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EDITORIAL

The Utility of ChatGPT in Educational Research—Potential Opportunities and Pitfalls

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ABSTRACT

Background/purpose –Leveraging the latest developments in natural language processing, recent versions of ChatGPT has demonstrated astounding performance on a wide array of tasks through its ability to understand and generate human language, and respond to diverse conversational prompts. Its remarkable performance in numerous applications has also attracted researchers' attention, prompting investigations into the potential utility of this AI-tool to enhance scientific work. The current paper aims to present a succinct overview of the opportunities and challenges of using ChatGPT in educational research based on the anticipations and analysis of scholars from different fields of research.

Practical implications – ChatGPT is a double-edged sword with its potential benefits and caveats for scientific research. Educational researchers could benefit from the utility of ChatGPT in identifying gaps in the literature, generating new ideas and developing hypothesis, devising surveys or rating scales, conducting systematic reviews, eliminating human error in analysis of large datasets as well as drafting and editing scientific manuscripts. On the other hand, the current limitations of ChatGPT in enabling a reliable and transparent generation of content, its inability to provide accurate references or tendency to suggest non-existent resources, and incompatibility with the current ethical and legal obligations of academic publishing warrants cautious and meticulous endeavor of educational researchers.

Conclusion – The current era has witnessed groundbreaking advancements in AI-based technologies, which will for sure act as precursor for the development of more-developed AI-systems that could overcome the recent shortcomings of ChatGPT in aiding scientific research. Till then, scientists working in the education field should continue striving to understand its potential to advance any aspect of their scientific quest, and collaborate to formulate guidelines and principles to enable the ethical and responsible integration of these new technologies into scientific research and publishing.

Keywords – ChatGPT, educational research, artificial intelligence, AI-based technologies.
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1. INTRODUCTION

Since the time Alan Turing first raised the intriguing question of whether machines could emulate human thinking in 1950, numerous technologies have been developed in pursuit of this notion (Taecharungroj, 2023). The integration of recent developments in artificial intelligence (AI), machine learning (ML), and natural language processing (NLP) have led to the emergence of large language models (LLM) such as ChatGPT, an AI-based chatbot developed with Generative Pre-trained Transformer technology.

ChatGPT, particularly ChatGPT-4 as its most recent version, has garnered growing interest and excitement as well as concerns among people with diverse backgrounds. Leveraging supervised and reinforcement learning supported by its pre-training over large-scale data, ChatGPT is capable of responding to a wide array of conversational prompts in a natural, human-like manner along with answering follow-up questions, admitting its mistakes, challenging incorrect premises, and rejecting inappropriate requests (OpenAI, 2023). In fact, this ground-breaking chatbot has quickly proven that it could demonstrate astonishing performance in a wide range of tasks such as answering open-ended and analytical questions on diverse subjects like physics, mathematics or philosophy (Frieder et al., 2023; West, 2023), assisting healthcare professionals in diagnosing diseases (Nov et al., 2023), writing poems or stories (Belouadi et al., 2022), generating codes in different programming languages or augmenting this code-writing process (Noever et al., 2023), and performing inductive reasoning to infer feelings or stances of people (Michail et al., 2023).

As a result of these immersive performances, ChatGPT has instantly increased its reputation as a 'new level of service that artificial intelligence (AI) can offer to humanity in searching for information, answers, or solutions online' (Macdonald et al., 2023, p. 1), and has driven its utilization in diverse fields such as medicine, healthcare, journalism, education and scientific research (Alkaissi and McFarlane, 2023; Liu et al., 2023). In fact, ChatGPT is frequently described as a double-edged sword entailing both positive and negative consequences for the scientific community (Hisan and Amri, 2023; Shen et al., 2023) and whether ChatGPT can facilitate scientific research or even shift contemporary scientific paradigms has already become a topic of hot debate (Marchandot et al, 2023; Sallam, 2023; Xames and Shefa, 2023). Considering the inevitable consequences of ChatGPT for scientific work, particularly for educational domain (Sok and Heng, 2023), we believe that it is timely and relevant to engage in a discussion over the potential benefits and limitations of using ChatGPT in educational research. The present paper aims to present a succinct overview of the opportunities and challenges of utilizing ChatGPT in educational research.

2. Using ChatGPT in Educational Research: Two Sides of the Same Coin

2.1. Promises of ChatGPT for educational research

Scientific work is basically conducted in four stages: (1) brainstorming and idea generation through the review of previous evidence and research gaps, (2) data collection and analysis, (3) interpreting and reporting results in the context of existing literature, (4) publishing research in academic journals to disseminate the newly-acquired knowledge. With its ability to process and generate knowledge from a vast amount of internet resources within seconds, to conduct a swift and accurate analysis of large amounts of information, and maintain a human-like conversation, ChatGPT is now considered to bear significant potential to assist researchers throughout all these stages of scientific work (Aljanabi, 2023; Liu et al., 2023).

Although the literature on the contribution of ChatGPT to any stages of scientific research is still young, it implies that educational research could benefit from using ChatGPT in different stages. For instance, Dahmen et al. (2023) underline that ChatGPT has a great potential to aid researchers in generating new ideas and developing hypothesis via its capability to analyze the gaps in existing literature. This could save enormous time and energy that the researchers could canalize to other aspects of their investigation (Wen and Wang, 2023). Gordjin and Have (2023) even suggest that ChatGPT could act as an interlocutor of the brainstorming session, and provide novel insights or perspectives into the topic under investigation. Similarly, Dowling and Lucey (2023) experimented with ChatGPT in finance research, and demonstrated that ChatGPT could contribute greatly to idea generation. Given these illustrative results, educational researchers could enhance this essential phase of their scientific quest.

ChatGPT is also tested for its ability to assist systematic literature reviews, and offered promising results with this regard, providing that the researcher uses effective prompts (e. g., Wang et al., 2023). As ChatGPT is capable of understanding complex instructions and good at text classification through processing a wide array of resources, it is considered to be a valuable tool to generate effective systematic reviews (Liu et al., 2023; Wang et al., 2023). Likewise, ChatGPT could also help researchers to quickly grasp the key findings of a study through generating a concise summary of research papers in a fraction of the time, which would provide invaluable assistance for literature reviews (Marchandot et al., 2023). This rapid review of literature could also assist educational researchers to develop surveys, questionnaires or rating scales (Xames and Shefa, 2023) that would facilitate analysis into newer concepts or issues in educational field. As Burger et al. (2023) suggest, these AI-based technologies could also help reduce human error in such studies because unlike humans, they are better at producing repeatable results and can sustain work without getting tired or distracted.

In its current state, the most significant contribution of ChatGPT to scientific enterprise seems to be its ability to generate and optimize text, which aids researchers to express and convey their results in a more accurate and coherent way. Therefore, ChatGPT proves to be an invaluable tool to draft, write, or edit articles (Kasneci et al., 2022; Kim, 2023; Leibrenz et al., 2023; Wen and Wang, 2023; Zhai, 2022), which can also maximize the scientific productivity of particularly non-English speaking researchers in the 'publish or perish' culture of the contemporary academy.

2.2. Caveats for using ChatGPT in educational research

Although ChatGPT offers promising results that could accelerate the scientific progress with significant aid in designing studies, conducting analyses, and drafting/editing research articles (Macdonald et al., 2023), the caveats of using ChatGPT in its current form is also highlighted. In his comprehensive analysis of the limitations of ChatGPT in scientific research and writing, Borji (2023) listed the potential shortcomings in its content generation such as the likelihood of giving inaccurate and biased information, lack of transparency and reliability, poor systematicity and stability, and insufficiency to follow ethical standards. In addition to the risk of generating superficial, fabricated or over-detailed content (Sallam, 2023), ChatGPT is also unable to provide references or often refers to non-existent resources when asked (Kitamura, 2023; Macdonald et al., 2023; Wen and Wang, 2023). Furthermore, the lack of transparency in content generation combined with the possibility of generating non-original content directly taken from other publications prompts significant concerns in terms of

research and publication ethics. Regarding this aspect, ChatGPT could, in fact, put additional burden on researchers to examine ChatGPT-generated content before including them in their manuscripts (Sallam, 2023).

Finally, the integration of ChatGPT into the research process has also initiated controversial views on whether to include it as an author (Ali and Djalilian, 2023; Nature, 2023). While it was initially listed as a co-author in some publications due to its contribution in writing the paper, its mention as a co-author has later been banned by several journals (Mcdonald et al., 2023), considering that it cannot assume responsibility or accountability for the content and integrity of its writing, and thus cannot meet current legal obligations of authorship (Sabzelieva and Valentina, 2023). These issues also warrant further discussions and regulations for prospective educational research, and poses challenges to the current norms acknowledged in the field.

3. CONCLUSION

As Yudkowsky, a researcher and writer of artificial intelligence, eloquently articulated once, 'by far the greatest danger of artificial intelligence is that people conclude too early that they understand it' (Ali and Djalilian, 2023, p. 1). The current era has indeed witnessed unprecedented advancements in the AI-based technologies going as far as an attempt to develop artificial general intelligence, a form of artificial intelligence capable of demonstrating human-level intelligence, and the birth of chatbots like ChatGPT can be considered a grandiose endeavor in pursuit of this notion. Considering these breakthroughs, it is very likely that developments in AI-based technologies will continue to astound humanity, and change the way scientists interact with such technologies (Aljanabi, 2023; Gordjin and Have, 2023). In the meantime, we believe that educational researchers should neither be simplistically enthusiastic nor hostile towards using ChatGPT, but should continue striving to understand its potential to advance any aspect of their scientific quest (Burger et al., 2023).

We currently acknowledge that scientific enterprise is fundamentally a human endeavor built upon expertise, creativity, and innovation, and thus artificial intelligence cannot fully replace human touch (Thorp, 2023; Wen and Wang, 2023). Even ChatGPT itself underlines that '*while ChatGPT can provide assistance in educational research, it should be used as a complementary tool and not a replacement for rigorous scholarly inquiry, critical thinking, and human expertise; researchers should always exercise their judgment and carefully evaluate the information provided by ChatGPT in the context of their research goals and methodologies*'. However, it can be clearly anticipated that these recent developments in LLMs will act as a precursor for the development of more advanced AI-systems that can overcome the current shortcomings and limitations of ChatGPT in aiding scientific research, which would inevitably perpetuate the integration of such chatbots into the academic world. Given that resorting to reflexive reactions like banning or restricting their use would be of no use, it is now high-time that educational scholars work in collaboration to develop guidelines and formulate principles to enable their responsible, legitimate, and ethical use in scientific research and publishing (Ali and Djalilian, 2023).

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