APPLICATION PROSPECT AND RISK ANALYSIS OF GENERATIVE ARTIFICIAL INTELLIGENCE TECHNOLOGY IN HIGHER EDUCATION

Ling Zhang

Jiangxi Regional Development Research Institute, Jiangxi University of Technology, Nanchang 330098, Jiangxi, China.
Corresponding Email:jxzlkyzh@163.com

Abstract: Nowadays, generative artificial intelligence technology is closely related to many subdivisions in higher education, and its impact on higher education is increasingly apparent. This paper discusses the potential and risk of the application of generative artificial intelligence technology in higher education. In terms of application potential, it can be divided into five aspects: innovation of learning mode, effective promotion of knowledge production, extension of evaluation system dimension, wisdom innovation of teaching mode, and stimulation of educational concept transformation. In terms of application risk, it is mainly divided into five aspects: the doubt of knowledge legitimacy and authenticity, the risk of data security and privacy, the impact on students' discerning and creative thinking, the ban on users' imagination and innovation, and the ethical and moral risks associated with information output. The application of generative artificial intelligence technology in the field of education involves a multi-faceted and multi-level process. It is necessary to clarify the advantages and disadvantages of generative artificial intelligence technology in order to better play the potential of generative artificial intelligence application in the field of education and promote the digital transformation and upgrading of education.
Keywords: Generative artificial intelligence; Higher education; Application potential; Application risk

1 INTRODUCTION

In 2023, China issued the Interim Measures for the Management of Generative Artificial Intelligence Services, which pointed out that the bottom line should be drawn, refined supervision should be carried out, artificial intelligence should be promoted to be better, and effective measures should be taken to encourage the innovative development of generative artificial intelligence. This marks that China's artificial intelligence services have entered a new stage, further clarify the red line of the system, say goodbye to the situation of unclear system in the past, for the field of colleges and universities, it is necessary to actively grasp the development opportunity, combine artificial intelligence with scientific research and teaching, and cross multiple fields for teaching and scientific research innovation. In 2021, the Ministry of Education and the Ministry of Finance issued the Notice on the Implementation of the National Training Plan for Primary and Secondary School Kindergarten Teachers (2021-2025), pointing out that to promote the integration of artificial intelligence and teacher training, explore "intelligence + teacher training", and form a mechanism for artificial intelligence to support teachers' lifelong learning and sustainable development. At the end of the plan, the field of colleges and universities should refer to the content of the plan, combine the development needs, grasp the new momentum of science and technology, use generative artificial intelligence to empower, build a high-quality teacher team, and promote the high-quality development of college education. In 2019, the General Office of the CPC Central Committee and The General Office of the State Council issued Several Opinions on Deepening the Reform and Innovation of Ideological and Political Theory Courses in Schools in the New Era, proposing to "vigorously promote the reform of teaching methods of Ideological and political courses, and promote the application of modern information technologies such as artificial intelligence in the teaching of ideological and political courses"[1]. As a place for ideological and political communication, colleges and universities should actively play a leading role in ideological and political communication, actively use new technologies and new methods to build an AI+ teaching model and build high-quality ideological and political classrooms.

The vigorous development of artificial intelligence has given birth to large generative AI models such as chatGPT and Wenxin Yiyi. By December 2023, chatGPT had 180 million users, generating 1.7 billion web page views per month, and Wenxinyiyi had 100 million users. According to the statistics of Baidu Search Index on March 20, 2024, the average daily searches were 30, 600 and 141, 900 respectively in the past 30 years. Among them, users aged 20-39 account for more than 70% of the search volume, with a male/female ratio of about 6:4. The highest daily search index values in China are 3.5 million and 9.52 million, respectively; The data show that more and more users choose to use generative artificial intelligence. According to the Basic Situation of National Education Development in 2023 released by the Ministry of Higher Education, there are 2.074, 900 full-time teachers in higher education in China, and 47, 631, 900 students in various forms of higher education[2]; According to incomplete survey statistics, 75.56% of teachers in colleges and universities have the idea of using generative artificial intelligence, and 52.89% of teachers are already using generative artificial intelligence. College teachers shoulder the responsibility of teaching students knowledge, cultivating students' skills, academic research and innovation in the field. Generative AI empowers the teaching and research of university teachers to assist in teaching, provide personalized learning services, innovate

teaching methods and acquire knowledge base to support the teaching and research of teachers. Therefore, the empowering potential and application risks of generative AI in the field of education will become the focus of research in the field of education.

2 HISTORY OF GENERATIVE ARTIFICIAL INTELLIGENCE

The term "artificial intelligence" originated in the mid-20th century when it was proposed by John McCarthy and the development of artificial intelligence was jointly promoted by many researchers[3]. Artificial intelligence is a broad concept that covers a variety of techniques and methods for mimicking human intelligent behavior; It aims to solve a wide variety of problems, ranging from simple rule-based systems to complex deep learning models. With the rapid development of science and technology, the world has entered a new era of artificial intelligence. The generative artificial intelligence technology represented by ChatGPT and the application of large language model are leading a new round of information technology reform and promoting the rapid development of the industry. Different from traditional artificial intelligence systems, generative artificial intelligence technology can generate new data according to given input, including text generation, image generation, video generation, audio generation, etc.[4]. Due to its cross-border and efficient integration advantages, generative artificial intelligence technology has quickly become a facilitator, designer and operator of human practice in all fields and all-factor integration, and an "operating system" of a deeply media society[5]. The development of generative AI technology has brought new ideas and methods to the field of artificial intelligence, and promoted the continuous innovation and progress of artificial intelligence technology.

Artificial intelligence and generative artificial intelligence play an important role in the field of artificial intelligence. Artificial intelligence is a broad concept. It covers a variety of techniques and methods for mimicking human intelligent behavior. It aims to solve a variety of problems, ranging from simple rule-based systems to complex deep learning models. Generative artificial intelligence is a specific type of artificial intelligence. It focuses on using models to generate new data. Although they differ in terms of definition, function and application, the two are intertwined and closely related in terms of technical foundation and mutual enhancement.

With the rapid development of science and technology, the world has entered a new era of artificial intelligence, and the application of generative artificial intelligence and large language model represented by ChatGPT is leading a new round of information technology reform and promoting the rapid development of the industry[6]. Different from traditional AI systems, generative AI can generate new data according to given input, including text generation, image generation, video generation, audio generation, etc. Due to its cross-border and efficient integration advantages, generative artificial Intelligence has quickly become a facilitator, designer and operator of human practice in all fields and all-factor integration, and an "operating system" for a deeply media society[5]. The development of generative artificial intelligence has brought new ideas and methods to the field of artificial intelligence, and promoted the continuous innovation and progress of artificial intelligence technology. As an unprecedented "super medium", generative artificial intelligence has shown great potential.

3 RESEARCH ON THE APPLICATION POTENTIAL OF GENERATIVE ARTIFICIAL INTELLIGENCE IN THE FIELD OF EDUCATION

Generative AI empowers education and adds "intelligent wings" to education. By virtue of its highly intelligent interaction, creative generation, complex data processing and other capabilities, it improves traditional and inefficient scientific research and teaching methods, promotes the change of learning methods in the field of education[7], promotes the innovation of knowledge production and learning methods, and reshapes teaching activities[8] and expand a new dimension for evaluation in the field of education[9].

3.1 Generative Artificial Intelligence Effectively Promotes Knowledge Production

The data scale and algorithmic advantages of generative AI make it gradually become the core force of knowledge production. First, it accelerates the comprehensive data of knowledge production and the full scene of knowledge connection[10]; second, it has the characteristics of high knowledge density, fast generation speed and low generation cost[11]. It makes man-machine collaboration in the knowledge production process become closer, knowledge opening and sharing become more common and easy, and the production mode changes from individual knowledge emergence to generative knowledge emergence[12]. Its powerful knowledge generation ability, knowledge creation, sorting and dissemination become more efficient and intelligent, this change of knowledge logic and generative logic effectively promotes knowledge exchange and integrated development, and creates opportunities for cultivating a higher level of collective intelligence.

3.2 Generative Artificial Intelligence Promotes the Innovation of Learning Methods

Generative AI provides efficient and personalized intelligent services and technical support for learning objects. First, generative artificial intelligence is the integration of large model technology, knowledge base technology and all kinds of intelligent education technology. It takes learners as the center and has the interactive question-and-answer function based on the huge knowledge base, showing obvious advantages in learning forms, role playing and interaction process[13]. It can play the role of tutor, assistant, companion and evaluator for learners, and has significant advantages

in supporting learners' adaptive learning; Second, generative artificial intelligence can effectively make up for the lack of learning resources, strengthen academic guidance, accelerate learners' acquisition of innovative knowledge, break discipline barriers, guide research problem mining, and stimulate innovative thinking[14]. The unique advantages of generative artificial intelligence can help accurately analyze learners' preferences, recommend diversified learning materials, and generate recommendations by constructing prompts, generating recommendations and evaluation results, so as to better implement individualized teaching and reduce learners' burden.

3.3 Generative Artificial Intelligence Stimulates the Transformation of Educational Concepts

Generative AI empowers and educates people, and promotes the concept of education to shift to higher-order ability cultivation. First, the deep integration of generative artificial intelligence and education has a significant impact on education. The education model has changed from binary to triadic, from teacher-student interaction to teacher-student-AI interaction[15], from the use of machine learning to optimize education, to the use of deep learning to empower education, and to the use of general large model to innovate education, which is becoming more and more important; Second, artificial intelligence is changing education at an unprecedented speed, putting forward new requirements for the existence value, role positioning and professional quality of teachers[16]. Teachers need to continuously improve, in the knowledge transformation, man-machine collaboration, in-depth exploration of learning concepts, and provide support in the cultivation of students' abilities. Give full play to its significant advantages in the three aspects of education quality, education efficiency and education equity[17]. At the same time, it is necessary to focus on cultivating students' higher-order thinking ability, so that students can distinguish complex situations in reality and make clear that they are limited to instrumental attributes, so as to better tap their own potential for innovation and development.

3.4 Generative Artificial Intelligence Intelligently Innovates Teaching Methods

Generative artificial intelligence integrates into the classroom and explores innovative practical teaching. First, the emergence of generative artificial intelligence has brought a new pattern of education, marking a breakthrough in the relationship between artificial intelligence and education, and triggering the resonance of teaching and learning activities[18]. At this stage, the continuous iteration and upgrading of generative artificial intelligence has shown the basic ability of efficient accumulation of knowledge and rational use of knowledge. It can play the role of an assistant of teachers' educational resources, an assistant of students' self-study, an assistant of enhancing classroom learning interaction, and an assistant of automatic correction of extracurricular homework in teaching[19]; It can be seen that the generative teaching enabled by artificial intelligence turns data intelligence into teaching wisdom. Second, through the role transformation and relationship reconstruction among teachers, students and technology, and the combination of innovation and practice, artificial intelligence is regarded as a strategic technology leading the future development of society, and the development of the classroom towards intelligence is promoted[20]; The experiment found that the man-machine collaborative deep inquiry learning model and its teaching mode can significantly change students' learning performance[21], improve problem solving ability, enhance critical thinking ability, learning attitude and intrinsic learning motivation; Therefore, it is necessary to give full play to the principal role of students in education and help students build their own knowledge system. To truly empower students with wisdom and realize their all-round development[22].

3.5 Generative Artificial Intelligence Extends the Evaluation System Dimension

With its revolutionary technological innovation, artificial intelligence has exerted many influences on the current reform of college education evaluation. It brings new opportunities for the development of education and causes changes in educational goals, contents, forms and evaluation[23]. It makes the evaluation content multi-dimensional, the evaluation subject diversified and the evaluation technology diversified. In terms of scientific research, generative artificial intelligence improves the traditional and inefficient scientific research methods, and promotes the academic evaluation of universities to broaden the evaluation dimension[24]; In terms of traditional educational tools, based on man-machine collaboration, new educational forms and educational evaluation systems have been spawned[25]; In terms of student management, generative artificial intelligence technology can effectively use students' academic data to realize the automatic generation of reviews, providing decision-making support for assisting teachers to carry out personalized reviews[26]; In terms of integration and innovation of teaching content, for different professional student groups, generative artificial intelligence is used to generate simulated employment application scenarios, strengthen students' skill training, and promote the application and integration of college teaching[27].

4 RESEARCH ON THE APPLICATION RISK OF GENERATIVE ARTIFICIAL INTELLIGENCE IN EDUCATION FIELD

As a subversive technology, generative artificial intelligence still faces doubts about the authenticity and legitimacy of knowledge generation, data security and privacy risks generated by interaction, ethical and moral risks associated with information output, and bans on users' imagination and innovation, as well as affecting students' discerning and creative thinking.

4.1 The Authenticity and Legality of Knowledge Generation Remain in Doubt

First, generative artificial intelligence is based on large models and trained by large-scale data sets, which is essentially information reconstruction of real world content[28]. Its performance depends on the scale and quality of the training data set[29]; However, the one-sidedness of the training database may lead to unfair, incorrect, false information and other situations[30], which brings the risk of uncertainty to the user group. This kind of wrong information may be generated and disseminated, making it difficult for educators to distinguish. Second, the copyright of generative artificial intelligence-generated content has not been determined, the ownership configuration of human-computer interaction works is not clear, the boundary of reasonable use of intelligent generated content is fuzzy and the potential infringement risk of intelligent generated content utilization[31]. The specific performance is that the content uploaded by user groups is used to further train the model, while the generated content is difficult to distinguish from traditional works[32], and new problems in the field of intellectual property and criminal law have gone beyond the scope of regulation of the current law[33], and have challenged the existing legal framework.

4.2 Data Security and Privacy Risks Arising from Interaction

First, in the training process, generative artificial intelligence is based on knowledge data as the underlying logic, transforming the knowledge production relationship, promoting the multi-modal fission and aggregation of knowledge, and realizing the comprehensive data of knowledge production[34]. However, in the training process, the model may indirectly "remember" the sensitive information in some training data, such as trade secrets, patent information, etc., which may be accidentally leaked in the process of knowledge generation by the model. Second, when using generative AI, external data input is usually required to answer in combination with the framework of the existing knowledge system, and the communication process will be recorded and collected without consent, which will aggravate the risk of disclosure of private data such as raw numbers and generated data[35].

4.3 Information Output is Accompanied by Ethical and Moral Risks

First, the ethical risks of generative artificial intelligence in frontier science and technology have increasingly attracted high concern from the international community, and the ethical governance of science and technology in China is on the road of institutionalized development. As a machine, generative artificial intelligence only has instrumental significance, but does not have independent personality, and it is difficult to obtain the status of ethical subject[36]. At the same time, the irrational use of generative artificial intelligence will weaken the value of human subjects[37]. Although it promotes technological innovation, it also brings many social ethical risks. For example, the generation of fake news and comments will mislead the public, training data contains biases, and AI-generated content may also reflect these biases, thus exacerbating social discrimination, such as gender, race or age discrimination. Second, the "deep forgery" technology using generative artificial intelligence has a high possibility of falsifying information production and is widely used in pornography and telecom fraud[38]. The unreasonable use of artificial intelligence makes the number of false information increase, the generation speed is fast, the types are diverse and the virus is viral, and the content creation process and the implementation of false information activities are automated. As these features continue to improve and prolifze, they undermine trust in verifiable facts, further threaten democratic governance, and lead citizens to doubt the possibility of truth in public life[39].

4.4 The Containment of Users' Imagination and Creativity

First, generative artificial intelligence has diversified application scenarios in different disciplines. In the field of education, it can assist teachers in scientific research and teaching and student paper collaboration, in the medical field, it can assist clinical decision-making, and in the computer field, it can improve programming efficiency, etc.[40]. To some extent, it outsources users' demands to the outside world. Users are required to have sufficient knowledge reserves, transaction analysis and other key capabilities, otherwise users will easily fall into the education trap, leading to lazy thinking and cognitive fragmentation, and thus limiting the development of individual innovation[41]. Second, generative artificial intelligence (Sora) can generate detailed realistic and imaginative dynamic scenes composed of multiple characters, specific sports types, themes and backgrounds according to user instructions, constantly iterating and upgrading. Sora will become the knowledge overlord, surpass human beings in imagination and creativity, and thus realize the exclusion of human thinking. In the cultivation of human ability to realize the possibility of education alternative. Sora's instrumental rationality, false pretense, value deviation and other problems will dissolve the educative nature of education. In addition, the human-machine interactive learning model with visual, integrated and adaptive learning shaped by Sora will shake the foundation of the existence of the school as an entity[42].

4.5 It will Affect Students' Discerning Thinking and Creative Thinking

First, students' improper use of generative artificial intelligence is increasing. In view of the phenomenon that a large number of students use generative AI to generate homework, the experiment found that the experimental group's academic performance, critical thinking ability, problem solving ability and learning attitude were significantly better than the control group, but the effect of innovation ability was not significant. This result will affect the cultivation of

students' critical thinking and creative thinking. Second, at the present stage, artificial intelligence does not show the potential of enabling students to improve their autonomy by producing integrated content output after students ask questions[43]. Meanwhile, human-computer interaction will cause students to lack interpersonal communication, and students may be limited in understanding ability. Due to the limited personalized teaching ability of generative artificial intelligence, students may lose their ability of independent discernment and creative thinking.

5 CONCLUSIONS AND SUGGESTIONS

Generative artificial intelligence technology has shown a broad application prospect in the field of higher education, but it also comes with a series of challenges and risks. By analyzing the potential of generative AI technology in learning mode innovation, knowledge production, evaluation system expansion, teaching mode innovation and educational concept transformation, we can see that it has great advantages in improving education quality, optimizing teaching resource allocation, and promoting students' personalized learning. However, we can not ignore the risks in the authenticity and legitimacy of knowledge generation, data security and privacy protection, ethical and moral risks, potential restrictions on user creativity and imagination, as well as the impact on students' critical thinking and creative thinking.

In order to better realize the potential of generative AI technology in higher education and promote the digital transformation and upgrading of education, we need to take a series of measures:

(1) Strengthen and improve the construction of laws and regulations: formulate relevant regulations and ethical guidelines to clarify the boundaries of the use of generative AI in the field of education, protect intellectual property rights, ensure data security and privacy protection, and prevent possible ethical and moral risks.

(2) Improve teachers' and students' digital literacy: Through training and education, improve teachers' and students' understanding and application ability of generative AI technology, and enhance their discernment ability and critical thinking when using AI tools.

(3) Promote the deep integration of technology and education: In teaching practice, actively explore the integration of generative AI and traditional teaching methods, innovate teaching models, and promote education equity and teaching quality improvement.

(4) Strengthen cross-field cooperation: promote cooperation in education, technology, law and other fields, jointly study and solve various problems in the application of generative AI in the field of education, and promote the synchronous progress of technological progress and educational development.

(5) Carry out continuous risk assessment and management: establish a sound risk assessment mechanism, continuously monitor the application effects and potential problems of generative artificial intelligence in the field of education, and timely adjust and optimize relevant policies and measures.

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