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Review Article

Analyzing the role of ChatGPT as a writing assistant at higher education level: A systematic review of the literature

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ABSTRACT

This study examines the role of ChatGPT as a writing assistant in academia through a systematic literature review of the 30 most relevant articles. Since its release in November 2022, ChatGPT has become the most debated topic among scholars and is also being used by many users from different fields. Many articles, reviews, blogs, and opinion essays have been published in which the potential role of ChatGPT as a writing assistant is discussed. For this systematic review, 550 articles published six months after ChatGPT's release (December 2022 to May 2023) were collected based on specific keywords, and the final 30 most relevant articles were finalized through PRISMA flowchart. The analyzed literature identifies different opinions and scenarios associated with using ChatGPT as a writing assistant and how to interact with it. Findings show that artificial intelligence (AI) in education is a part of the ongoing development process, and its latest chatbot, ChatGPT is a part of it. Therefore, the education process, particularly academic writing, has both opportunities and challenges in adopting ChatGPT as a writing assistant. The need is to understand its role as an aid and facilitator for both the learners and instructors, as chatbots are relatively beneficial devices to facilitate, create ease and support the academic process. However, academia should revisit and update students' and teachers' training, policies, and assessment ways in writing courses for academic integrity and originality, like plagiarism issues, AI-generated assignments, online/home-based exams, and auto-correction challenges.

Keywords: AI in education, chatbots, ChatGPT as writing assistant, scientific writing, academic integrity

INTRODUCTION

The introduction of ChatGPT in academia is the most debated topic nowadays due to its striking features for academic writing, long essays, short stories, poems, and even letters (Dergaa et al., 2023). Thus, this study aims to discuss prospective use of ChatGPT in writing programs at higher education levels and the future of teaching writing skills in classrooms. Since its launch in November 2022, ChatGPT received huge success in January 2023, and it became one of the fastest and most highly welcomed artificial intelligence (AI) technological tools by open-AI, with more than 100 million active users just in two months (Williams, 2023). Generative pretrained transformer (GPT), its technology, and capabilities work underlying ChatGPT technology that has revolutionized traditional learning and writing ways. ChatGPT, being an open-access and public tool, is a highly sophisticated chatbot that works according to GPT language model technology (Kirmani, 2022, p. 574).

Over the past two decades, artificial intelligence and education (AIED) research mostly focused on learner-supporting AI technologies that aim to make learners independent and automate teacher functions (Afzaal et al., 2022). The connection between AI and education is based on the solution to many core problems the education sector is facing, such as the lack of qualified teachers, virtual assistance, and the growing and under-achievement gap among rich, poor and mediocre learners (Holmes et al., 2022; Imran & Almusharraf, 2023). However, this connection raises further queries about the purpose of using AI in education, how it is being used, at what levels (e.g., individual, collective, or transnational), where and by whom, and finally, how it works within the educational system. Due to the recent developments in various applications for different disciplines, AI systems can simulate the human brain and accomplish daily tasks carrying out large amounts of data. For example, intelligent tutoring systems (ITS) can be used as a model to simulate ono-to-one personal tutoring (Lo, 2023). In a meta-analysis-based study of the effectiveness of ITS on college learners' academic performance, Steenbergen-Hu and Cooper (2014) concluded that ITS has a moderately positive impact on college students' academic achievement. Similarly, learning analytics (LA) is another AI educational technology that provides actionable feedback for both students and teachers. Individuals can use it for their own learning progress assessment, whereas teachers can use it on a regular basis to assess learners' progress and efforts to provide rigorous, actionable feedback (Greller & Drachsler, 2012).

However, this current study is set to contribute to the state-of-art of ChatGPT in teaching and learning as a writing assistant by presenting a systematic literature review. In addition, this study will examine the gaps and so-far unexplored areas of this chatbot, such as the adaptation of ChatGPT as a writing assistant to learners and teachers, assessment scenarios, pedagogical roles, and ethical considerations like plagiarism and real data citations. This study is structured in five sections: first, the background of the study, where authors discuss the context of the study. In the second section, the authors review the related works and a comprehensive introduction to ChatGPT as a writing assistant, followed by an explanation of the research methodology applied in section three. Section four will present results, and finally, the last section will discuss findings and future research directions in using AI tools in education, particularly in writing courses, and the conclusion.

CHATGPT AND RELATED WORKS

Open-AI's latest development in introducing conversational chatbots, ChatGPT-3.5 and ChatGPT-4, has made it easier for teachers and learners to apply AI technologies in teaching and learning (Taecharungroj, 2023). However, the release of ChatGPT has revolutionized the tools and applications used for writing. In comparison with already available chatbots, this latest ChatGPT by open-AI is more efficient in text generation, particularly for long essays and creative writings, and has the most striking ability to produce a human-like performance for various academic and professional tasks (Rasul et al., 2023; Suaverdez & Suaverdez, 2023).

Use of ChatGPT as a Writing Assistant

This chatbot can accomplish a wider range of tasks such as writing, answering questions, coding, and individual and collaborative guiding through discussions about productivity (Lund & Wang, 2023). ChatGPT completes these tasks by leveraging its efficient design and extensive data stores to comprehend and interpret the input commands by users' requests and generate appropriate answers. It has the capacity to provide examples related to the asked queries from any subject. It can provide answers, remember the context of an earlier conversation and follow-up corrections, and is further trained to accept or decline requests. However, its official page also displays some limitations that may encounter during its use, such as the unavailability of some latest information, especially after September 2021, which may produce biased and harmful content, and the information generated may be incorrect (Barrot, 2023; Ray, 2023).

Academic and scientific discussions globally show that ChatGPT can play a very significant role in writing assistance in accomplishing writing tasks in a versatile way (Sallam, 2023). The study of literature published on ChatGPT's role in writing tasks can be summarized as ChatGPT is a complete package from ideas generation to final proofreading and editing of writing material. For more ChatGPT's writing functions, the following five points are summarized from the selected published journal articles, blogs, and web essays. These points would help in understanding its use in writing as an assistant and AI tool.

1. **Increased efficiency:** ChatGPT's invention can reduce the time and effort required to generate written content. With its ability to generate coherent and well-structured text on any topic, students and educators can save time and focus on other aspects of their work (Lund et al., 2023; Yan, 2023).
2. **Idea generation:** ChatGPT can help students generate new ideas for their writing assignments by suggesting topics, themes, and perspectives that they might not have considered otherwise (Kasneci et al., 2023; Taecharungroj, 2023).
3. **Language translation:** ChatGPT can translate text from one language to another, which can be useful for students who are writing papers in a language that is not their native tongue. This can help students ensure that their writing is accurate and grammatically correct (Lametti, 2022; Lund & Wang, 2023; Stock, 2023).
4. **More accurate and consistent content:** With the ChatGPT invention, there is a higher likelihood of producing accurate and consistent content. ChatGPT has access to vast information, making identifying and eliminating errors easier (Stacey, 2022).
5. **Improved collaboration:** ChatGPT can also facilitate collaboration among students and educators. Using AI to generate content allows multiple people to work on a project simultaneously, allowing for more efficient collaboration. ChatGPT can proofread and edit student writing by suggesting corrections for grammar, syntax, and spelling errors. This can help students improve the quality of their writing and reduce errors (Geher, 2023; Holmes et at., 2022; McMurtrie, 2022).

Related Works

AI systems and chatbots are promising advancement in technology that has the potential to increase work pace and efficiency in daily routine (Cotton et al., 2023). In terms of usability and accessibility of ChatGPT, this AI technology provides unique features and possibilities, such as tools for communication, writing tasks, search engines, and customized information providers. According to Firat (2023), ChatGPT, including other AI technologies, significantly impact students' academic performance and can potentially revolutionize traditional learning practices, foster soft skills development and promote personalized learning experiences. Lametti (2022), in *AI could be great for college essays,* discusses that ChatGPT, the latest AI chatbot, would not kill the college essay. Lametti further describes that teachers and learners should enjoy working with this new technology and take chatting with ChatGPT as fun. This AI technology does not harm writing classes because it would not replace flesh and blood authors.

In an interview with Professor Selber, who teaches English at Pennsylvania State University, Stacey (2022) concludes Selber's remarks as "cheating on your college essay with ChatGPT will not get you good grades; however, AI could make education fairer" (p. 1). There would be no down in higher education because, like the discussions on the use of ChatGPT in academia, every year or two, "there is something that is ostensibly going to take down higher education as we know it. So far, that has not happened" (p. 3). Selber further stated that being an English language professor, he is not afraid and worried about including and developing literary technologies in the higher education system. It would rather make the education process smoother and more easygoing. Similar debates were circulated a couple of decades ago about the internet, online study tools, Wikipedia, etc. globally, but these tools are now part and parcel of daily academic activities without any threats.

Few other scholars (Kung et al., 2023; Manohar & Prasad, 2023; Transformer & Zhavoronkov, 2022) have also recognized ChatGPT as a powerful writing assistant and added it as a co-author in their research articles. However, according to Stokel-Walker (2023) and Thorp (2023), this idea is disapproved by many scholars to list ChatGPT as a co-author and writing assistant in academic works, particularly research items. Undoubtedly, AI technology and tools have greatly advanced in recent times and revolutionized how academic and scientific writings work; however, there is a dire need to understand that AI-generated writing will never replace human writing. There are many ethical issues, such as plagiarism and authentic data utilization, and the accuracy of writing products is still questionable. Therefore, the present study provides a complete review of ChatGPT's understanding as a writing assistant for learners and teachers.

Table 1. Keywords used as search sting for literature identification

Database	Keywords related to AI & ChatGPT used
Scopus 208	TITLE-ABS-KEY ((chatgpt OR gpt) AND (writing assistant OR future of writing) OR (AI in education OR AI for writing) OR (writing with chatgpt) OR (AI future of writing) OR (writing tools OR writing application*) OR (chatbot*)) AND (LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR, 2023))
WoS	TS=((“ChatGPT” OR “Artificial Intelligence writing tools” OR “AI writing assistant” AND “ChatGPT as coauthor OR “Writing with ChatGPT” OR “AI future of writing” AND “chatbots” OR “GPT-4” OR “AI systems”))
PubMed	ChatGPT*, chatbots*, writing assistant*, AI in education*
Science Direct	ChatGPT AND writing assistant AND future of scientific writing AND AI in education

Table 2. Search strings used during the screening process

Criteria	Eligibility	Exclusion
Duplication	One publication from any one selected database is taken	All publications with the same authors, collected from various databases, were excluded
Timeline	After October 2022	< November 2022
Working language	Published in the English language	Not published in the English language
Literature type	Journal articles, review articles, & conference papers	Blogs, unauthentic essays, preprints, editorials, book chapters, & books

METHODOLOGY

This section discusses the details of methods employed to retrieve the published articles related to AI technology and tools in education, specifically ChatGPT as a writing assistant for writing tasks. This systematic review is conducted through preferred reporting items for systematic review and meta-analysis (PRISMA) as a guide (Liberati et al., 2014). The study was started from identifying and finding literature on AI technologies and tools practiced at educational institutions for academic and scientific writings. For this process, leading databases, Scopus, Science Direct, PubMed, and Web of Science (WoS), were systematically used to review literature in four stages: identification, screening, eligibility, and inclusion.

Throughout this systematic review, PRISMA is followed as a guide because it is commonly used in educational research projects due to its three advantages. First, it helps examine a large database of research articles and other literature. Second, it clearly addresses research questions for a smooth, systematic research process, and finally, it makes the researcher able to identify the inclusion and exclusion criteria for related literature (Ramalingam et al., 2022). For resources, this study relied on four major databases, Scopus, Web of Science, Science Direct, and PubMed, and to make it more rigorous, PRISMA guidance was employed in the collected literature to identify ChatGPT as a writing assistant practice used in the learning institutions.

The procedure for systematic literature review searching strategies on ChatGPT and its role in writing tasks has been divided into four primary stages. First, the identification of relevant literature was made, where certain keywords were used as a search string for the systematic review process. These keywords were developed keeping a view of the topic and research questions related to AI in education, ChatGPT, and higher education, ChatGPT and its opportunities and challenges, and AI and the future of writing in higher education (see **Table 1** for more details). Moreover, Boolean search operators, ‘AND,’ ‘OR,’ and ‘NOT,’ were used to create very broad and narrow findings with keywords (Uegaki, 2022). 550 articles were identified and retrieved from the four major databases.

Screening process was done to check and remove duplicate publications from the selected databases, and 25 duplicate publications were excluded from 550 initially collected documents. Moreover, 321 documents that did not meet the criteria were excluded, such as publications before November 2022, non-English publications, and articles that did not deal with the determined keywords. Therefore, the studies only related to ChatGPT and other AI tools, which were helpful in writing tasks were selected for further eligibility process.

After the screening, only 204 documents were selected for the eligibility test so that it could be determined through a rigorous examination of the titles, abstracts, keywords, and major contents to double-check the inclusion criteria, as mentioned in **Table 2**. So, during this eligibility stage, 174 more documents were excluded because their abstracts and main contents did not meet the research objectives and were not related to ChatGPT and AI as writing assistant context. Finally, 30 most relevant articles were considered eligible for further examination and analysis.

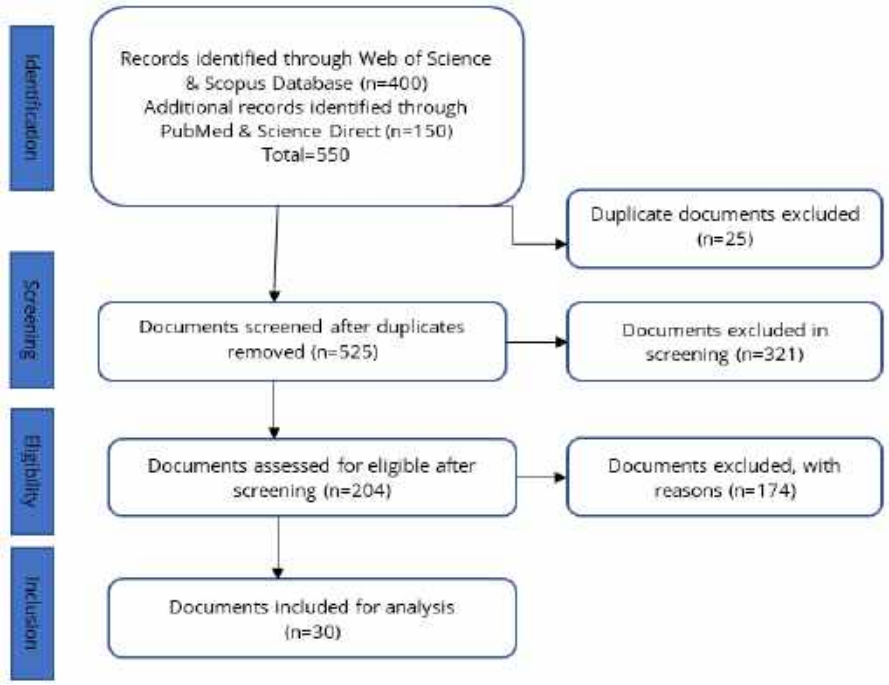

Figure 1. PRISMA flow chart (adapted from Liberati et al., 2014)

In the final round of inclusion, 30 documents were included that fulfilled the criterion of this systematic review. Irrelevant and non-supporting literature to the objectives of this study was excluded, such as published before November 2022, non-English, non-indexed journal publications in WoS and Scopus, preprints, general studies on ChatGPT that did not deal with writing issues, and book chapters. This whole process is illustrated in **Figure 1**. This process strictly followed the PRISMA guidelines to ensure the selection of high-quality and reliable data for this study.

DATA ANALYSIS AND FINDINGS

General Findings

Through PRISMA flow chart, thirty articles were analyzed based on the primary search keywords: ChatGPT and AI in education, ChatGPT as a writing assistant, ChatGPT and the future of writing, and AI and scientific writing. This section analyzed the background information of these thirty selected documents, including countries, journals, citations, and subject areas. **Figure 2** shows that most literature related to ChatGPT and

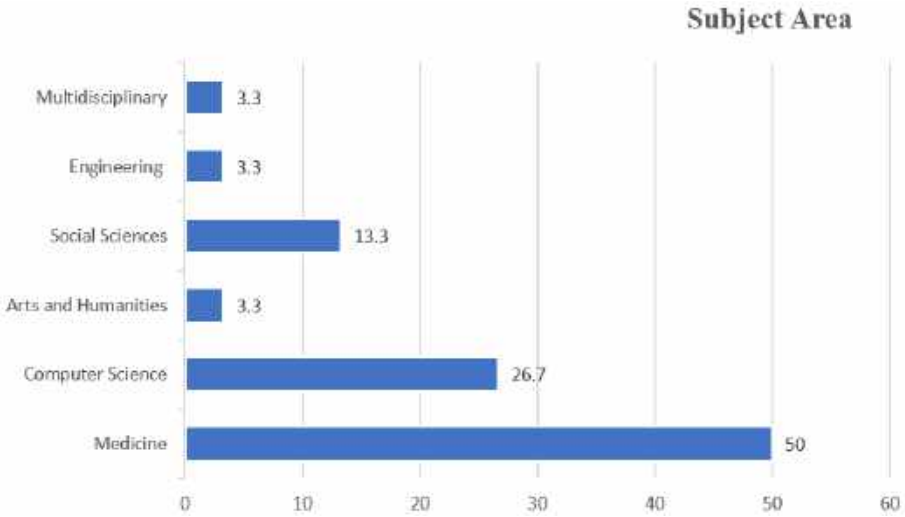

Figure 2. Subject-areas-wise distribution of selected articles (Source: Authors, based on the data collected from Scopus, Web of Science, Science Direct and PubMed databases)

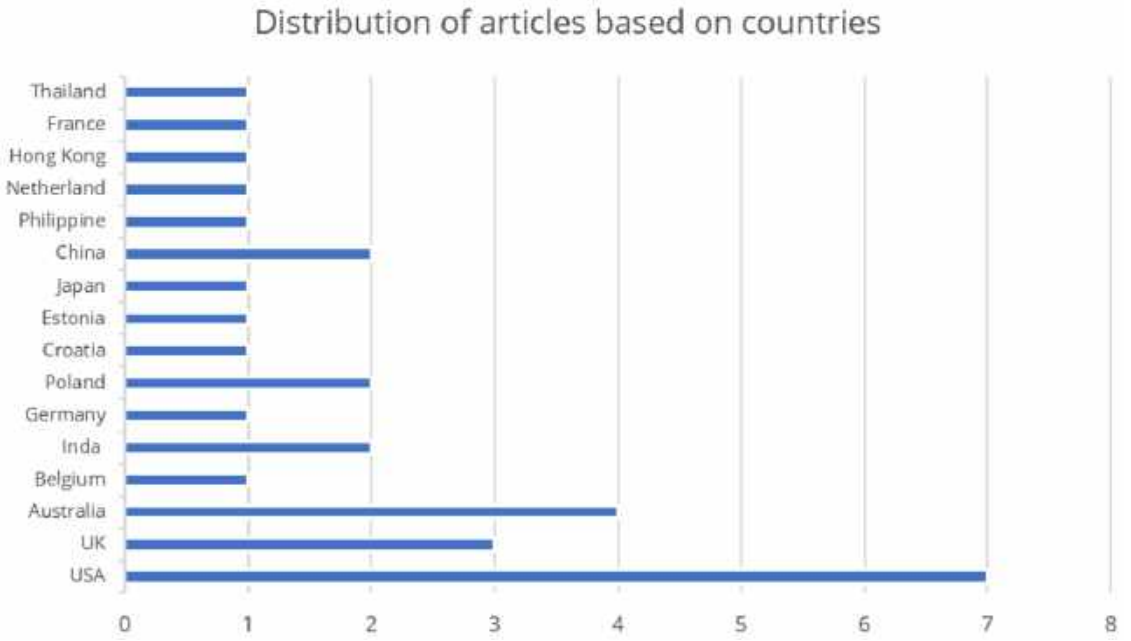

Figure 3. Distribution of selected articles based on their origin of corresponding authors (Source: Authors, based on the data collected from Scopus, Web of Science, Science Direct and PubMed databases)

writing themes were published in medical journals. However, multidisciplinary, humanities, and engineering-related journals had the least number of related documents on ChatGPT and its role in writing tasks.

Moreover, the selected documents were also analyzed based on their area of origin. The scholars in the USA produced more articles than other countries in disseminating the debate on ChatGPT and writing issues. UK and Australia were also among other countries that contributed to studies on ChatGPT as a writing assistant and an AI tool-related theme. However, authors of various publications from different countries have observed and highlighted that ChatGPT and its role as a writing tool/assistant received attention worldwide (**Figure 3**).

It was very interesting to observe that during screening and securitizing documents from various databases, many publications, including articles, reviews, comments, editorials, preprints, letters to editors, essays, and blogs, were identified based on search strings mentioned in **Table 1**. But most articles appeared in medical journals, and only a few relevant and high-quality articles were published in arts and humanities and social sciences-related journals. To maintain the quality of the selected literature, titles of the documents, journal names, publication years, and citations were collected carefully and presented in **Table 3**.

Table 3. Documents reviewed based on journals, titles, & citations

No	Article title	Journal	Year	Citations*
1	From human writing to artificial intelligence generated text: Examining the prospects and potential threats of ChatGPT in academic writing	Biology of Sport	2023	8
2	What is the impact of ChatGPT on education? A rapid review of the literature	Education Sciences	2023	14
3	ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the ethics of the large language models in scholarly publishing	Journal of the Association for Information Science and Technology	2023	24
4	Impact of ChatGPT on learners in a L2 writing practicum: An exploratory investigation	Education and Information Technologies	2023	4
5	"So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges, and implications of generative conversational AI for research, practice, and policy	International Journal of Information Management	2023	89
6	Detecting AI-generated essays: The ChatGPT challenge	The International Journal of Information and Learning Technology	2023	0

Table 3 (Continued). Documents reviewed based on journals, titles, & citations

No	Article title	Journal	Year	Citations*
7	Examining science education in ChatGPT: An exploratory study of generative artificial intelligence	Journal of Science Education and Technology	2023	18
8	ChatGPT and publication ethics	Archives of Medical Research	2023	7
9	Chatting and cheating: Ensuring academic integrity in the era of ChatGPT	Innovations in Education and Teaching International	2023	79
10	ChatGPT: Five priorities for research	Nature	2023	234
11	Can artificial intelligence help for scientific writing?	Critical care	2023	54
12	Comparing scientific abstracts generated by ChatGPT to real abstracts with detectors and blinded human reviewers	NPJ Digital Medicine	2023	2
13	The death of the short-form physics essay in the coming AI revolution	Physics Education	2023	13
14	What can ChatGPT do?" Analyzing early reactions to the innovative AI chatbot on Twitter	Big Data and Cognitive Computing	2023	36
15	Welcome to the era of ChatGPT et al.: The prospects of large language models	Business & Information Systems Engineering	2023	10
16	Opportunities and risks of ChatGPT in medicine, science, and academic publishing: A modern Promethean dilemma	Croatian Medical Journal	2023	14
17	ChatGPT for language teaching and learning	RELC Journal	2023	5
18	Artificial intelligence-based text generators in hepatology: ChatGPT is just the beginning	Hepatology Communications	2023	4
19	ChatGPT: When artificial intelligence replaces the rheumatologist in medical writing	Annals of the Rheumatic Diseases	2023	2
20	Using ChatGPT for second language writing: Pitfalls & potentials	Assessing Writing	2023	0
21	The role of ChatGPT in scientific communication: Writing better scientific review articles	American Journal of Cancer Research	2023	1
22	A comparison of ChatGPT-generated articles with human-written articles	Skeletal Radiology	2023	1
23	Artificial intelligence in scientific writing: A friend or a foe?	Reproductive BioMedicine Online	2023	1
24	ChatGPT in scientific writing: A cautionary tale	The American Journal of Medicine	2023	7
25	Is ChatGPT a valid author?	Nurse Education in Practice	2023	9
26	A ghostwriter for the masses: ChatGPT and the future of writing	Annals of Surgical Oncology	2023	1
27	The rise of AI coauthors: Navigating the future of scientific writing with ChatGPT	Journal of Neurosurgery	2023	0
28	To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology	Interactive Learning Environments	2023	1
29	ChatGPT: Systematic review, applications, and agenda for multidisciplinary research	Journal of Chinese Economic and Business Studies	2023	0
30	The future of ChatGPT in academic research and publishing: A commentary for clinical and translational medicine	Clinical and Translational Medicine	2023	7

Note. *Citations are based on Google Scholar data retrieved on June 5, 2023

Main Findings

ChatGPT is used as a writing tool/assistant in different subject areas, and authors have highlighted its role in creative, academic, and scientific writing as a facilitator and author. Most noticeable statements collected during this systematic review show that how authors from almost all subjects realized role of open-AI's ChatGPT as a writing assistant and writing tool for academic and scientific writing purposes.

Table 4 shows a list of main statements discussed ChatGPT as a writing tool, capability examination, and focused subject areas.

Table 4. Findings of the systematic review of selected documents

Capability examined	Main statements	Subject area
Academic writing/application	"AI chatbots may be able to generate research questions and hypotheses, develop methodology, create experiments' research protocols, analyze and interpret data, and write manuscripts" (Dergaa et al., 2023, p. 620).	Medicine/artificial intelligence
L2 writing/research	"In the study, participants generally showed more concern rather than satisfaction towards the unrestricted application of ChatGPT in L2 writing" (Yan, 2023, p. 18).	Education/information technology

Table 4 (Continued). Findings of the systematic review of selected documents

Capability examined	Main statements	Subject area
Research/writing	"ChatGPT undoubtedly is among the most transformative AI tools developed in recent years" (Dwivedi et al., 2023, p. 57).	Information technology/ management
Assessment/writing	"Ability to detect AI-generated essays is getting increasingly important as use of AI in text generation continues to grow" (Cingillioglu, 2023, p. 266).	Learning/information technology
Writing assistant	"ChatGPT can significantly enhance both the efficiency and the quality of writing review articles for scientists" (Huang & Tan, 2023, p. 1153).	Science/digital learning
Writing assistant/ research tool	It is important for educators to model responsible use of ChatGPT, prioritize critical thinking, and be clear about expectations. ChatGPT is likely to be a useful tool for educators designing science units, rubrics, and quizzes" (Cooper, 2023, p. 444).	Digital technologies/ STEM learning
Research ethics/ writing assistant	"ChatGPT can generate high-quality, plausible, human-like written responses. It can also generate statistical analyses, lyrics, computer programs, and abstracts or introductions to scientific articles" (Rahimi & Abadi, 2023, p. 272).	Medicine/information technologies
Writing/assessment	"... a wake-up call to university staff to think very carefully about the design of their assessments and ways to ensure that academic dishonesty is clearly explained to students and minimized" (Cotton et al., 2023, p. 9).	Education/teaching
Writing/ assessment/ game-changer	"Conversational AI is likely to revolutionize research practices and publishing, creating both opportunities and concerns" (Van Dis et al., 2023. p. 224).	Multidisciplinary
Writing assistant	"ChatGPT is an AI software potentially able to assist in the writing process of a scientific paper and can help in the literature review, identify research questions, provide an overview of the current state of the field, and assist with tasks, such as formatting and language review" (Salvagno et al., 2023, p. 4).	Medicine/information technologies
Application/writings /assessment	"There is an urgent need to determine if ChatGPT can write convincing medical research abstracts" (Gao et al., 2023, p. 1).	Medicine/digital learning
Writing tool/ assessment/editing	"... current natural language processing AI represent a significant threat to the fidelity of short-form essays as an assessment method in physics courses" (Yeadon et al., 2023, p. 1).	Natural science/education
Reactions/writing tool	"The potential positive and negative impacts of ChatGPT are immediate and wide-ranging, emphasizing the necessity for a comprehensive examination and collective formation of ethical guidelines for its use in all fields" (Taecharungroj, 2023. p. 8).	Computer science/social science
Alternate/writing tool	"For AI to realize its full potential in medicine and science, we should not implement it hastily but advocate its mindful introduction and an open debate about the risks and benefits" (Homolak, 2023, p. 2).	Medicine/education
Affordances of writing tools/ technology review	"ChatGPT is a versatile and valuable tool with significant potential to promote engaging and adaptive language learning" (Kohnke et al., 2023, p. 11).	Language teaching/learning
AI technology background/ writing	"Due to the phenomenon of hallucinations, ChatGPT users must carefully proofread output to ensure that they are accurate and ready for use" (Ge & Lai, 2023, p. 9).	Medicine/information technology
Practice/writing assistant	"AI is already used in medicine, especially in image analysis, but the domains are infinite, and it is possible that AI could quickly help or replace rheumatologists in the writing of scientific articles" (Verhoeven et al., 2023, p. 1).	Medicine/education
Writing assistant	"ChatGPT is able to generate coherent research articles, which on initial review may closely resemble authentic articles published by academic researchers" (Ariyaratne, 2023, p. 1).	Education/training
Understanding AIs/ reasoning/ writing	"When using ChatGPT in scientific writing, we want to highlight that if papers are not properly revised, there is a high risk of presenting incorrect information and non-existent references, especially among writers without domain expertise in the topic" (Altmäe et al., 2023, p. 6).	Education/training

In this systematic review, the role of ChatGPT as a writing assistant has been analyzed as an AI tool based on the generative pre-trained transformer (GPT) that could work/assist as a powerful tool in academic and scientific writing.

However, Altmae et al. (2023) are of the view that ChatGPT is an advanced AI tool, and researchers should use it very carefully by considering its pros and cons. This is the beginning of the diverse and dynamic age of AI inclusion in education and learning, where such free-to-use tools continue to become the reality of everyday activities. It is too early to decide; ChatGPT is a friend or foe for writing activities; it depends on the users and their training to accept and work with AI technologies. Moreover, Altmae et al. (2023) shared their personal experience using ChatGPT as a writing assistant for scientific writing and found it a very helpful, convenient, and user-friendly tool. Similarly, Suaverdez and Suaverdez (2023) discussed AI-supported chatbots' impact on academic writing by quoting opportunities and challenges. They also tested a few chatbots like ChatGPT, Google Bard, and the generative AI for mapping their human-like responses in academic writing; however, despite their benefits, these chatbots have challenges of lack of originality, inaccuracies, too generalized responses, and poor logic flow in writing prompts.

The studies by Alattar and McDowell (2023) and Zimmerman (2023) assessed the significance and efficiency of AI chatbots, particularly ChatGPT, in the future of scientific writing in the medicinal sciences. Zimmerman (2023) evaluated the prospective role of ChatGPT as a genuine writer or a ghostwriter through a detailed analysis of AI and natural language processing (NLP) systems and concluded that the best way to familiarize and get used to these platforms is to use this chatbot like other educational software and gadgets regularly. However, this study concluded that AI tools still have certain limitations, especially for medical practitioners to get deeply involved in AI technologies for responsible uses in medical affairs. To advance the use of AI tools in scientific writing, Alattar and McDowell (2023) navigated the use of ChatGPT as a rising AI co-author in various projects such as they believed that in the near future, most of the writing tasks would be accomplished by these AI tools. Therefore, getting familiar with these AI technologies is necessary by keeping an eye on both benefits and drawbacks.

In the beginning, a few manuscripts, such as Kung et al. (2023), Manohar and Prasad (2023), O'Connor and ChatGPT (2023), and Transformer and Zhavoronkov (2022), appeared with ChatGPT as a co-author because this AI chatbot has taken the world by storm and received huge appreciated and acknowledgment in the very start of its debut in the scientific literature. However, after that, a huge debate across academia and publishing houses started, where publishers, editors, and researchers questioned the adoption of AI as a co-author instead of taking it as any other writing tool or AI technology. After this debate, almost all publishers and journals introduced their policies about the status of ChatGPT as a co-author or facilitator (Stokel-Walker, 2022).

Moreover, da Silva (2023) raised a similar question about the authorship of AI tools, saying, "is ChatGPT a valid author?" and asked many questions from the authors who adopted ChatGPT as their co-author in scientific publications. Besides, da Silva (2023) also analyzed AI-generated passages and found them very causal and suspected to be plagiarized from actual sources with minor paraphrasing. Therefore, ChatGPT is not considered much successful in providing any authentic and pertinent literature. The same issue Zheng and Zhan (2023) discussed when they observed the role of ChatGPT in academic and scientific writing and highlighted serious concerns. According to the findings of the studies mentioned above, the increasing impact and use of AI tools like ChatGPT in research and scientific writing pose an immediate and unprecedented challenge to academic writing and scientific publishing. No regulations, rules, or guidelines are currently available about its use and issues related to plagiarism, copyright, authorship, and attribution for the text generated by ChatGPT and other AI tools.

DISCUSSION

This systematic review analyzed literature published on ChatGPT and its role in various writing tasks, including essays, scientific and scholarly articles, editorials, and creative writings. Therefore, through an extensive literature review, this study has brought together almost all of the published literature that deals with the implications and applications of ChatGPT as a writing assistant and its role in the future of academic and scientific writing tasks.

This study has presented a classification of search string keywords in **Table 1** and selected literature for systematic review based on their subject areas, capabilities examined, and main statements (**Table 4**) and linked ChatGPT with writing issues. Despite ChatGPT's significant potential and application in various

departments and industries, the present systematic literature review only focused on the application of ChatGPT for writing purposes. The findings reveal that more academic integration and exploration into scientific writing for ChatGPT's ethical implication in writing tasks is needed. Moreover, this systematic review highlights a significant research gap in the utilization and ability of AI chatbots and other technologies, including ChatGPT, to tackle machine learning tasks in an efficient way. Based on the findings, the authors have identified ChatGPT's use in writing tasks in the following three perspectives.

ChatGPT as a Co-Author

The idea of inclusion of ChatGPT as a co-author has been disapproved by the academic community (see Stokel-Walker, 2022 and Thorp, 2023), as a few earlier publications at the end of 2022 and the start of 2023 included ChatGPT as a co-author (see Kung et al., 2023; Manohar & Prasad, 2023; Transformer & Zhavoronkov, 2022) in their research publications. The findings gleaned from the literature reviewed and analysis suggest that ChatGPT can proffer, identify and collect data for research purposes to facilitate prospective researchers' work in getting relevant resources. However, this study found that text generated by this AI chatbot and proposed searched material, including references and other publication feathers like authors' names and DOIs, contain errors. No one can mindlessly rely on the results produced and suggestions made. Even ChatGPT accepted those errors, expressed regret for them, and tried to produce similar results (Roumeliotis & Tselikas, 2023).

ChatGPT as a Writing Assistant

The most impressive role of ChatGPT, according to the reviewed literature, is its use as a writing tool and writing assistant. More than 70% (**Table 4**) of the main statements from selected literature for this systematic review highlighted this aspect. In (Dergaa et al. 2023; Dwivedi et al., 2023; Lund, 2023), the authors carried out studies to verify the use of ChatGPT in scientific writings to judge its content's quality, reliability, and comparative analysis with human-generated content. These studies further investigated AI-generated content and pointed out significant differences between ChatGPT and human-generated writings, such as ChatGPT has the ability to produce concise abstracts, introductory passages, and literature sections. However, ChatGPT produced limited responses compared to human content and concluded that both writings differed significantly. Like humans, ChatGPT cannot produce the latest information as current ChatGPT-4 can only produce information from a limited time frame, like before September 2021. Therefore, the content it creates lacks the latest information and references, whereas humans can add anything based on their knowledge and requirements because humans do not face such restrictions.

ChatGPT and Future of Writing

This study has also covered the literature dealing with opportunities and challenges that the education sector will face due to the advanced AI technologies and their extensive use in writing tasks in the future. In (Alattar & McDowell, 2023; Biswas, 2023; Wen & Wang, 2023; Zimmerman, 2023), the authors analyzed the future application of AI tools for writing purposes; however, these tools have limited output currently. The finding from the literature reviewed systematically highlights that the development of AI technologies like ChatGPT can impact future writing tasks potentially.

ChatGPT's best use would be strengthened as an assistant for researchers, teachers, and students to use it as a collaborative tool for receiving feedback, customizing search results, seeking suggestions, and identifying ethical and academic integrity considerations in the future. Moreover, like other language correction tools such as Grammarly and Quill Bot, ChatGPT can also work as a writing support and feedback tool that will help to identify advanced grammar and syntax issues, suggestions for writing structure improvement, and coherence of the prompts. The major findings of this study conclude that ChatGPT can offer significant assistance in generating text, initial drafts, brainstorming ideas, and summaries of the literature, but it cannot replace or be considered like a human writer in various skills and knowledge.

In summarizing the discussion, in this scientifically advanced era, no one can deny the importance of AI and its technologies that are making miracles in every field; a similar case is with ChatGPT. However, it has its benefits and drawbacks in accomplishing various tasks. Notably, ChatGPT's role in the fields of writing, research, and education can increase productivity and enhance efficiency. Ultimately, development in AI

technologies, including ChatGPT, can potentially revolutionize and challenge the existing writing techniques and domains and can have both challenges and opportunities, ranging from positive to negative aspects.

CONCLUSIONS

This systematic review has shed light on the significant role of AI chatbot, ChatGPT as a writing assistant in different subjects. The analysis and findings show that the launch of the ChatGPT represents a new era of unlimited miracles in science, technology, and education. Among thirty selected studies, most of them have supported ChatGPT as an advanced AI generative model that can produce good responses to users' queries; however, no one can 100% rely on its responses due to various technical errors and the unavailability of the latest information, due to rapidly expanding AI technology, scholars from across the world working on various aspects of its use and utility. Therefore, the present study provides a comprehensive overview of the literature published in the last six months, particularly regarding ChatGPT's role as a writing assistant in different subjects. Moreover, the authors have systematically extracted and presented data into figures and tables to understand its role in academic and scholarly writing tasks. This study fills the gap by offering a detailed finding and discussion on the challenges and opportunities of ChatGPT's role as a facilitator and assistant for current and future wirings tasks.

The need is to understand ChatGPT's role as an aid and facilitator for both the learners and instructors, as chatbots are relatively beneficial devices to facilitate, create ease and support the academic process. However, academia should revisit and update students' and teachers' training, policy, and assessment ways in writing courses for academic integrity and originality, like plagiarism issues, AI-generated assignments, online/home-based exams, and auto-correction challenges. Overall, this study suggests further areas of research in AI tools and chatbots to enhance existing technology, techniques, and knowledge. Being the first systematic review on ChatGPT's role as a writing assistant, this study recommends that researchers, teachers, and students can not only rely on ChatGPT for writing tasks; human control should be integrated with it for maximum utilization of this AI tool.

Limitations

A few limitations are associated with this systematic literature review about ChatGPT's role as a writing assistant at the higher education level. First, this study only covers the existing literature on ChatGPT's role as a writing assistant at the higher education level, and all other functions and uses are not discussed in this study. Secondly, the quality and depth of the literature reviewed may vary, potentially affecting the robustness and generalizability of the findings of this study. Moreover, the rapidly evolving nature of NLP technologies, like ChatGPT, means that the literature available at the time of the study may not fully capture the advancement and most recent developments in this field. Finally, the primary focus of this study on higher education settings might limit the transferability of the findings to other educational contexts. This study provides valuable insights into ChatGPT's role as a writing assistant; therefore, these limitations should be taken into consideration when interpreting the findings.

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