledge more clearly.

In summary, generative AI transforms students from "knowledge receivers" into explorers, critics, and creators.

3.2. Risks and concerns associated with generative artificial intelligence

Although we can observe from practice that generative artificial intelligence can bring many opportunities to teachers and students, we cannot ignore the risks and concerns it may pose.

Firstly, there is the risk of academic integrity and plagiarism. With the increasing power and popularity of generative artificial intelligence, students may use AI to write homework and essays to avoid effort. Such opportunistic behavior will gradually weaken students' independent thinking ability. At the same time, teachers lack reliable AI-generated detection tools, and the trust crisis between teachers and students has significantly increased [5].

Secondly, there is the risk of teachers' technological dependence and weakened teaching abilities [2, 8]. Directly applying AI lesson plans can easily solidify teachers' teaching styles and weaken their reflective abilities. Excessive reliance on function-rich generative artificial intelligence will also reduce teachers' willingness and ability to use other digital tools [3].

Then there are risks related to educational equity and algorithmic bias. The technological equipment and teaching staff disparities between urban and rural areas, and among schools, may widen into an "intelligence gap" under the influence of generative artificial intelligence. Its own algorithm also has biases and data transparency issues, which can easily lead to unfair evaluations [4, 6].

Some ethical risks and the absence of humanistic elements can also become problems. The intervention of generative artificial intelligence will reduce face-to-face communication between teachers and students, as well as between families and schools. The emotional, value, and moral education aspects will be weakened [2, 6]. Students' private data is also at risk of being leaked, and excessive algorithmic monitoring will also raise ethical concerns [4, 8].

4. Conclusion

To sum up, generative artificial intelligence is deeply integrating into all aspects of teaching and learning in primary and secondary schools in an irreversible trend. This article starts from the actual needs and analyzes the problems such as excessive burden on teachers, insufficient personalization, and passive learning of students in the traditional teaching model. It demonstrates the internal logic of integrating generative artificial intelligence into basic education under the triple driving forces of

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technical feasibility, policy support, and actual demand. Through the depiction of practical scenarios in the pre-class, in-class, post-class, and management processes, it can be seen that generative artificial intelligence can significantly improve teaching efficiency, achieve precise learning situation analysis and personalized resource push, and prompt teachers to shift from "teachers who impart knowledge" to "guiders for growth", and students to transform from "knowledge receivers" to "inquirers", critics, and creators.

However, opportunities and challenges coexist. While generative artificial intelligence brings benefits such as burden reduction, precision, efficiency, and personalization, it also triggers big risks such as academic integrity crises, teachers' technological dependence and ability weakening, damage to educational equity, and a lack of humanistic emotions. These risks are not the original sin of the technology itself, but reflect the reality of an unclear human-machine relationship and lagging institutional norms behind technological iteration.

Therefore, this paper argues that generative artificial intelligence is always an auxiliary tool rather than an educational subject. The fundamental direction of intelligent education transformation is human-machine collaboration, teacher leadership, and education for the people. To this end, teachers and students should actively enhance AI literacy and become the masters of technology rather than slaves; schools should establish usage norms, strengthen practical training, and adhere to ethical bottom lines; at the policy level, the national government should improve implementation guidelines, strengthen supervision, and promote the good use of technology. Only in this way can we avoid the expansion of instrumental rationality and safeguard the humanistic warmth of education.

This study still has room for improvement. The main basis of the paper is literature review and case analysis, lacking empirical research support such as questionnaire surveys and experimental comparisons, and it has not deeply explored the differences between different disciplines and different educational stages. The specific paths for teacher AI literacy training and the practical obstacles in policy implementation have not been fully analyzed either.

Future research might also focus on conducting large-scale empirical studies to quantify the behaviors and effects of teachers and students in using AI, or to explore the application models of AI by subject and grade level. It could also pay attention to the "digital divide" between urban and rural areas and educational equity, or conduct international comparative studies.

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