Opportunities and Challenges of Education Based on AI – The Case of ChatGPT

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Abstract. Generative artificial intelligence, exemplified by ChatGPT, is growing rapidly and causing multiple controversies in areas such as education. The development of artificial intelligence has great significance and many influences on today's education. How will ChatGPT change education? The application of ChatGPT in education may also lead to the following four types of risks: academic integrity and evaluation mechanism, excessive dependence and teacher status, information transmission and knowledge level, ethical awareness and ethical risks. Finally, this paper further puts forward three perspectives on the application of generative AI represented by ChatGPT in education.

Keywords: ChatGPT · Generative Artificial Intelligence · Educational · Application

1 Introduction

In recent years, with the rapid development of information technology and artificial intelligence technology, the state attaches great importance to promoting education informatization and school education digitization. The report of the 20th National Congress of the Communist Party of China clearly put forward "promoting the digitalization of education". This educational policy focus was fully reflected at the World Digital Education Congress in February 2023. Education digital transformation refers to the transformation of traditional classroom teaching mode to digital teaching mode on the basis of information technology including artificial intelligence, so as to achieve efficient, fast and repeatable education services. The digital transformation of education is obviously the use of digital technology to change the current process of student learning, teacher education, teaching and management. Living in the era of highly developed information technology, we are witnessing the rapid development of digital technology represented by artificial intelligence. Most industries, including education, are in urgent need of digital transformation [1].

The application of information technology and artificial intelligence technology in education and teaching in countries around the world is not only reflected in the use of multimedia teaching, the use of online classroom teaching and other new ways to implement personalized education and teaching, but also reflected in the use of artificial

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intelligence technology. For example, automatic grading realizes homework correction, virtual laboratory, robot teaching, intelligent precision teaching realized by big data analysis, and personalized teaching materials and content generation. The innovation and practice ability of artificial intelligence in all aspects and links of school education has been continuously strengthened, and the digital transformation and development of school education has shown remarkable results.

Meanwhile, deep learning-based computer-aided systems have become a widely researched topic, with particular emphasis on their applications in various domains such as image recognition, natural language processing, and speech recognition. However, there are also concerns about the ethical and social implications of these systems, such as privacy, bias, and job displacement, that require careful consideration and regulation [2].

ChatGPT (ChatGenerativePre-TrainedTransformer) is an artificial intelligence chatbot program developed by OpenAI company in the United States. It was publicly tested on November 30, 2022 and became popular all over the Internet as soon as it was launched. ChatGPT generates natural response text based on what the user types, allowing the user to communicate with them about anything. Since ChatGPT products are close to the natural living world of human beings and can be connected with almost everyone, it is bound to change many behaviors of people and promote the corresponding change of learning patterns. Its characteristics of daring to question, daring to admit ignorance, and supporting continuous dialogue and understanding of context have attracted a large number of educators' attention. In the face of rapid development and progress of artificial intelligence, how should educators prepare for the emergence of ChatGPT?

2 What AI Development Means for Education Today

In the digital age, using artificial intelligence to promote education reform and innovation is a necessary measure. With the continuous development of information technology represented by artificial intelligence, the influence of artificial intelligence application practice on social production and life gradually attracts people's attention. In the field of education, artificial intelligence technology enabling education also has a profound impact on the original behavioral cognitive model and educational ecological structure. Accelerate the integration and innovation of artificial intelligence, student learning, teacher development, home-school co-education, educational governance and educational evaluation, and realize the development and progress of education towards higher quality (Fig. 1).

High quality student learning, with the development of artificial intelligence-related technologies, student learning presents three changing trends of precision, diversification and simulation. Precision is mainly embodied in the dynamic analysis of students' learning situation and real-time warning [3]. Diversification is reflected in the adaptive learning support services. Knowledge graph and deep learning algorithm can realize the adaptive push of teaching resources and learning support, so as to better meet the diversified needs of students. Simulation is reflected in the strong interaction and high simulation of teaching situations. The classroom teaching space constructed by ChatGPT, meta-universe, 3D, VR, 5G network technology has the characteristics of high

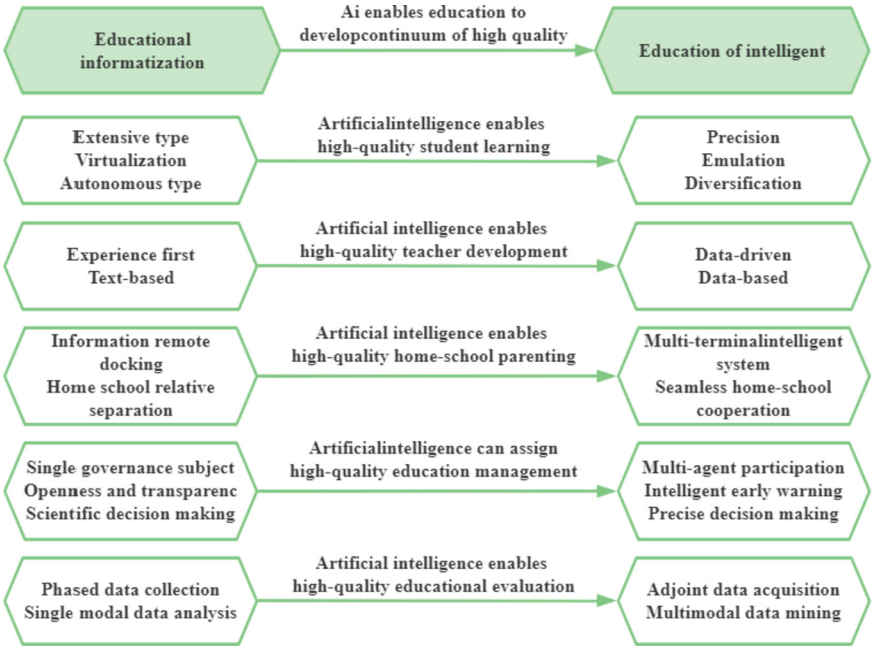

Fig. 1. High-quality development of AI enabling education

transmission rate, low delay and high simulation, which enhances the enthusiasm and commitment of students in learning and makes them more immersed in learning [4].

High-quality teacher development, through the application of data support and artificial intelligence technology, realizes the management and evaluation value beyond teaching research, and then improves the efficiency and quality of teachers' teaching research.

High-quality home-school co-parenting. With the development of artificial intelligence technology, this model provides the possibility to solve the problems such as separation of education scenes, unequal information and insufficient cooperation and communication in the traditional home-school cooperation model. At the same time, the adoption of reasonable communication forms is also of positive significance to home-school co-parenting [5].

High-quality education governance, the use of artificial intelligence technology to support and promote the improvement of education governance ability, promote the development and progress of education, promote the school, family, society and other multi-party cooperation.

High-quality educational evaluation, in terms of evaluation methods, artificial intelligence, big data and other technologies have broken through the limitations of traditional paper-and-pencil examinations, and made students' knowledge evaluation and ability evaluation realize a comprehensive transformation of process, dynamic and advanced. Promote the practical exploration of result evaluation, process evaluation, value-added

evaluation and comprehensive evaluation, and make the evaluation methods more refined and diversified [6].

3 Impact of ChatGPT on Education

In January 2023, Li, a sophomore, used ChatGPT to finish a paper in the course of New Media and advertising and got a high score of more than 90 [7]. In addition, there are countless examples of how to use ChatGPT to accomplish tasks. According to incomplete statistics, there were more than 100,000 discussions on the use of ChatGPT on domestic social platforms as of January 2023. Some argue that using ChatGPT encourages dependency and deprives students of the ability to think for themselves. Relying solely on artificial intelligence will make students lack of innovative thinking. Chomsky, a professor emeritus at MIT (Massachusetts Institute of Technology), insists that "ChatGPT is essentially high-tech plagiarism" and "a way to avoid learning." Educators believe that with the development of artificial intelligence, education also faces many challenges: with the development of artificial intelligence, the increase of human-computer dialogue will lead to the decrease of human interaction; If ChatGPT is widely used, whether students will use ChatGPT to cheat in their daily academic life; The misuse of ChatGPT in scientific research raises ethical questions about whether traditional instruction has a role to play in writing instruction and essay writing [8].

There were also dissenting voices in the media, arguing that "ChatGPT's potential as an educational tool outweighs its risks "and even that" schools should thoughtfully use ChatGPT as a teaching aid, a way to unleash student creativity, provide personalized tutoring, And prepare students with AIDS to work with AI systems as adults." [9].

Facing the rapid development of generative artificial intelligence technology such as ChatGPT, how should we rationally understand the impact of ChatGPT on human learning, life and work mode? [10] The New Generation of AI Governance Principles focuses on the development of "responsible" AI and puts forward the AI governance framework and action guidelines, which is also a positive response to the development of safe, reliable and controllable AI [11]. Therefore, promoting technological development and risk prevention is an important topic for future AI research. In the field of education, artificial intelligence technology enabling education also has a profound impact on the original behavioral cognitive model and educational ecological structure. In addition, due to the lagging attribute of the education field, facing a series of risks brought by the deep integration of artificial intelligence and education, educators need to study and judge the action mechanism and development law of the deep integration of artificial intelligence and education. It is necessary to prevent the high uncertainty and potential risks brought by artificial intelligence from challenging the existing educational concepts and systems, and realize a beautiful picture of two-way empowering and sustainable development of artificial intelligence and education [12].

4 Risks and Challenges of ChatGPT on Education

In the field of education, some scholars have expressed concern about the use of ChatGPT. Alshater [13] believes ChatGPT has certain limitations, including reliance on data quality, limited areas of knowledge, ethical issues, over-reliance on technology, and

potential for abuse. Qadir [14] also noted that ChatGPT, like other generative AI systems, can be biased, even generate and disseminate misinformation, and raise a host of ethical questions. Baidoo-Anu [15] et al. also argue that the use of ChatGPT in education may be affected by issues such as lack of human interaction, limited understanding, biased training data, lack of creativity, lack of contextual understanding, and invasion of privacy. One of the biggest concerns in education today is that ChatGPT undermines educational equity by helping students complete assignments or cheat on exams without thinking for themselves. To sum up, although ChatGPT has great potential in educational applications, there are risks and challenges such as unfavorable academic integrity, over-reliance on teachers and students, inaccurate information delivery, and difficulty in dealing with ethical risks [16].

4.1 The Academic Integrity is Questioned and the Evaluation Mechanism is Unbalanced

ChatGPT's ability to help students complete academic tasks in a variety of disciplines has raised concerns in the academic community about academic integrity. Some researchers have argued that ChatGPT could help students cheat, destabilize the educational evaluation system, and lead to educational inequity [17, 18]. After comparing ChatGPT's answers to those given by real students in the Open University exams, the researchers said the launch of ChatGPT could lead to the end of academic integrity in online and open exams, as ChatGPT's answers showed a high level of critical and logical thinking. By generating highly logical text with very little input, it makes it possible for students to cheat on exams [19]. In addition, the office said it was difficult to distinguish between students and ChatGPT generated writing, and that it was difficult for the office to adequately assess students' true level of understanding when using ChatGPT to answer questions. Therefore, this may lead to the failure of the existing educational evaluation mechanism [17]. Keffer-butterfield, director of artificial intelligence at the World Economic Forum in Davos, said students submitting AI-generated content would affect their ability to improve themselves because "it's like a machine that works" [20]. More importantly, the education sector has been slow to respond to AI tools, requiring many trials and adjustments to guard against risks. What can students learn from their education when they rely on AI products and transfer creative sovereignty to AI? How can we know the true level of students? This presents a great challenge to the academic integrity detection and evaluation mechanism.

4.2 Excessive Dependence on Students and Addiction May Weaken the Status of Teachers

ChatGPT does offer interactive learning [15]. A 2014 study also proved that students who talked to an imaginary mentor who mimicked human emotional behavior learned better. However, over the course of using ChatGPT multiple times, dependencies can arise. In particular, people who have used it many times with good results may notice the effect. Some people become lazy because they rely on smart tools. For example, it has been reported in the past that if you rely on test search tools, your grades will drop. Over-reliance on online tools can reduce students' creativity in development and

may divert the saved time to places unrelated to learning [12]. At the same time, the powerful artificial intelligence AIDS also put forward higher requirements on the ability of teachers, requiring teachers to have a strong ability to distinguish between right and wrong knowledge, especially in the link of lesson preparation to choose the essence and discard the dross. In addition, excessive use of ChatGPT may threaten the teacher's status in the classroom, causing students to lose concentration and leave after-class problems to ChatGPT [21]. It is true that ChatGPT makes it easier to acquire knowledge, to provide feedback on assignments, to diversify learning patterns, and to dispense with written assignments and marking, but it is unclear how teachers and students can cope with ChatGPT's changes.

4.3 Inaccurate Information Transmission and Limited Knowledge Level

Although ChatGPT is similar to traditional search engines in that it provides a wealth of learning information quickly, its accuracy is not guaranteed. The New York City Department of Education has raised concerns about the information ChatGPT gives students, particularly about the safety and accuracy of the answers. They are also concerned that the use of ChatGPT will lead to pride among young students and a lack of skills needed to assess information [8]. OpenAI also acknowledges that ChatGPT, while reasonable, sometimes gives incorrect or absurd answers [14]. In addition, ChatGPT is sensitive to student text input adjustments and multiple entries of the same text. For example, if you type a question into ChatGPT, even if ChatGPT says it doesn't know the answer, it will reply with a slight modification. Because of this, ChatGPT must be a textbook for precision counseling when used in the classroom. Teachers and students do not fully trust it. In addition, when OpenAI released ChatGPT, the data of the training model was limited to 2021, and the knowledge of the world after 2021 was limited. There was too little understanding of the problems of specific populations. Almost all the researchers pointed out what had not been mentioned, especially science knowledge. In addition, ChatGPT has no connection to the active Internet, no access to any information from social media, is a closed data set, and therefore can generate incorrect information. If ChatGPT creates fake reading lists on specific search topics, what are the teachable aspects of ChatGPT? [22].

4.4 Ethical Awareness is not Strengthened, and Ethical Risks Are Difficult to Deal with

Artificial intelligence ethics refers to the ethical principles and codes of conduct that should be observed in the development, management and application of artificial intelligence. With the rapid development of artificial intelligence, educators also need to have ethical awareness [23]. When ChatGPT provides personalized feedback to students, educators need to be concerned about three ethical issues: privacy of data, bias, and ownership. The first is data privacy. In order to solve a particular problem with ChatGPT, students and students have to enter a lot of data and information related to it. Stored data can be compromised when ChatGPT identifies the data and provides satisfactory answers to the user. There are concerns about how educational institutions, especially schools, can use students' data without the consent of third parties. The second

is prejudice. ChatGPT is a large-scale language model that is trained in millions of data points and contains a large number of texts and books, but it can only gain knowledge from the statistical laws of trained data and has no contextual understanding, so it is different from humans. An inability to understand the world in complex, abstract ways can lead to aggressive and biased feedback [15]. Third, ownership. We need to evaluate whether all the content ChatGPT produces for teachers and students can be used directly. ChatGPT's ghostwriting programming code and ability to extend vivid stories became widely recognized in a short time, and the generation model generated responses from patterns in these training data. However, this is not innovation and originality [24]. In other words, ChatGPT's responses are the result of collecting data from the database, but who owns these works? Who will bear the risk after that [25]? This is of great concern.

5 Future Prospects of ChatGPT on Education

5.1 Promote the Reform of Educational Concepts

The generative AI represented by ChatGPT has some limitations, but it has the ability to directly influence and inspire educational ideas. At present, the education in our country still attaches importance to acquiring knowledge through a large amount of reciting memory, understanding and a large amount of practice, but neglects the ability and the method of knowledge discovery through analytical thinking. Generative AI technology is expected to replace low-level mental workers who only focus on acquiring and accumulating knowledge by demonstrating the ability to effectively accumulate knowledge and rationally utilize it [26]. It can be seen that education should pay more attention to cultivating students' high-level thinking ability, especially interdisciplinary multi-thinking ability, critical thinking ability and creative thinking ability [27]. Through multi-disciplinary thinking, we can understand and distinguish the complex problems and situations in the real world, and finally complete those realistic topics that artificial intelligence cannot cope with. Only with good critical thinking ability can students' knowledge and skills go beyond deep understanding and analysis of AI models and fully recognize the limitations of AI technology and its attributes as a tool. Only with certain creative thinking ability, students can give full play to their innovative potential and role in a specific field and not be easily replaced by artificial intelligence machines. At the same time, in the process of education and teaching, teachers should speed up the change of ideas under the new information technology conditions, and fully mobilize the enthusiasm and creativity of front-line educators in the change of social needs and educational ideas brought about by technological change [28].

5.2 Innovate Teaching Methods and Contents

Driven by the educational concept that emphasizes the cultivation of advanced thinking ability, generative AI technology and products will increasingly influence the educational methods and contents, and play different roles. In terms of teaching methods, teachers are encouraged to actively innovate classroom teaching methods, integrate relevant technologies into the teaching process of different subjects, and enrich the content

and interest of classroom activities. For example, by setting up AI assistants with excellent interactive capabilities, providing real-time machine feedback and even an environment for human-computer discussion, students can engage in co-operative learning with machine assistants. In terms of teaching content, we should actively adjust the training objectives and teaching requirements of different disciplines, and pay more attention to the teaching content setting oriented by the core accomplishment of disciplines [29]. With current AI content generation technologies, for example, multilingual code generation and debugging capabilities are so good that the social division of labor among junior programmers may disappear. Therefore, more attention should be paid to computational thinking, artificial intelligence literacy and algorithmic thinking than to reciting the grammar of programming languages in basic and vocational education.

5.3 Encourage Mutual Development of Education and Technology

The technology of generative artificial intelligence is advancing rapidly. Take the GPT series technology as an example. From the early GPT-1 [30] to the current ChatGPT, although the fourth generation has been updated, the performance of each generation has improved significantly. However, as the update time is less than five years, it is expected that more intelligent and humanized AI technologies and products will appear in a short time. The system will further enhance natural language processing capabilities with better content understanding, generation and generalization capabilities. It can be seen that education is to adapt to the rapid development of artificial intelligence technology. We should strive to hold a more open and inclusive attitude towards artificial intelligence, maintain a technology-oriented education concept, and learn and use relevant technologies and tools to jointly complete various educational tasks. At the same time, fully realize that this new technology is no longer a tool for "photo search" or "face swap software," but an important part of the future of education, with profound implications for the transformation of the education field [27]. In the field of education, we should always pay attention to the potential risks generated by artificial intelligence technology, formulate laws and regulations related to the application environment in the field of education, and form a double spiral in which technology and education promote each other and make progress together. As artificial intelligence spreads to human society, education, the cornerstone of human civilization, needs to be flexible and confident in responding to challenges.

6 Conclusion

With the emergence of ChatGPT and its explosive popularity, generative artificial intelligence, a new technology, has gradually entered the education ecosystem and brought great impact and challenge to the current education modernization. Turning challenges into opportunities is an urgent need for every educator to think deeply. The relationship between technology and education is not opposite. The relationship between technological progress and educational development can be realized and needs to develop together. ChatGPT is a milestone in the development of artificial intelligence technology, which has become a great historic opportunity to promote education reform and innovation, but it is also a great challenge to education reform and innovation.

In the era of rapid development of artificial intelligence, either active choice or passive choice, no one can separate themselves from this fact. In the face of the emergence and development of ChatGPT or other new technologies, it is better to turn the crisis into an opportunity, make good use of the advantages of digital technology, so as to realize the integration of human and intelligence, and use technology to promote the progress and development of education [31]. At the same time, we must always remember that only by fully awakening the consciousness and subjectivity of "man" and stimulating creativity, can future human beings get rid of the control of self-created technology, so as to win the competition between man and technology and become the master of history.

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References

1. Campolo, A., et al.: AI now 2017 report (2017)
2. Kuang, Y., et al.: Double stimulations during the follicular and luteal phases of poor responders in IVF/ICSI programmes (Shanghai protocol). Reprod. Biomed. Online **29**(6), 684–691 (2014)
3. Firat, M.: How chat GPT can transform autodidactic experiences and open education. Department of Distance Education, Open Education Faculty, Anadolu Unive (2023)
4. George, A.S., George, A.H.: A review of ChatGPT AI's impact on several business sectors. Partn. Univ. Int. Innov. J. **1**(1), 9–23 (2023)
5. Buza, V., Hysa, M.: School-family cooperation through different forms of communication in schools during the Covid-19 pandemic. Thesis **9**(2), 55–80 (2020)
6. Gilson, A., et al.: How does CHATGPT perform on the united states medical licensing examination? The implications of large language models for medical education and knowledge assessment. JMIR Med. Educ. **9**(1), e45312 (2023)
7. Hassani, H., Silva, E.S.: The role of ChatGPT in data science: how AI-assisted conversational interfaces are revolutionizing the field. Big Data Cognit. Comput. **7**(2), 62 (2023)
8. Hsu, J.: Should Schools Ban AI Chatbots? Elsevier, Amsterdam (2023)
9. Ali, S.R., et al.: Using ChatGPT to write patient clinic letters. Lancet Digit. Health **5**(4), e179–e181 (2023)
10. Biswas, S.S.: Role of Chat GPT in public health. Ann. Biomed. Eng., 1–2 (2023)
11. Huang, F., Kwak, H., An, J.: Is ChatGPT better than human annotators? Potential and limitations of ChatGPT in explaining implicit hate speech. arXiv preprint arXiv:2302.07736 (2023)
12. Jiao, W., et al.: Is ChatGPT a good translator? A preliminary study. arXiv preprint arXiv: 2301.08745 (2023)
13. Alshater, M.M.: Exploring the role of artificial intelligence in enhancing academic performance: a case study of ChatGPT. SSRN (2022)
14. Qadir, J.: Engineering education in the era of ChatGPT: promise and pitfalls of generative AI for education (2022)
15. Baidoo-Anu, D., Owusu Ansah, L.: Education in the era of generative artificial intelligence (AI): understanding the potential benefits of ChatGPT in promoting teaching and learning. SSRN 4337484 (2023)
16. Chen, T.-J.: ChatGPT and other artificial intelligence applications speed up scientific writing. J. Chin. Med. Assoc. **10** (2023)

17. Cotton, D.R., Cotton, P.A., Shipway, J.R.: Chatting and cheating. Ensuring academic integrity in the era of ChatGPT (2023)
18. Ventayen, R.J.M.: OpenAI ChatGPT generated results: similarity index of artificial intelligence-based contents. SSRN 4332664 (2023)
19. Susnjak, T.: ChatGPT: the end of online exam integrity? arXiv preprint arXiv:2212.09292 (2022)
20. Curtis, N.: To ChatGPT or not to ChatGPT? The impact of artificial intelligence on academic publishing. Pediatr. Infect. Dis. J. **42**(4), 275 (2023)
21. Khalil, M., Er, E.: Will ChatGPT get you caught? Rethinking of plagiarism detection. arXiv preprint arXiv:2302.04335 (2023)
22. Lund, B.D., Wang, T.: Chatting about ChatGPT: how may AI and GPT impact academia and libraries? Libr. Hi Tech News (2023)
23. Macdonald, C., et al.: Can ChatGPT draft a research article? An example of population-level vaccine effectiveness analysis. J. Glob. Health **13**, 01003 (2023)
24. McGee, R.W.: ANNIE CHAN: three short stories written with chat GPT. SSRN 4359403 (2023)
25. Pavlik, J.V.: Collaborating with ChatGPT: considering the implications of generative artificial intelligence for journalism and media education. Journal. Mass Commun. Educ., 10776958221149577 (2023)
26. McGee, R.W.: Who were the 10 best and 10 worst US presidents? The opinion of chat GPT (artificial intelligence). Opin. Chat GPT Artif. Intell. (2023)
27. Naumova, E.N.: A mistake-find exercise: a teacher's tool to engage with information innovations, ChatGPT, and their analogs. J. Pub. Health Policy, 1–6 (2023)
28. McGee, R.W.: Is ESG a bad idea? The ChatGPT response. Working Paper, 8 April 2023 (2023). https://ssrn.com/abstract=4413431
29. McGee, R.W.: Political philosophy and ChatGPT. Working Paper, 25 March 2023. https://ssrn.com/abstract=4399913. 10.13140
30. Radford, A., et al.: Improving language understanding by generative pre-training (2018)
31. Qin, C., et al.: Is ChatGPT a general-purpose natural language processing task solver? arXiv preprint arXiv:2302.06476 (2023)