

Use ChatGPT in Teaching and Learning: Opportunity and Challenge

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Abstract. This paper explores the role of ChatGPT in education, focusing on both the opportunities and challenges it presents. The study examines how ChatGPT can enhance teaching and learning through personalized feedback, improved engagement, and critical thinking. However, the paper also addresses concerns such as data privacy, potential over-reliance on AI, and the reliability of AI-generated content. By reviewing existing research, this paper aims to provide educators with insights into the effective use of ChatGPT in the classroom, while also highlighting areas where further research is needed to address the challenges associated with its use.

Keywords: ChatGPT, Teaching, Learning

1. Introduction

With the rapid development of technology, AI has gradually become an important tool in the field of education. This literature review focuses on the impact of ChatGPT on teaching and learning. Artificial intelligence, as a technology capable of simulating human intelligence [1], has been widely used in various aspects of education, including personalized learning, intelligent tutoring, and automated assessment [2]. This paper mainly studies ChatGPT in AI (generative pre-trained transformer). To better understand the role and impact of AI in education, this paper will explore existing research to understand the applications of ChatGPT in education and the opportunities and challenges it brings.

Existing research shows that the application of AI in teaching and learning brings opportunities but also raises challenges. For example, some studies point out that AI can improve students' learning outcomes through personalized teaching while reducing the burden on teachers [3]. However, other research shows that teachers' acceptance and adaptability to AI in actual teaching vary, which may affect the practical application of AI [4]. Additionally, the impact of AI in learning also shows diversity about resources and means. Not only does it provide personalized learning paths and enhance learner engagement, but it also helps students grasp knowledge points faster with real-time feedback [3]. Moreover, the widespread use of AI has also brought about privacy and data security issues, which are gradually receiving attention in current research. This study will review early research results after the release of ChatGPT to provide quick references for educators and researchers.

The main purpose of this article is to explore the opportunities and challenges ChatGPT brings to teaching and learning by reviewing previous articles. The research reveals the impact of AI technology on education, and there may be great differences and commonalities in the impact of different studies. Therefore, different educational environments and students' learning needs may lead to differences in the application effects of AI technology. In order to better understand these differences and commonalities, this article will delve into how these factors affect the educational effectiveness of ChatGPT through an analysis of the literature.

My research questions are:

- (1) What does research tell us about the impacts of ChatGPT on teaching?
- (2) What does research tell us about the impacts of ChatGPT on learning?

This paper will be structured as follows: first, introduction illustrates impacts of ChatGPT on teaching and learning; secondly, an analysis of the benefits and challenges associated with its use in teaching and learning, supported by existing research; finally, a conclusion on the future development of ChatGPT in education and corresponding suggestions.

2. Methods

This study uses a literature review method to examine the application and impact of ChatGPT in education. The main goal of this research is to analyze the most recent studies on how ChatGPT is used in teaching and learning. By reviewing these articles, I aim to identify common themes and patterns related to the benefits and challenges of ChatGPT in education. To gather relevant studies, I searched databases such as Google Scholar, using key terms like "ChatGPT in education," "AI in teaching," and "AI for student learning." I focused on peer-reviewed articles published between 2022 and 2024 to ensure that the research is up-to-date.

After selecting the relevant studies, I carefully analyzed their findings to determine how ChatGPT impacts both teachers and students. I also compared different studies to find similarities and differences in how ChatGPT is applied in various educational settings. The themes and patterns that emerge from this review will help provide a better understanding of how ChatGPT can be used to improve student learning and teaching efficiency. By identifying these key points, I can offer useful recommendations for educators who want to integrate ChatGPT into their classrooms.

2.1. Searching and Screening Literature

The process of my search literature, I mainly used Google scholar. I chose Google scholar as the main search platform because of its comprehensibility in locating articles. It allows me to find the most current published articles that relevant to this study’s topic as much as I can. In order to improve the accuracy and efficiency of the search, I used keywords in my literature searching. The key words that I used include “AI, ChatGPT, teaching and learning”, “AI, ChatGPT, education”.

After searching the literature, the next step that I performed is screening the literature. During the process of screening literature, the first step that I performed is to read the key words and the title of the searched articles. This process allows me to quickly learn whether those articles’ content is relevant to my research topic or not.

The second step that I performed is to focus on the article’s publication year (2022-2024) and the authority of the journal. In this process, I focused on journal articles, instead of website articles or books, because of its authority and reliability since it is usually peer-reviewed. I chose articles published in the last three years to ensure the research is up-to-date and accurate.

The third step that I performed is to screen the articles by reading the abstracts to exclude those not related to the study topic. First, I read the abstracts of the selected articles. Then, through the abstracts, I got a basic understanding of the research content, methods, and main conclusions. This process allows me to exclude irrelevant articles and keep the ones useful for the study.

The fourth step that I performed is to do a detailed evaluation of the full text. I first selected the articles and then read them thoroughly to assess whether the research methods, data analysis, and conclusions are representative and valuable. I focused on the teaching contexts and the specific ways AI tools were applied in the studies to ensure the practicality of the literature. This process allows me to select the most relevant and useful articles for the research.

The fifth step that I performed is to do a detailed evaluation of the full text and finally identify 10 core articles as the main focus of this study. These articles cover different application scenarios of ChatGPT in education and can provide sufficient data and theories for the research. This process allows me to ensure that the study is based on well-supported and relevant literature.

2.2. Analysis of the Gathered Articles

In terms of the process of analyzing the core articles, I used a template to summarize the major information of the article. The template that I used include the article’s “title”, “research questions”, “methods” “key findings”, and “notes about my takeaways”. For example, I attached one sample article summary and analysis to showcase how I analyzed the gathered core articles.

Table 1. Summary of Core Article Information

Title of the Article	Research Question	Methods	Key findings	Critique and takeaways from the article
Oseremi Onesi-Ozigagun (2024) Revolutionizing Education Through AI: A comprehensive review of enhancing learning experiences	1. What are the main applications of AI in the field of education? 2. How does AI impact learning outcomes and teaching methods? 3. How do AI-driven adaptive learning systems customize personalized learning paths? 4. What impact does AI have on the overall education ecosystem?	1 Use a variety of data collection and analysis methods to assess the impact of AI on learning outcomes and teaching methods. 2. Use the application of AI in education, personalized learning, and adaptive learning systems to facilitate the systematic screening of relevant research 3. Screening representative sample studies, synthesizing, analyzing, and results to draw a comprehensive view of AI applications in the field of education.	1. AI develops learning plans to improve students' learning outcomes. 2. AI provides teachers with new teaching solutions to make teaching more interactive. 3. AI formulates plans based on students' individual learning progress to improve learning efficiency. 4. AI optimizes the student learning experience.	AI has great potential in education, but there are still data privacy concerns. It provides an all-encompassing understanding that allows readers to better understand how AI can innovate education.

After summarizing and evaluating each article, I compared similarities and differences of different articles. For example, I looked at the similarities of two or three articles to find benefits and challenges of ChatGPT on teaching and learning. The two articles that I compared are Karthikeyan's (2022) work entitled Literature Review on Pros and Cons of ChatGPT Implications in Education and Kwan Lo (2023)'s work entitled What Is the Impact of ChatGPT on Education? A Rapid Review of the Literature.

3. Findings

After reviewing and analyzing existing research on ChatGPT use in teaching and learning, this study presents five themes here.

3.1. Theme 1: Benefits of ChatGPT on Student Learning

ChatGPT has shown a positive impact on students' critical thinking and conceptual understanding [5]. Firstly, through interaction with ChatGPT, students are exposed to a variety of perspectives and explanations, which encourages students' deeper thinking and analysis, helping them develop critical thinking skills [6]. In addition, ChatGPT can assist students in deeply understanding complex concepts, providing detailed explanations and instant clarifications, which strengthens their grasp of the subject content and enhances their practical application skills [7].

In personalized learning and feedback, ChatGPT shows many advantages. Students can use ChatGPT to tailor their learning according to their own pace and needs, improving learning efficiency and effectiveness [5]. Additionally, ChatGPT can provide immediate feedback, allowing students to correct mistakes promptly during the learning process [2]. This instant feedback not only improves learning accuracy but also enhances students' learning motivation, keeping them positive and proactive in their studies, leading to progress [8].

ChatGPT enhances students' critical thinking and conceptual understanding by providing access to multiple viewpoints and detailed explanations. For example, AI-driven learning tools like ChatGPT were shown to foster deeper analytical skills by encouraging students to engage with diverse perspectives during discussions [6]. This was particularly evident in subjects like literature and history, where ChatGPT could offer alternate interpretations of texts or historical events, prompting students to think critically about differing viewpoints.

Moreover, ChatGPT provides immediate feedback, which is critical in subjects like mathematics, where solving equations requires step-by-step accuracy [5]. Immediate error correction helped students refine their approaches in real-time, reducing frustration and enhancing their engagement with complex problems.

3.2. Theme 2: Benefits of ChatGPT on Teaching

Assessment and Feedback: ChatGPT helps teachers to observe students' learning gaps and provide prompt and personalized feedback. ChatGPT shows clear benefits in teaching, especially in assessment and feedback. Through ChatGPT, teachers can more accurately observe students' learning gaps and provide timely, personalized feedback. For example, in a writing class, ChatGPT can help teachers quickly assess students' essays, point out strengths and areas for improvement, and greatly improve teaching efficiency [4].

Knowledge Expert: ChatGPT helps teachers expand their expertise or field. Teachers can use ChatGPT as a knowledge expert to quickly access and learn new knowledge, which helps them guide students better. For example, teachers can use ChatGPT to get the latest academic research trends and teaching methods, improving the quality of their teaching [4].

Regarding the lesson planning and preparation, ChatGPT improves teaching efficiency by providing teachers with new teaching plans. This helps teachers save time and increase interaction in the classroom [6].

ChatGPT significantly enhances teaching by facilitating personalized feedback and lesson planning. For instance, in essay writing classes, teachers using ChatGPT can receive automated suggestions for improving students' grammar and style, thus speeding up the feedback process and allowing more time for personalized instruction [9]. In a practical example, teachers integrated ChatGPT into their evaluation workflows, reducing the time needed for grading and improving the consistency of feedback on technical subjects like programming [2].

Additionally, ChatGPT serves as a "knowledge expert" that teachers can rely on for quick updates on academic trends. This can be particularly useful in rapidly evolving fields like data science, where teachers need to keep pace with technological developments [10].

3.3. Theme 3: Challenges and Concerns of ChatGPT on Student Learning

Data privacy is one important concern. Since ChatGPT needs to access a large amount of data to provide personalized services, students' privacy may be at risk. Ensuring the security of student data and preventing data leaks has become a key concern for educational institutions when using ChatGPT [4].

Existing literature also presents concerns in terms of students' critical thinking skills. Although ChatGPT has many advantages in personalized learning, it also brings potential challenges. For example, students might rely on ChatGPT for learning, which could weaken their critical thinking skills. If students depend too much on the answers provided by ChatGPT without thinking for themselves, they may lack the ability to analyze complex problems deeply [8].

Another concern and challenge of using ChatGPT is the reliability issues: When asking subject-related questions, ChatGPT might provide incorrect answers due to outdated data, which could cause students to develop incorrect memories of the knowledge [1].

Despite its advantages, ChatGPT poses challenges, particularly in critical thinking development. While AI can provide quick answers, it also risks making students too reliant on automated responses, thereby weakening their independent problem-solving abilities [3]. For example, in problem-solving scenarios in STEM subjects, students might over-rely on ChatGPT to complete assignments rather than engaging with the material themselves.

In addition, reliability concerns arise when ChatGPT provides outdated or incorrect information. Some students developed misconceptions about historical events due to ChatGPT's reliance on data that had not been recently updated [1]. This highlights the need for teachers to carefully monitor the information ChatGPT provides and cross-check facts when necessary.

3.4. Theme 4: Challenges and Concerns of ChatGPT on Teaching

In teaching, educators need to find a balance between traditional teaching methods and the use of artificial intelligence. Combining traditional methods with AI-enhanced teaching can maximize teaching efficiency and reduce risks [4]. However, many teachers find they lack the skills to effectively use ChatGPT [10].

In the data privacy issues, a major concern is data security. Teachers need to handle students' learning data carefully when using ChatGPT to prevent potential data leaks. Additionally, the accuracy and reliability of AI-generated content must be carefully reviewed by teachers [9].

One of the major challenges for teachers is data privacy, particularly when handling students' personal information in AI-assisted platforms. For instance, concerns about the security of student data surfaced, especially when ChatGPT was used to generate personalized learning paths. Teachers must ensure that privacy measures are in place to prevent the unauthorized use of student data [9].

Another significant challenge is the lack of teacher training for effective AI integration. As emphasized, teachers often struggle with fully utilizing ChatGPT's potential due to limited training in AI technology [4]. In classrooms where AI has been integrated without sufficient professional development, the educational benefits of ChatGPT are less evident, with some teachers unable to go beyond basic functionalities like automated grading.

Different concern is the issue of over-reliance on AI, which could negatively affect teaching quality. If teachers depend too much on ChatGPT, they might reduce their efforts to innovate and adapt to students' specific needs. Human creativity and empathy are essential aspects of teaching that AI cannot replace. Therefore, teachers should maintain a balance between using AI tools and applying their own judgment in the classroom [4].

3.5. Theme 5: Recommendations on Using ChatGPT

Given the concerns and challenges that using ChatGPT in education, teachers should take measures to address plagiarism issues related to the use of ChatGPT in education. For example, they can establish clear academic integrity policies to guide students in the proper use of ChatGPT. Additionally, using plagiarism detection tools to check the originality and similarity of AI-generated content can effectively prevent academic misconduct [9].

Teachers should also actively cultivate students' AI literacy, helping them not only to use AI tools for learning but also to understand the limitations of AI. This will help students develop critical thinking and problem-solving skills in an AI-assisted environment, better preparing them for future learning and work [9].

To address challenges like data privacy and over-reliance, teachers should focus on cultivating students' AI literacy, which includes understanding the limitations and ethical considerations of AI tools like ChatGPT. Educators implement workshops and courses to teach students how to use AI responsibly, fostering an understanding of when and how AI should supplement but not replace human reasoning [10].

Additionally, using plagiarism detection software in tandem with ChatGPT-generated assignments can help maintain academic integrity, [6]. By enforcing strict guidelines on the acceptable use of AI in academic work, teachers can mitigate issues of academic dishonesty while still leveraging the benefits of AI technology.

In the end, teachers should foster collaborative learning with AI tools like ChatGPT. Group activities where students use ChatGPT to research or solve problems together can encourage teamwork and critical discussions. This method allows students to benefit from AI while still interacting with each other and developing social and communication skills. By promoting collaborative learning, teachers can ensure that AI is used as a tool for deeper, shared understanding [10].

4. Conclusion

In summary, ChatGPT is bringing important changes to both teaching and student learning. On the one hand, it offers many advantages such as personalized learning, increased engagement, and quick feedback. These features help students improve their critical thinking and understand difficult ideas better. For teachers, ChatGPT saves time by automating tasks like grading and lesson planning. It also helps teachers expand their knowledge by offering quick access to new information and academic trends. As a result, ChatGPT can make teaching and learning more efficient and effective.

However, there are also some challenges. One concern is that students may rely too much on ChatGPT for answers, which could harm their critical thinking and problem-solving skills. Sometimes ChatGPT can also give incorrect or outdated information, which can lead to confusion. For teachers, the main challenges include data privacy risks and the need for more training to use ChatGPT effectively in the classroom. Without enough training, teachers may not be able to fully take advantage of the tool.

In the future, as AI develops, its role in education will continue to grow. Teachers and students must learn to use these tools responsibly, balancing the benefits with careful attention to the challenges. By integrating ChatGPT into classrooms thoughtfully, educators can make sure that students and teachers both benefit while avoiding over-reliance on technology.

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