

A Critical Examination of the Role of ChatGPT in Learning Research: A Thing Ethnographic Study

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Abstract. The rapid evolution of artificial intelligence (AI) in natural language processing has sparked considerable interest in AI Large Language Models (LLM), such as ChatGPT, within the field of education. Despite this attention, there exists a noticeable gap in scholarly discourse regarding the potential impact of ChatGPT on learning research. This study adopts an ethnographic research approach, considering ChatGPT as an active research participant. Guided by four key questions derived from the SWOT analysis framework, the study conducts a comprehensive evaluation of ChatGPT's strengths (Availability and Accessibility, Natural Language Processing, Vast Knowledge Base) and weaknesses (Lack of Deep Understanding and Creative Thinking, Lack of Objectivity and Integrity) in the context of learning research. Special emphasis is placed on the substantial opportunities that ChatGPT introduces for learning research, notably its potential as an Intelligent Research Assistant and its capacity to provide Writing Assistance. Additionally, the study illuminates potential threats posed by ChatGPT to learning research, including Risks to the Development of Critical Thinking and Creativity, Risks to Information Security, and Risks of Deepening Educational Inequities. Through this rigorous critical analysis, the study endeavors to bridge the aforementioned gap in the literature. Furthermore, the research proposes that learning researchers prepare for the impact of ChatGPT on learning research by concentrating on Critical Scrutiny of ChatGPT, Integration of ChatGPT into Research Practices, and Reflective Practices Regarding ChatGPT. By elucidating these aspects, the study advocates for additional empirical research on the role of ChatGPT in learning research, aiming to effectively guide its valuable contributions in the future of learning research.

Keywords: AI; ChatGPT; SWOT; Learning Research; Thing Ethnographic.

1. Introduction

The demonstrated success of artificial intelligence (AI) in various domains, including education, underscores its capability to tackle complex problems[1]. Particularly in natural language processing, AI has driven the development of intelligent chatbots and virtual assistants, such as ChatGPT, capable of comprehending and generating human language. ChatGPT, introduced publicly on November 30th, 2022, stands out as a powerful AI chatbot employing deep learning techniques for the comprehension, processing, and generation of natural language with exceptional complexity, accuracy, and usability[2]. In the education sector, ChatGPT has garnered popularity for its conversational interaction style resembling that of human tutors.

However, the application of ChatGPT in learning research poses inherent risks and challenges. A survey reveals that 89% of college students in the United States use ChatGPT to complete assignments, with instances of students achieving high scores by relying on the system for paper writing. In response, many universities explicitly prohibit students from using ChatGPT or other AI tools in classrooms, assignments, and assessments. Several reputable academic journals have also updated their editorial rules, barring ChatGPT from co-authorship and prohibiting the use of text generated by ChatGPT in papers. This controversy has triggered debates on the integration of ChatGPT into learning research.

Learning research, as a scientific field, investigates learning processes and the human attributes, interactions, organizations, and institutions influencing learning outcomes. It encompasses literature retrieval, reading, research paper writing, and other specific tasks. Supporters commend ChatGPT

for its contributions to learning research, emphasizing its potential to enhance researchers' writing skills and offer personalized guidance[3]. Opponents raise ethical concerns[4].

Despite the widespread interest in generative AI and ChatGPT in learning research, discussions on their uses, risks, misuses, and opportunities in learning research remain limited. This study utilized the SWOT analysis framework to comprehensively assess the strengths and weaknesses inherent in ChatGPT, aiming to analyze its impact on learning research and provide evidence-based recommendations for educators and researchers in the learning studies field. The study addresses the following research questions:

What are the strengths of ChatGPT relevant to Learning Research?

What are the weaknesses of ChatGPT relevant to Learning Research?

What significant opportunities (uses) for Learning Research can ChatGPT offer?

What are the potential threats (misuses) for Learning Research posed by ChatGPT?

2. SWOT Analytical Framework

SWOT, an acronym denoting strengths, weaknesses, opportunities, and threats, was initially introduced in the early 1950s as a framework for examining organizational strategies. In the realm of education, this framework has found widespread utility in guiding strategic planning and decision-making[5]. In light of a SWOT analysis, a successful approach to incorporating new technology in education entails capitalizing on the technology's strengths and mitigating threats by addressing its weaknesses. SWOT analysis offers a structured approach to collecting insights from various sources, offering a comprehensive view of both internal elements (i.e., strengths and weaknesses) and external factors (i.e., threats and opportunities) that can influence the integration of new technologies in education.

Leveraging the SWOT framework, this study offers a comprehensive examination of ChatGPT's strengths, enabling the identification of diverse opportunities in the realm of Learning Research. Additionally, it sheds light on ChatGPT's weaknesses, highlighting potential threats that relevant stakeholders may encounter in the future.

3. Methodology

3.1 Thing Ethnography

Ethnography, a form of social research, emphasizes first-hand exploration of people's actions and words within specific contexts [6]. Traditionally, ethnography focused on human perspectives using qualitative methods like observation and interviews. However, there is a recent shift towards a broader ethnographic approach, one that includes nonhuman perspectives within a given context [7]. This evolving method incorporates 'thing ethnography,' enabling the interpretation of objects' viewpoints and their socio-material networks [8]. Artificial intelligence (AI) plays a crucial role in this shift, granting unprecedented access to nonhuman viewpoints, especially through the development of chatbots, which enable direct interaction and access to AI systems' perspectives via text exchange. In this context, ChatGPT should not be viewed merely as an object created and used by people, but as a subject actively engaging in daily practices with users, influencing the socio-material networks it is part of [9].

This study employed thing ethnography with ChatGPT as research participant. Semi-structured interviews, guided by four key questions based on the SWOT framework, were conducted. To enhance the study's validity, emerging findings were compared with existing literature on generative AI and ChatGPT in Education, examining similarities, contradictions, and their underlying reasons.

4. Results

4.1 Strengths of ChatGPT

4.1.1 Availability and Accessibility

The 24/7 availability of ChatGPT provides valuable support for individuals with busy schedules. This continuous availability meets essential needs, ensuring that academic researchers are not constrained by time when seeking knowledge. The instant feedback offered by ChatGPT further enhances research efficiency. Researchers can use ChatGPT to obtain concise and relevant answers to specific research questions. It can provide insights, explanations, and references, assisting researchers in the early stages of literature review or problem identification. Studies indicate that ChatGPT's processing speed is outstanding, with response times of less than two minutes, highlighting its efficiency and reliability[10]. This rapidity streamlines the process of obtaining information, eliminating the need for manual searches through numerous sources and search engines. This is particularly beneficial for researchers seeking to stay updated on the latest discoveries and publications in the field of learning research. ChatGPT possesses the ability to answer questions, offering succinct and pertinent answers to specific research queries. Providing immediate, accurate, and tailored support for academic researchers, it ultimately shapes the future of academic research.

4.1.2 Natural Language Processing

Natural Language Processing (NLP) is a crucial technology for ChatGPT, enabling computers to understand, interpret, and generate human language. Within ChatGPT, this processing capability allows the system to comprehend natural language questions posed by users and generate responses in a natural language format. This goes beyond merely recognizing keywords; it involves a deep understanding of semantics and context, enabling the system to intelligently respond to user queries. In the context of learning research, the proficiency in natural language processing provides researchers with efficient means of communication and information retrieval, making interactions more natural and flexible. It also serves as a convenient tool for research work.

4.1.3 Vast Knowledge Base

In the realm of learning research, ChatGPT serves as an invaluable asset. Its extensive knowledge base covers a wide range of topics, providing detailed insights into research methods, learning theories, and specific research content. This wealth of information not only enhances learning researchers' understanding, but also improves their research skills. Additionally, ChatGPT goes beyond mere information dissemination. It acts as a resource curator, recommending pertinent books, articles, websites, and teaching materials, being a valuable tool for knowledge construction and idea generation [11]. The content variety offered by ChatGPT is unmatched. It provides diverse learning materials that enrich the experience of learning researchers and prepares them to conduct complexity-based research in the future.

4.2 Opportunities for Learning Research

4.2.1 Intelligent Research Assistant

Research in the field of learning requires innovative thinking and a multidimensional approach. As an intelligent thinking companion, ChatGPT can assist researchers in expanding their perspectives and handling repetitive and tedious research tasks. For example, ChatGPT can aid learning researchers in conducting interviews and processing qualitative materials. With its powerful natural language understanding capabilities, ChatGPT can categorize and mine themes and emotions in interviewees' responses, helping learning researchers gain a better understanding and manage interview data effectively. ChatGPT can also assist researchers in brainstorming, generating hypotheses based on existing knowledge. It can provide alternative viewpoints, contributing to the creative process of hypothesis formulation. Engaging in conversation with users,

ChatGPT can offer novel ideas and perspectives during discussions, thereby inspiring creativity in researchers. This proves to be highly beneficial for the implementation of research methods in learning studies and innovative research design.

4.2.2 Writing Assistance

ChatGPT possesses robust natural language processing capabilities, providing users with support such as automatic translation, speech recognition, and question-answering systems. These technologies can assist researchers in generating research content, including research paper frameworks and abstracts. They can aid learning researchers in refining their papers, offering appropriate suggestions, and conducting automatic proofreading in terms of grammar, spelling, punctuation, and more. Additionally, for researchers working in multilingual environments, ChatGPT's ability to perform language translation may prove highly valuable. It can help bridge language gaps and facilitate understanding of research published in different languages.

4.3 Weaknesses of ChatGPT

4.3.1 Lack of Deep Understanding and creative thinking

ChatGPT has limitations in word processing, often resulting in responses lacking depth, particularly in tasks requiring nuanced domain knowledge [12]. Despite its proficiency in response generation, it falls short of the nuanced understanding possessed by experienced learning researchers. Additionally, while it can assist in designing complex learning research projects, its deficiency in creative thinking hampers its utility in learning research. In certain learning research contexts, it shows potential, but its limitations in expertise, contextual understanding, handling complex queries, and generating truly innovative language pose challenges.

4.3.2 Lack of Objectivity and Integrity

ChatGPT is a deep learning-based language model that comprehends language structures and acquires knowledge through pretraining on extensive natural language text. Consequently, its responses are primarily based on the static knowledge acquired during training and do not undergo real-time updates. This implies that if questions pertain to the latest learning theories, scientific research, or similar content, ChatGPT's responses may exhibit some latency, potentially generating answers that appear reasonable but are, in fact, incorrect or misleading.

Furthermore, an equally concerning issue lies in the potential biases and stereotypes embedded within the model, reflecting the biases present in its training data [13]. The quality of data used to train ChatGPT directly influences its final performance. The model may perpetuate stereotypes or biases present in the pretraining data, thereby providing incomplete information to researchers when serving as a learning research assistant.

4.4 Threats to Learning Research

4.4.1 Risks to the Development of Critical Thinking and Creativity

The work of learning researchers is novel and creative. However, ChatGPT may interfere with the development of creativity and critical thinking skills. Traditionally, learning researcher activities include problem formulation, literature review, theoretical modeling, empirical study design, data collection and analysis, discussion of results, theoretical and practical discussion of results, theoretical and practical contributions and finally writing quality publications based on the work [14]. However, as Killian et al. pointed out, the ready availability of AI-generated answers may demotivate learning researchers to engage in the rigorous intellectual processes that underpin critical thinking.

In addition, the reliance on AI-generated content may lead to a lack of creativity, and researchers may become less willing to explore and design innovative research methods or materials. These issues highlight the need for careful consideration and balance when incorporating ChatGPT into learning research.

4.4.2 Risks to Information Security

When using ChatGPT for learning research, challenges in information security arise, leading to concerns about privacy issues and the risk of data breaches. Firstly, privacy concerns are a crucial factor. The interactive nature of ChatGPT may involve users providing personal or sensitive information, such as researchers sharing experimental details or research directions during conversations. Therefore, ensuring that ChatGPT's handling and storage of such information comply with privacy regulations and ethical standards becomes critically important. Upholding principles and mechanisms for user privacy, such as data anonymization and encryption, are key steps in mitigating this threat. Secondly, there is a potential risk of data breaches. The use of ChatGPT may result in the storage of dialogues and input data, exposing them to the risk of unauthorized access or attacks. Hence, emphasizing security measures in system design, including enhanced authentication, encrypted communication, and secure storage practices, is crucial. In conclusion, utilizing ChatGPT in learning research necessitates a vigilant approach to address these information security challenges, focusing on both user privacy protection and safeguarding against potential data breaches.

4.4.3 Risks of Deepening Educational Inequities

It is evident that not all researchers have equitable access to technology or the internet, potentially intensifying prevailing educational inequalities. The incorporation of ChatGPT into educational research has ignited considerable apprehension, particularly concerning the digital divide. Researchers lacking access to sophisticated technological resources are placed at a substantial disadvantage compared to peers who effortlessly wield this technological privilege. This discrepancy not only underscores how digital technology exacerbates the intricate landscape of societal inequalities but also accentuates the latent perils associated with such disparities.

5. Discussion and Conclusion

This study conducted a comprehensive SWOT analysis of ChatGPT, examining its strengths, weaknesses, opportunities, and threats in the context of learning research. Our findings echoed the paradoxical nature of generative AI, as elucidated by Lim et al. [15], who highlighted how it can be both a 'friend' and a 'foe,' 'capable' yet 'dependent,' 'accessible' yet 'restrictive,' and surprisingly, 'popular' even when 'banned.'

The utilization of ChatGPT in the domain of learning research is currently in its nascent stage and necessitates extensive empirical investigations. Moreover, a reevaluation of training methodologies for learning researchers when confronted with AI-driven tools such as ChatGPT is imperative. The following are concluding reflections, adhering to scholarly considerations, on how researchers can prepare for the impact of ChatGPT on learning research:

Critical Scrutiny of ChatGPT. Prior to engaging in discussions on the application of ChatGPT in learning research, researchers must cultivate a fundamental understanding of the technical underpinnings of ChatGPT. Proficiency in critically assessing the information generated by ChatGPT is essential, encompassing insights into the model's mechanics, the characteristics of training data, and awareness of potential biases. Equipped with this knowledge, researchers can more accurately decipher and interpret ChatGPT's outputs, discerning potential misleading information or inherent limitations.

Integration of ChatGPT into Research Practices. The seamless integration of ChatGPT into research practices is of paramount importance for learning researchers. AI should be perceived as a collaborative tool that supports human endeavors. Researchers should deliberate on how to effectively collaborate with ChatGPT, proactively fostering opportunities for interaction with AI technology. This entails active participation in the training process, model customization to meet specific research requirements, and continuous optimization and enhancement in real-world applications.

Reflective Practices Regarding ChatGPT. Facilitating a space for reflection and reconsideration of practices underpinned by ChatGPT is essential for learning researchers. Reflective exercises empower researchers to adapt, innovate, and strike a balance, ensuring that the application of ChatGPT aligns with the nuanced needs of learning research. This may encompass periodic reviews of model outputs, meticulous attention to potential biases or errors, and the implementation of corrective measures to enhance overall performance. Through a sustained commitment to reflective practices, researchers can harness the potential of ChatGPT while upholding ethical standards in its application within academic settings.

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