

Transformation of Vocational Education Based on Generative Artificial Intelligence: Impact, Opportunity and Countermeasures

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Abstract: Generative AI has great potential and broad prospects in vocational education. However, with its in-depth application in the field of education, a series of challenges and impacts have also followed. In order to effectively address these challenges, it is necessary to take a series of measures, including transforming educational concepts, enhancing teachers' technical capabilities, constructing new teaching models, strengthening data privacy protection and management, and formulating relevant policies and regulations. At the same time, we also need to pay attention to the redistribution of educational resources, the transformation of students' learning methods, and personalized learning, and give full play to the advantages of generative AI to improve the quality and efficiency of vocational education.

Keywords: Generative AI, Vocational Education, Impact, Opportunities, Countermeasures

1. Introduction

With the rapid development of science and technology, the wave of the fourth industrial revolution is rising all over the world. In this context, OpenAI Company of the United States launched ChatGPT in November 2022, which is a powerful artificial intelligence chat robot model, which can deeply understand human language input and complete various tasks in a short time, such as writing emails, writing codes and proofreading languages. Since then, Chinese technology giants have also launched their own artificial intelligence models, such as iFlytek's Spark cognitive model, Huawei's Pangu model, Baidu's Ernie Bot model, Ali's Tongyi Qianwen model, etc. These models have been open to the public and have open source nature.

The emergence of Generative Artificial Intelligence (GAI) has brought new challenges and opportunities to vocational education. On the one hand, these models can help teachers to generate teaching materials quickly, and greatly improve the teaching quality and efficiency^[1]. For example, teachers can use these models to create personalized courses and learning materials to meet the needs and interests of different students. In addition, these models can also provide personalized learning suggestions and counseling plans according to students' learning behaviors and achievements, so as to help students master knowledge and skills better^[2].

However, generative artificial intelligence still faces many challenges in the practical promotion of vocational education. First of all, although generative artificial intelligence has been widely used in many fields, its application in vocational education has not been fully studied. Secondly,

while improving the teaching quality of vocational education, generative artificial intelligence may change the teaching mode of vocational education, so it is necessary to re-examine and adjust the existing teaching methods and curriculum system to adapt to this change^[3]. In addition, the development of generative artificial intelligence technology may change the role of teachers from traditional knowledge disseminators to learning guides and assistants^[4]. These changes need us to conduct more in-depth discussion and application in future research and practice.

2. The application of generative artificial intelligence in vocational education

2.1 Definition and working principle of generative artificial intelligence

Generative artificial intelligence is a cutting-edge and increasingly popular machine learning technology, which uses probability models and statistical methods to analyze and generate a large amount of data, and generates new meaningful content by simulating human thinking and behavior. The core idea of this technology is to let machines learn and generate new knowledge or content independently through training data. The working principle of generative artificial intelligence is based on deep learning algorithm and big data analysis, which carefully analyzes a large number of learning behavior and achievement data, and provides personalized learning resources and suggestions for each student.

In vocational education, the application of generative artificial intelligence has far-reaching influence, mainly reflected in the following aspects:

- (1) Intelligent recommendation of learning resources: By analyzing students' learning behaviors and achievements, as well as their interests and individual needs, machines can recommend the most suitable learning resources for students^[5], such as online courses, textbooks and practical projects.
- (2) Personalized learning path planning: The machine can make personalized learning paths for each student according to their learning style, progress and goals, so that students can learn in the most suitable way for themselves.
- (3) Automatic evaluation of learning achievements: By analyzing students' learning behaviors and achievements, the machine can automatically evaluate their learning achievements and provide timely feedback and suggestions. This can not only help students understand their learning progress and shortcomings, but also provide them with opportunities to improve their learning.

2.2 Current situation and challenges of generative artificial intelligence in vocational education

In China, with the rapid development of generative artificial intelligence technology, its application in the field of education has also attracted wide attention. Relevant policies, such as "China Education Modernization 2035"^[6] and "New Infrastructure"^[7] issued by six ministries and commissions, all emphasize the importance of applying educational assistants based on artificial intelligence technology to realize "man-machine collaborative teaching and man-machine joint education" and improve the quality of education and teaching. Many educational

researchers have also systematically analyzed the potential impact of generative artificial intelligence on teachers, students and policies. In July 2023, the State Internet Information Office issued the Interim Measures for the Management of Generative Artificial Intelligence Services^[8], which clearly pointed out that "the innovative application of generative artificial intelligence technology in various industries and fields should be encouraged to generate positive, healthy and upward-oriented high-quality content, explore and optimize application scenarios, and build an application ecosystem", which provided policy support for teachers to actively apply generative artificial intelligence self-generation technology to build teaching resources.

Some educators have begun to test ChatGPT and other generative artificial intelligence models, which can show critical thinking skills and integrate them into educational activities, such as research, teaching and evaluation. They found that the automation of some tasks and processes confirmed the potential and value of generative artificial intelligence in the fields of educational guidance and personalized education. For example, Shen Shusheng and others proposed that ChatGPT can be used as an external brain working together with the internal brain to promote the construction of a compound brain adapted to the future world. School education needs to develop a new way of thinking to consider learning assessment, giving priority to thinking over knowledge, questions over answers, and logic over enumeration^[9]. Wang Youmei and others believe that ChatGPT may promote teaching innovation, improve the degree and creativity of teaching achievements, and support the generation and personalized feedback and evaluation of teaching achievements^[10]. Huang Xinrong and Liu Liang suggested that generative artificial intelligence can provide more information channels, interactive experience and decision-making services in work, but it may also produce incorrect or false information, ideological prejudice and over-dependence lead to ethical problems^[11]. Zeng Jin believes that the computer-aided instruction system based on generative artificial intelligence can imitate the role of teachers and interact with students to provide personalized counseling, so that teachers can accurately understand students' knowledge mastery and learning progress, thus matching reasonable teaching plans and counseling programs for each student^[12].

Although generative artificial intelligence has great potential in the field of education, there are also some challenges and problems. Future research needs to further explore how to effectively apply this technology to education and teaching to improve teaching quality and efficiency. At the same time, it is necessary to study how to solve its possible problems, such as data privacy and algorithm transparency.

2.3 Influence of Generative Artificial Intelligence on Traditional Vocational Education and Its Countermeasures

The application of generative artificial intelligence technology not only promotes the transformation of teaching mode, shifting from the traditional "teacher-student" binary structure to a "teacher-machine-student" ternary structure^[13], but also puts forward new requirements for educational goals. Specifically, generative artificial intelligence emphasizes the cultivation of talents with creativity, innovation, critical thinking, and interdisciplinary abilities.

In the field of vocational education, the application and impact of this technology are particularly evident. Firstly, it can provide students with a more personalized learning experience by offering customized teaching based on each student's needs and progress.

Secondly, generative artificial intelligence can provide teachers with more teaching resources and support, helping them better accomplish their teaching tasks. Additionally, this technology can also facilitate better alignment between vocational schools and enterprises, meeting their talent demands.

3. The promotion and challenge of generative artificial intelligence to the transformation of vocational education

3.1 The promotion of generative artificial intelligence in the transformation of vocational education

- (1) Improve teaching quality: Generative artificial intelligence can provide personalized learning resources and suggestions for each student through personalized teaching strategies, so as to help students better master knowledge and improve learning effect.
- (2) Realize personalized learning: According to students' learning ability and needs, generative artificial intelligence can formulate personalized learning plans and goals, and provide customized learning experiences to adapt to students' learning rhythm and style^[14].
- (3) Enhance the ability of autonomous learning: Through the intelligent recommendation system, students can independently find learning resources and learning paths, formulate learning plans and goals, independently evaluate learning achievements, and cultivate autonomous learning methods and skills.

3.2 Challenges of Generative Artificial Intelligence in Vocational Education Transformation

- (1) Data privacy and security issues: Generative artificial intelligence needs to collect and process a large amount of student data, including sensitive information such as personal information, learning behavior and grades, and there are security risks such as data leakage and abuse.
- (2) Educational equity: Intelligent recommendation system and other personalized learning resources may aggravate educational inequality, and some students cannot make full use of these resources due to lack of equipment, network or other resources.
- (3) Technology dependence: Generative artificial intelligence needs advanced technology and algorithm model, and there is a risk of technical failure or failure. Over-dependence may lead to over-dependence on technology^[15], ignoring the value of traditional teaching methods and teachers.

4. Vocational education transformation strategies and measures based on generative artificial intelligence

4.1 Strengthen the student-centered educational concept

Facing the challenge of generative artificial intelligence, vocational education should change its educational concept and strengthen students' central position. Generative artificial intelligence provides a powerful learning analysis tool, which helps teachers better understand students' learning characteristics and needs, and provides accurate and personalized teaching services and guidance for each student. In order to better implement the student-centered educational concept, we need to improve from the following aspects:

- (1) Pay attention to students' individual needs and learning styles, and make personalized teaching plans and goals.
- (2) Strengthen the communication and interaction between teachers and students, encourage students to actively participate in the teaching process, and give full play to their initiative and creativity.
- (3) Pay attention to cultivating students' autonomous learning ability and lifelong learning consciousness, help them master learning methods, and improve learning effect and efficiency.

4.2 Improve teachers' technical ability

The application of generative artificial intelligence requires teachers to have corresponding technical knowledge and application skills. Therefore, we need to provide technical training for teachers to improve their technical level. Specifically, teachers need to master relevant software and tools, such as intelligent recommendation system and personalized learning path planning tools. In addition, teachers need to have the ability to analyze and process data, and be able to use data analysis tools to analyze students' learning behaviors and achievements, so as to better make teaching plans and evaluate students' learning achievements. To improve teachers' technical ability, we can take the following measures:

- (1) Organize technical training and seminars to make teachers understand the latest development and application scenarios of generative artificial intelligence technology.
- (2) Provide technical support and resources to help teachers better apply generative artificial intelligence technology to the teaching process.
- (3) Encourage teachers to participate in scientific research and technological innovation projects to improve their technological application ability and innovative spirit.

4.3 Construct a new teaching mode

The application of generative artificial intelligence needs to build a new teaching mode. This model should combine the advantages of artificial intelligence and make personalized learning plans and goals according to students' individual needs and learning styles. Through intelligent recommendation system, teachers can provide students with learning resources and materials suitable for them, and help them master knowledge and skills better. At the same time, using the function of automatic evaluation of learning achievements, teachers can know students' learning

situation and feedback in time, so as to better adjust teaching strategies and methods. In order to build a new teaching model, we can take the following measures:

- (1) Combining with the characteristics of generative artificial intelligence technology, redesign the teaching content and methods to better meet students' individual needs and learning styles.
- (2) Using intelligent recommendation system to provide students with personalized learning resources and materials, and adjust the recommendation content in time according to students' learning situation and feedback.
- (3) Establish a comprehensive learning evaluation system, which combines automatic evaluation with teacher evaluation to evaluate students' learning achievements comprehensively and objectively.

4.4 Strengthen data privacy protection and management

The application of generative artificial intelligence needs a lot of students' data for training and learning. These data may include sensitive information such as students' personal information, learning behavior and academic achievements. Therefore, data privacy protection and management is one of the important issues to promote the transformation of vocational education based on generative artificial intelligence^[16]. Educational institutions need to formulate strict data protection and management measures to ensure that students' personal information is not leaked or abused. At the same time, it is necessary to strengthen data security measures to prevent security risks such as hacker attacks and data leakage. In order to strengthen data privacy protection and management, we can take the following measures:

- (1) Formulate strict data protection and management regulations, and clarify the purpose and scope of data sharing.
- (2) Strengthen data encryption and secure storage measures to ensure the security and integrity of data.
- (3) Establish and improve data access authority and approval process to prevent data abuse and unauthorized access.

4.5 Formulate relevant policies and regulations

The transformation of vocational education based on generative artificial intelligence needs to formulate relevant policies and regulations to standardize its application and management. The government and educational institutions need to formulate corresponding policies and regulations to protect students' rights and safety. Standardize the use and protection measures of data in educational institutions, and promote the rational application and development of generative artificial intelligence. At the same time, it is necessary to establish corresponding supervision mechanism and technical standards to ensure the healthy and orderly development of vocational education transformation based on generative artificial intelligence. In order to formulate relevant policies and regulations, we can take the following measures:

- (1) The government should strengthen the supervision of the application of generative artificial intelligence and formulate corresponding policies and regulations to ensure its reasonable, safe and compliant application in the field of vocational education.

(2) Educational institutions should establish and improve data use norms and procedures, clarify the purpose, sharing scope and protection measures of data, and ensure that students' personal information is not leaked or abused^[17].

(3) Establish corresponding technical standards and evaluation mechanisms to evaluate and supervise the application of generative artificial intelligence in vocational education to ensure its healthy and orderly development.

(4) Strengthen cooperation with industrial enterprises to jointly promote the development and application of generative artificial intelligence technology, and promote the close combination of vocational education and industrial needs.

5. Conclusion

Generative artificial intelligence has a far-reaching impact on the transformation of vocational education, and has brought new opportunities for education equity, students' learning methods, personalized learning and teaching modes. By redistributing educational resources, changing students' learning methods, realizing personalized learning and innovative teaching modes, generative artificial intelligence provides equal opportunities for all students and stimulates their interest and motivation in learning. In order to meet the challenge of generative artificial intelligence, we should take measures, such as renewing educational concepts, improving teachers' skills and literacy, constructing new teaching models and strengthening data privacy protection and management. Through these measures, we can make better use of generative artificial intelligence technology to promote the transformation and development of vocational education.

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