

The Impact of ChatGPT on Education and Future Prospects

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Abstract. ChatGPT is a large language model based on the GPT series models developed by OpenAI, which has gained widespread attention in the education sector due to its ability to generate natural language, demonstrate powerful understanding capabilities, and support multi-turn dialogue. Analysis results suggest that the emergence of ChatGPT has fundamentally changed the way people connect with information. It has made information that was previously expensive and difficult to obtain more accessible and greatly reduced communication barriers between different fields. This marks an unprecedented information revolution that could potentially alter human lifestyles. ChatGPT is also expected to have a profound impact on education, serving as a double-edged sword that brings both innovation and risks to the education sector. This paper summarizes existing literature and materials to analyze the essence of ChatGPT, its impact on education, and prospects for its future application. This paper aims to provide valuable insights for educators and researchers interested in understanding the implications of ChatGPT and its potential role in advancing education.

Keywords: ChatGPT, Natural language generation, multi-turn dialogue, Education impact, Future applications.

1. Introduction

With the continuous advancement of computer technology and the growth of language corpora, natural language processing (NLP) has gradually become an independent discipline. In recent years, the development of deep learning technology and the establishment of large-scale corpora have brought significant breakthroughs to the research and application of NLP. ChatGPT is not created out of thin air, but is based on OpenAI's continuous research and creative exploration of language models, especially in the field of NLP. Against this backdrop, as a deep learning-based natural language model, ChatGPT emerged. In June 2017, the Google Brain team published the article "Attention is All You Need", proposing the Transformer model, which laid the foundation for the development of the GPT model [1]. Through continuous improvements, OpenAI officially released the ChatGPT model on November 30, 2022, and added the InstructionGPT for conversation chat functionality, which is the focus of this article. The ChatGPT model is trained using Reinforcement Learning from Human Feedback (RLHF), which involves incorporating human feedback into the training process [2]. This approach helps to improve the model's performance and ensures that it can provide more accurate and appropriate responses in real-world scenarios. Incorporating human feedback into the training process also enhances the model's ability to learn from diverse perspectives and adapt to changing situations.

The application of ChatGPT in the education field has improved students' practical creativity, enhanced their cognitive initiative, strengthened their autonomy in choosing, and promoted reducing the burden and increasing efficiency. However, it also faces ethical issues such as the loss of thinking ability under the dependence on artificial intelligence, the ethical relationship between the alienation of teacher-student communication and emotional deficiency, the algorithmic ethics of knowledge blind spots and information silos, and the resource ethics of education inequality and unclear responsibilities [3].

Therefore, this article will discuss the challenges and opportunities of ChatGPT in the field of education and teaching through existing academic research and reports on its educational applications, and make prospects for its future development.

2. The Impact of ChatGPT on Education

2.1. The Essence of the Impact of ChatGPT

According to a video interview with American linguist Chomsky on January 23, 2023, he believes that the impact of ChatGPT on education can only undermine its foundation [4]. He considers ChatGPT to be essentially a "high-tech plagiarism" and believes that the system has no value for understanding language and cognition. Chomsky further points out that using ChatGPT is only a way to escape learning, and people cannot gain any real knowledge from it. Similarly, Li Zhimin also expressed a similar view, believing that ChatGPT cannot compare with the four information technology revolutions in human history [5]. Therefore, the use of ChatGPT in the education field may face certain limitations and challenges.

In contrast to Chomsky's views, more opinions believe that as a generative artificial intelligence, ChatGPT has enormous potential to subvert the existing educational paradigm. Because fundamentally, the way humans acquire information and interact with machines has undergone tremendous changes since the emergence of ChatGPT. Advanced simulations and algorithms like ChatGPT will become the core of all machines, devices, and robots, greatly improving the interaction between humans and machines, and making humans the most important participants rather than just passive receivers.

There are many opinions in this regard, and it has already entered practice. In more and more educational, learning, and even scientific research fields, more and more people are using ChatGPT as an aid, greatly improving work efficiency.

2.2. The Impact of ChatGPT in the Field of Education

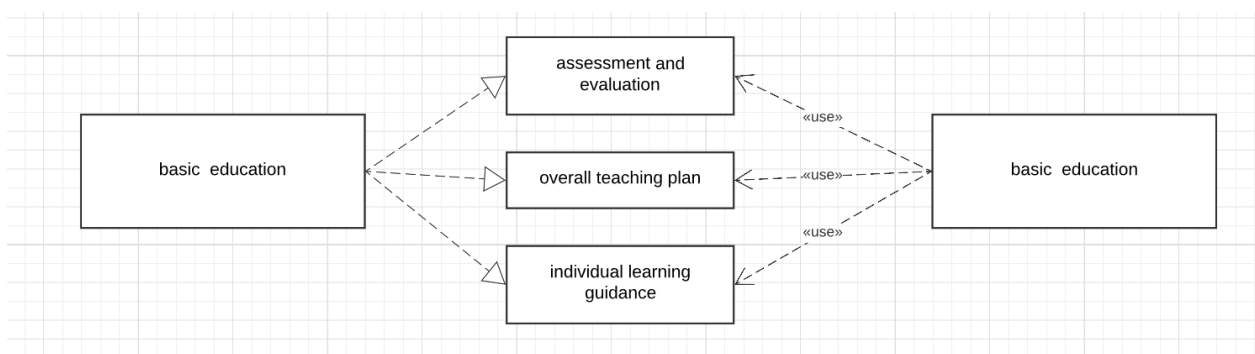


Figure 1. The impact of ChatGPT on education (Photo credit: Original)

The impact of ChatGPT on education involves both basic and higher education [6]. Figure 1 shows the overall situation of education's influence in the field of education. The greatest advantage of ChatGPT lies in its world-leading NLP processing capabilities. The performance of its word vector model behind excellent context dialogue ability can adapt to NLP tasks, which means that ChatGPT performs well in the most basic NLP tasks such as text classification, part-of-speech tagging, and named entity recognition. Therefore, the impact of ChatGPT on education is mainly in higher education. Knowledge cultivation is necessary for primary and secondary schools, and a certain knowledge reserve is a necessary condition for thinking training. Knowledge as a personal core literacy has become a core resource in modern society, and innovation and entrepreneurship rely on knowledge drive. After the emergence of ChatGPT, it will greatly replace the simple knowledge imparted in traditional education. In the higher education stage, it is necessary to teach students to use ChatGPT correctly, rely on its powerful knowledge organization ability, improve learning and research efficiency, and improve the quality of higher education. Educators must thoroughly change the traditional teaching tradition of knowledge impartation to cultivate students' creative thinking beyond artificial intelligence capabilities.

ChatGPT affects educational assessment and evaluation. Schools may have to change the evaluation methods of exam knowledge points and innovate evaluation methods, especially those that can exert creative and speculative thinking.

ChatGPT affects overall teaching plans and individual learning guidance. Some scholars believe that ChatGPT has a very powerful information search and organization ability, which can provide richer answers to students' questions and allow students to use natural language to find the learning resources they need, which is expected to completely change the way of internet-based information search [7]. It can be a good AI teaching assistant, helping teachers and students develop course plans and generate question lists at different levels in a short time; it can also serve as an intelligent assistant and secretary to assist students in completing academic papers, programs, and tests [8]. Zhai conducted an experimental study using ChatGPT and found that it could assist researchers in completing a coherent, partially accurate, and content-rich academic paper titled "Artificial Intelligence for Education." He also applied ChatGPT to science learning and proposed four specific application paradigms: developing automatic evaluation projects, evaluation and feedback, personalized learning guidance, and special needs formulation [9]. Rudolph explored the possible applications of ChatGPT in higher education, including introducing innovative evaluations for teaching, innovative teaching strategies, providing experimental and experiential learning, and promoting collaborative learning and teamwork [10].

There are also opinions that ChatGPT is just an assistant for programming, reading, and writing, and will not have too much substantive impact on teaching.

3. Challenges and Future Prospects of Applying ChatGPT in Education

3.1. The Development Trend of ChatGPT in the Education Field

As a new tool, there are currently limited research papers and reports on the application of ChatGPT. One example is the chat-based teacher training tool GPTeach, which allows teachers to practice teaching in simulated student situations. Through an A/B test and a reflective study, it was found that participants who received GPTeach had significantly higher recommenders' scores, indicating the potential for it as a scalable and engaging teacher training tool [11].

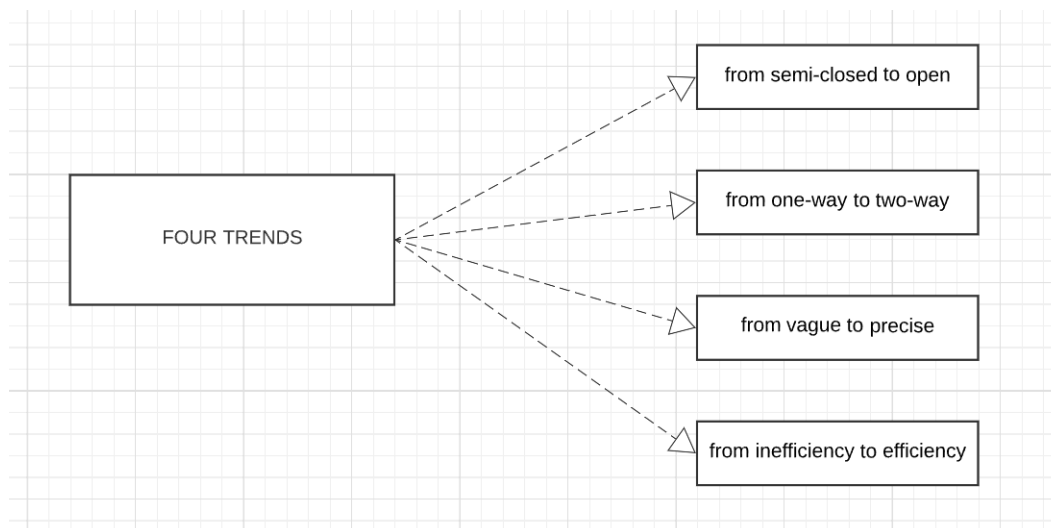


Figure 2. Four trends that ChatGPT will follow (Photo credit: Original)

Figure 2 shows four trends that ChatGPT will follow: from semi-closed to open, with the development of IoT technology, students' creative practice is constantly improving; from one-way to two-way, students' cognitive autonomy will also be enhanced through interaction with AI; from vague to precise, ChatGPT's personalized customization function will further strengthen students' autonomy in choosing learning content and methods that best suit their interests, abilities, and needs; from inefficiency to efficiency, ChatGPT will use big data technology to promote educational efficiency

and reduce burden. Analyzing student learning data can provide better teaching advice for teachers to help students learn faster and better.

British sociologist Anthony Giddens pointed out that "science has also brought new uncertainties - many of which are global. Such uncertainties are largely impossible to eliminate with past experience." ChatGPT will become an important tool in future education, helping students practice more creative learning methods.

3.2. Potential Risks of ChatGPT in the Education Field

Along with the popularity of ChatGPT, there has been a series of discussions about it. People are fascinated by passing the Turing test [12]. And get success in passing a law exam at the University of Minnesota, and achieve outstanding performance in another exam at the University of California, Berkeley [13]. However, the use of ChatGPT in the education field is mixed, and a recent survey of American college students shows that up to 89% of students choose to use ChatGPT to write assignments, which has raised concerns about crossing the bottom line of education [14].

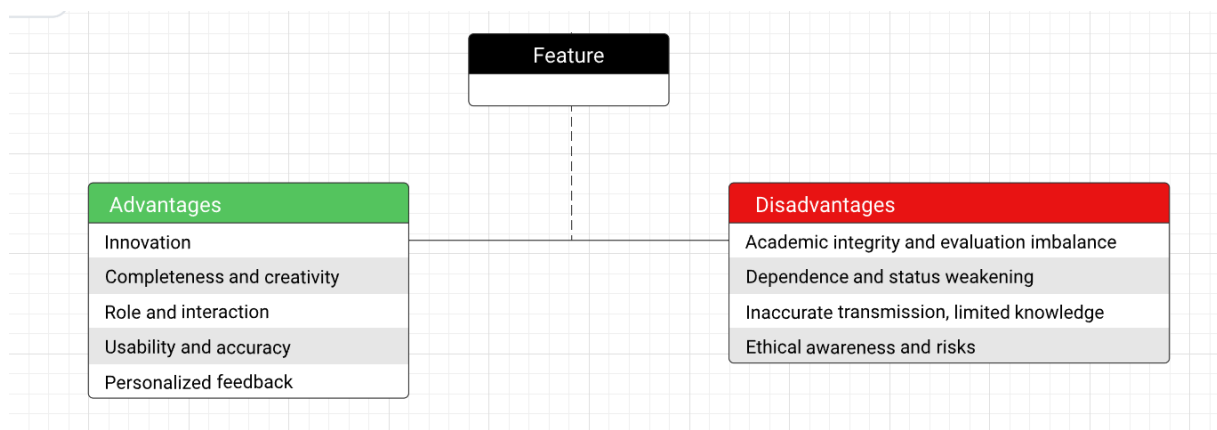


Figure 3. Feature (Photo credit: Original)

On the one hand, as Figure 3 shows that ChatGPT has the potential to empower teaching innovation, improve the completeness and creativity of teaching outcomes, enhance the sense of role and interaction of digital mentors, improve the usability and accuracy of adaptive learning systems, promote the intelligence and creativity of teaching strategies and methods, and support the generative and personalized feedback and evaluation of teaching. On the other hand, the application of ChatGPT in education may also pose four risks: questioning academic integrity and imbalance of evaluation mechanisms, excessive dependence leading to addiction and potential weakening of teacher status, the inaccurate transmission of information and limited knowledge level, and insufficient ethical awareness and difficulty in coping with ethical risks.

The widespread use of ChatGPT has led to a large amount of unthinking or unverified content. According to Intelligent.com, at least one-third of surveyed college students use ChatGPT to write answers for assignments [15]. ChatGPT is also widely used in answer production for Q&A websites and is inundated in social media. False information not only directly affects the audience, but the large amount of low-quality information generated also pollutes Internet data. This can lead to serious consequences if learners do not scrutinize the information generated by ChatGPT, as they may obtain incorrect information, which in turn can affect the model and mix in more noise.

4. Conclusion

This article summarizes existing literature and materials, analyzes the essence of ChatGPT and its impact on education, and provides valuable references for educators and researchers in the field while looking forward to its future applications. The emergence of ChatGPT technology signifies an unprecedented information revolution that may change human lifestyles. In the field of education, there are both unprecedented opportunities and challenges, which will prompt traditional teaching

methods to rapidly transition to intelligent ones. Wang Tien-en said that humans have been gradually emancipating themselves through objectification of their own activities, while also constantly causing their own evolution and degeneration through these objectification activities. The development of generative artificial intelligence such as ChatGPT has pushed this evolution and degeneration to a deeper and more intrinsic level of human nature. Therefore, the issue is not about the evolution and degeneration of human nature itself, but about the long-term control of this evolution and degeneration.

As Adam Stevens said, if our education system continues to "pursue scores rather than knowledge," ChatGPT will only be a threat. Reasonable use of AI as an excellent auxiliary tool rather than a cheating tool still faces various challenges such as limited communication interaction, over-reliance on data, bias in data analysis, and lack of empathy and understanding. However, these challenges may be effectively addressed in the future. In addition, standardized use of ChatGPT and similar technologies to avoid complete student dependence on them to complete tasks is crucial. Therefore, to further develop ChatGPT technology in the field of education, it is necessary to strengthen its security through more in-depth research and improve its accuracy and reliability. On the other hand, it is also necessary to strengthen the practical application of ChatGPT technology and explore more application scenarios in the field of education. As far as evaluation and supervision are concerned, more comprehensive and reasonable response measures can be expected with the development of all aspects.

References

- [1] VASWANI A, SHAZEER N, PARMAR N, et al. Attention is all you need, 2017-06-12, 2023-04- 15, <https://arxiv.org/abs/1706.03762>.2017.
- [2] OUYANG L, WU J, JIANG X, et al. Training language models to follow instructions with human feedback, 2022 - 03 - 04, 2023 - 04 - 15. <http://arxiv.org/abs/2203.02155>.
- [3] YUYANG MA, Application value, potential ethical risks, and governance paths of ChatGPT in the field of education, 2023 - 04, 2023 - 04 - 15.
- [4] ADIL CADER, Special Noam Chomsky Interview, 2023-01-18, 2023-04-15, <https://www.youtube.com/watch?v=L72vOPS016s>.
- [5] ZHIMING LI. The Nature of ChatGPT and Its Impact on Education, Chinese Education Informatization, 2023, 3: 12 - 18.
- [6] YOUMEI WANG, DAN WANG et al." Aladdin's Lamp" or "Pandora's Box": The Potential and Risks of ChatGPT's Educational Application, 2023 - 02, 2023 - 04 - 15.
- [7] ALJANABI, M, ChatGPT: Future Directions and Open Possibilities, Mesopotamian Journal of CyberSecurity, 2023, 16 - 17.
- [8] SHUTING CHU. ChatGPT is gaining popularity, how do we respond to the new challenges, WEN HUI BAO, 2023 - 02 - 05.
- [9] Zhai X. ChatGPT for Next Generation Science Learning, 2023-01-12, 2023-04-15, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4331313.
- [10] Rudolph J, Tan S, & Tan S. ChatGPT: Bullshit Spewer or the End of Traditional Assessments in Higher Education, Journal of Applied Learning and Teaching, 2023, 6 (1): 1 - 22.
- [11] Julia M. Markel et al. GPTeach: Interactive TA Training with GPT Based Students, 2023, 2023-04-15, https://al.linkedin.com/posts/dr-simone-smala-96a41ab_the-practical-guide-to-using-ai-to-do-stuff-activity-7026658692792008705-7bMv.
- [12] YALALOV D. ChatGPT Passes the Turing Test, 2023 - 02 - 08, 2023 - 04 - 15, <https://mpost.io/chatgpt-passes-the-turing-test/>.
- [13] KELLY S M. ChatGPT Passes Exams from Law and Business Schools|CNN Business, 2023- 01-26, 2023-04-15, <https://www.cnn.com/2023/01/26/tech/chatgpt-passes-exams/index.html>.ChatGPT.
- [14] LIEBRENZM, SCHLEIFERR, BUADZEA, et al. Gener G ating Scholarly Content with Chat GPT: Ethical ChalG lengesfor Medical Publishing, 2023.

- [15] INTELLIGENT.COM, Nearly 1in3 College Students Have Used ChatGPT on Written Assignments, 2023 - 01 - 23, 2023 - 04 - 15, <https://www.intelligent.com/nearly-1-in-3-college-studentshave-used-chatgpt-on-written-assignments/>.