ChatGPT in Teaching and Learning: A Systematic Review

Duha Ali 1, Yasin Fatemi 2, Elahe Boskabadi 3, Mohsen Nikfar 2, Jude Ugwuoke 4* and Haneen Ali 5,*

1 Department of Industrial and Manufacturing Engineering, California Polytechnic State University—San Luis Obispo, San Luis Obispo, CA 93407, USA; duali@calpoly.edu
2 Department of Industrial and Systems Engineering, Auburn University, Auburn, AL 36849, USA; yzf0024@auburn.edu (Y.F.); mzn0042@auburn.edu (M.N.)
3 Department of Economics, Le Moyne College, Syracuse, NY 13214, USA; boskabe@lemoyne.edu
4 Department of Political Science, Auburn University, Auburn, AL 36849, USA; jcu0005@auburn.edu
5 Health Services Administration Program, Department of Industrial and Systems Engineering, Auburn University, Auburn, AL 36849, USA
* Correspondence: hba0007@auburn.edu

Abstract: The increasing use of artificial intelligence (AI) in education has raised questions about the implications of ChatGPT for teaching and learning. A systematic literature review was conducted to answer these questions, analyzing 112 scholarly articles to identify the potential benefits and challenges related to ChatGPT use in educational settings. The selection process was thorough to ensure a comprehensive analysis of the current academic discourse on AI tools in education. Our research sheds light on the significant impact of ChatGPT on improving student engagement and accessibility and the critical issues that need to be considered, including concerns about the quality and bias of generated responses, the risk of plagiarism, and the authenticity of educational content. The study aims to summarize the utilizations of ChatGPT in teaching and learning by addressing the identified benefits and challenges through targeted strategies. The authors outlined some recommendations that will ensure that the integration of ChatGPT into educational frameworks enhances learning outcomes while safeguarding academic standards.

Keywords: ChatGPT; education; student engagement; plagiarism; bias; academia

1. Introduction

ChatGPT is a generative artificial intelligence model developed by OpenAI. Since its launch at the end of 2022, it has rapidly become a prominent technological phenomenon, especially in education. Research by Lozano and Fontao, 2023 and Waltzer et al., 2023 has demonstrated the ability of ChatGPT to engage in human-like conversations across various topics, a feature that has revolutionized interactive learning [1,2]. As highlighted by Van Slyke et al., 2023, ChatGPT’s capacity for interactive learning and practical applications underscores its significant impact on educational methodologies [3]. Other studies have emphasized its expansive training dataset, which enables the model to provide comprehensive and coherent responses, enhancing its utility in educational settings [4].

Beyond providing conventional educational assistance, ChatGPT has been the subject of multiple studies focusing on its multifaceted applications in learning environments [3,4]. Its rapid adoption across various fields reflects its versatile application potential [3,5,6]. The model’s ability to process and generate human-like text responses makes it an innovative tool for use in professional settings and diverse educational landscapes. In this context, different authors pointed out that ChatGPT can facilitate teaching and learning by generating quizzes, designing assessment, generating summaries, and translating complex terminologies, illustrating its multifunctional nature and far-reaching impact [4–9].

The integration of ChatGPT into academic settings signifies a major shift in the educational technology landscape [2]. Some studies have highlighted ChatGPT’s ability to...
redefine learning experiences through its advanced natural language processing capabilities, fostering a level of student engagement that mimics that via human interaction [10,11]. Similarly, Lozano and Fontao, 2023 and Yan et al., 2023 emphasized ChatGPT’s ability to enhance communication within educational environments [1,10].

Building on these foundational changes, ChatGPT’s academic applications are vast and varied. Research by Yan et al., 2023 on technology-enhanced language learning showcased ChatGPT as a powerful tool for language acquisition, providing interactive and responsive support to learners [10]. Additionally, other authors investigated its ability to personalize educational content, tailoring learning experiences to individual student needs [11–14]. ChatGPT facilitates automated grading and intelligent tutoring, aids educational content creation, and improves accessibility to support diverse learning needs. This transformative potential of ChatGPT in education can make learning more accessible, engaging, and effective. Moreover, ChatGPT can also be used as a student virtual assistant [15,16]. In this capacity, ChatGPT serves as a helpful tool, providing on-demand explanations, answering questions, and offering guidance on various academic topics [2].

Looking towards the future of education with ChatGPT, there is a landscape in which AI is not merely an auxiliary tool but rather a fundamental component of the educational framework.

Some researchers pointed to a future where ChatGPT continually expands the boundaries of education [2,17,18]. E-learning and online self-learning, which have recently gained popularity due to digital education platforms and the effects of the COVID-19 pandemic are areas in which ChatGPT can provide significant support as noted by [7,19–21]. ChatGPT acts as a virtual tutor, assisting learners in navigating online courses and offering insights into course materials [1]. Other researchers have highlighted the importance of ChatGPT in lifelong learning and digital literacy, illustrating how this technology is reshaping both the content and methods of education [12].

Additionally, ChatGPT’s adaptability caters to individual learning styles, making it a valuable resource in self-paced online education. ChatGPT interprets complex questions, generates relevant responses, and facilitates complex academic tasks, offering substantial opportunities for personalized learning support in educational settings [22]. Some researchers explored ChatGPT’s adaptability across various learning contexts, from traditional classrooms to digital platforms, also in addition to incorporating it for teaching design, underscoring its value in creating versatile and dynamic educational experiences [23,24]. Collectively, these perspectives paint a picture of an academic future in which AI is seamlessly integrated into the fabric of education, enhancing learning experiences while presenting new challenges and opportunities for educators, students, and policymakers.

Despite these promising applications, the integration of ChatGPT in educational settings is challenging. Some researchers have raised concerns about the quality of responses and potential biases within AI-generated content [8,13,25–27]. These issues are crucial, particularly in educational contexts, where the accuracy and reliability of information are paramount. Others, like Deraga et al., 2023 and Strzelecki, 2023 have advocated for a balanced approach to integrating technologies like ChatGPT in education [28,29]. It is essential to leverage the benefits of ChatGPT while mitigating its potential risks and ensuring that ethical standards are upheld. Most researchers have stressed the importance of academic integrity and ethical considerations, especially considering the ease with which students might rely excessively on AI for learning and problem-solving [9,30].

The incorporation of ChatGPT into educational settings has its detractors. Some authors have explored the controversies surrounding the use of ChatGPT in education, highlighting concerns about overreliance on technology and a potential loss of critical thinking skills among students (for example, [27–29,31]). Researchers like Farazouli et al., 2023 and Farrokhnia et al., 2023 have emphasized the potential downsides, such as the automation of academic tasks leading to a lack of deep learning [22,32]. These debates are not only confined to the classroom but also extend to the ethical dimensions of using such advanced technology.
Schön et al., 2023 and Tam et al., 2023 highlighted the importance of maintaining academic integrity and addressing the ethical implications of AI in education [26,32]. Many researchers have contributed to this discussion, emphasizing the need for a balanced approach in integrating AI tools like ChatGPT [22,26,33–37]. The central concern revolves around the potential for these tools to facilitate plagiarism, undermine academic integrity, and erode the traditional student–teacher dynamic [38].

There is an intense debate among scholars about using ChatGPT in educational settings, with diverse and often conflicting viewpoints. This range of perspectives highlights a significant gap in the literature: the need for a comprehensive study synthesizing these varying opinions to provide a cohesive understanding of ChatGPT’s role in learning environments (e.g., assignments and tutoring). First, a notable group of authors have focused on the innovative potential of ChatGPT [10,30,39–42]. They have often discussed the advantages of ChatGPT in personalizing learning experiences, automating routine educational tasks, and facilitating interactive learning. However, their enthusiasm is not universally shared. Other scholars have raised concerns about the potential pitfalls, including the impact on students’ critical thinking skills, the risk of fostering dependency on AI for academic tasks, and the implications for academic integrity (for example, [43–46]).

Second, the debate has been further intensified by authors highlighting the ethical and pedagogical implications of integrating AI into learning environments [47–49]. They have emphasized the need to carefully consider how ChatGPT is implemented, ensuring it is used to complement rather than to replace traditional teaching methods. Meanwhile, some authors have argued for a balanced approach, highlighting the importance of maintaining academic integrity and an authentic learning experience in the face of rapidly advancing AI technologies [49–52]. Finally, the last set of authors have underscored the need for a comprehensive study that considers the full spectrum of views on ChatGPT’s role in education [53–56].

Several review papers focus on the impact of ChatGPT in education. For instance, Castro [57] conducted a critical literature review using electronic databases such as newspapers affiliated with Harvard University, Google Scholar, Springer, and Scopus. However, the paper is quite short and includes only thirteen references, representing a limited sample of the papers analyzed. Another literature review paper by Jameela [58] focused on the impact of ChatGPT in educational and organizational contexts, utilizing twenty-two papers. However, they did not mention the names of the databases from which they retrieved the papers and simply summarized each one. Once again, their lack of a systematic approach and the limited number of papers they included affected the robustness of their results. On the other hand, Faisal conducted a systematic literature review on the benefits of ChatGPT in higher education. He utilized the Web of Science, EBSCO, and ProQuest databases and selected 52 papers. The results included papers published until 5 June 2023 and discussed only the benefits of ChatGPT for higher education. This paper concluded with remarks on the potential use of ChatGPT in higher education in Saudi Arabia.

Our work complements this latter body of literature by reconciling these diverse perspectives and provides insights into best practices for integrating ChatGPT in education. Thus, it contributes significantly to the academic discourse by providing a better understanding of how ChatGPT can enhance learning experiences while addressing legitimate concerns about its potential drawbacks. Through its comprehensive analysis of 112 articles, this study robustly covers the current state of research on ChatGPT in education, addressing both breadth and depth within the scope defined. The results of this comprehensive review will be instrumental in guiding educators, policymakers, and researchers in making informed decisions about the use of ChatGPT in educational settings.
2. Methodology
2.1. Research Questions

The primary aim of this literature review is to investigate the benefits and limitations of ChatGPT use in academia, with a specific focus on its application in teaching and learning. Two research questions guided our inquiry:

1. What are the benefits of ChatGPT use in academia, particularly in teaching and learning contexts?

   This question seeks to uncover the positive aspects of ChatGPT in educational contexts. It explores how ChatGPT enhances teaching and learning experiences, its role in engaging students, and its potential to aid educators. By examining its benefits, this research aims to identify how ChatGPT can be effectively integrated into academic practices to improve outcomes and experiences for both teachers and students.

2. What are the limitations associated with the use of ChatGPT in educational settings?

   The focus here is to understand the challenges and constraints associated with ChatGPT usage in academia. This includes potential issues like the accuracy of the information provided, ethical concerns such as plagiarism, and the impact on students’ learning and critical thinking skills. This question is crucial for identifying potential risks and developing strategies to mitigate them, ensuring a balanced and responsible approach to incorporating ChatGPT in educational environments.

2.2. Search Strategy

We utilized a comprehensive set of keywords to systematically search for the relevant literature in three major databases: Academic Search Premier, Web of Science, and IEEE. The keywords used in our search strategy are presented in Table 1.

Table 1. Search strings and keywords.

<table>
<thead>
<tr>
<th>Search Strings</th>
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<tbody>
<tr>
<td>((ChatGPT OR Chat gpt) AND (Challenge OR pros OR cons OR benefit OR Advantage OR problem OR disadvantage OR harm OR support))</td>
</tr>
<tr>
<td>(((ChatGPT OR Chat gpt) AND (future OR application OR possibility)))</td>
</tr>
<tr>
<td>(((ChatGPT OR Chat gpt) AND (opinion OR feeling OR attitude OR user OR professional OR evaluation OR evaluate OR experience OR perception OR misconduct OR ethics OR integrity)))</td>
</tr>
<tr>
<td>(((ChatGPT OR Chat gpt) AND (teaching OR assignment OR homework OR education OR school OR student OR teacher OR practice OR project)))</td>
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</tbody>
</table>

We selected the keywords for the literature search with precision, ensuring a thorough and targeted approach to data collection across the three databases. To expand the scope of our search, we incorporated a series of outcome-oriented keywords, ranging from evaluative terms like “challenge”, “benefit”, and “advantage” to forward-looking terms like “future” and “possibility”. We refined this search further by incorporating terms related to ethical dimensions, including “opinion”, “ethics”, and “integrity”, ensuring a comprehensive perspective on ChatGPT’s impact. We also employed educational keywords like “teaching”, “assignment”, and “homework”, focusing the search on the practical educational applications and implications of ChatGPT, thus guaranteeing a rich and relevant dataset for subsequent analysis.

2.3. Inclusion and Exclusion Criteria

Table 2 presents the inclusion and exclusion criteria that were applied in the selection of articles in this study. We excluded conference articles, works that were not peer-reviewed, summaries of other work, book chapters, articles from magazines, theses, and notes to editors.
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<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
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<tbody>
<tr>
<td>Peer-reviewed journal articles.</td>
<td>Conference articles, non-peer-reviewed publications, review articles, book chapters, magazine articles, theses, and notes to editors.</td>
</tr>
<tr>
<td>Availability of full texts.</td>
<td>Articles not directly related to the application of ChatGPT in educational contexts.</td>
</tr>
<tr>
<td>Published in the English language.</td>
<td></td>
</tr>
<tr>
<td>Published any time after 30 November 2022 (the launch day of ChatGPT).</td>
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2.4. Screening the Articles

To avoid bias, we applied the following process. In each round of screening, each author coded the papers as either “0”: The paper should not be included, “1”: Not certain about including the paper, or “2”: The paper is eligible for inclusion. It is worth mentioning that the authors were not aware of the others’ decisions. Discrepancies were discussed and addressed in a focus session with all authors present.

Figure 1 presents a PRISMA flow diagram of the search methodology. Initially, three databases were searched, yielding 999 articles from Academic Search Premier, Web of Science, and IEEE. From these, 133 articles were excluded due to duplication. The remaining 866 articles’ abstracts were screened. Based on the inclusion and exclusion criteria, 678 articles were removed. Subsequently, 188 full-text articles were assessed for their relevance in discussing the benefits and challenges of ChatGPT, leading to the further exclusion of 76 articles. The process resulted in a final data set comprising 112 articles that met all the criteria for the review. In this study, we utilized Web of Science, IEEE Xplore, and Academic Search Premier based on the following considerations. Web of Science: We chose Web of Science due to its comprehensive coverage of high-quality, peer-reviewed journals and its strong emphasis on scientific citation indexing, which is crucial for the scope of our analysis. IEEE Xplore: Given that our research intersects significantly with technology and education, IEEE Xplore was selected for its extensive repository of technical literature and proceedings, which are highly relevant and authoritative in the fields of engineering and technology. Academic Search Premier: This database was included to broaden our research scope to capture interdisciplinary perspectives that are not strictly covered by the more specialized databases, thus ensuring a comprehensive exploration of the literature.

2.5. Research Profile

The top countries with the highest number of included articles related to our topic were the United States (n = 22), the United Kingdom and Northern Ireland (n = 11), and Australia (n = 11). The country of the published article was determined based on the first author’s country of affiliation. Additionally, many other researchers from other countries conducted research related to ChatGPT in education. This may be interpreted to mean that the application of ChatGPT in teaching and learning has been attracting attention globally. Figure 2 presents the heatmap for the number of papers per country.

Figure 3 displays the number of included articles per publication month in 2023 (hereafter, when we talk about our results in 2023, we mean the results we found up till 12 October 2023). The highest numbers of papers were published in July (n = 25) and August (n = 18), while the lowest numbers of papers were published in February (n = 3) and January (n = 1). This trend suggests a growing academic interest in the field, potentially influenced by academic calendars, grant cycles, or conferences. The data also indicate that the start and end of the year had less research output, which reflects the planning and development phase of research activities. Furthermore, the database search was conducted on 12 October 2023; therefore, no data were available for November or December.
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**Figure 1.** PRISMA flow diagram.

**Figure 2.** Number of articles published per country.
Figure 4 illustrates the distribution of published papers on ChatGPT across a spectrum of academic journals in 2023. The Journal of Chemical Education (n = 4) had the most publications, indicating a particular interest or focus on ChatGPT within the chemical education community. This was closely followed by other journals, including Cureus Journal of Medical Science, Sustainability, Education and Information Technologies, Scientific Reports, and International Journal of Management Education (n = 3), each contributing three papers to the discourse on ChatGPT. The diversity of journals—from medical sciences to sustainability and information technology—reflects ChatGPT’s interdisciplinary impact and the wide-ranging academic curiosity it has sparked. A single paper was found in numerous other journals, highlighting the expansive influence of this AI technology, which extends across various fields and specialties within the academic landscape.

Additionally, we created word clouds for abstracts, ChatGPT benefits, and limitations (Figure 5, Figure 6, and Figure 7, respectively). Figure 5 presents the abstracts of papers related to ChatGPT, highlighting the central themes and concepts emerging from academic discussions. Dominant terms like “education”, “student”, “learning”, and “question” highlight the focus on the educational applications of ChatGPT and its role in student engagement and learning processes. The visibility of words like “study”, “research”, and “artificial intelligence” reflects the scholarly examination of AI tools in academic settings. Meanwhile, the presence of “tool” and “response” within the cloud suggests an interest in the functional aspects of ChatGPT, such as its responsiveness and utility as a supportive tool in educational practices. Together, these terms sketch a landscape in which ChatGPT’s influence on education can be scrutinized from multiple angles, emphasizing its integration into teaching methods, student interaction, and the broader implications of AI in learning environments.

Figure 6 graphically represents the most frequently mentioned benefits of ChatGPT as gleaned from the literature. Words like “learning”, “teaching”, “feedback”, “student”, and “teacher” are prominent, highlighting ChatGPT’s significant role in educational enhancement. The repeated appearances of “generate” and “support” suggest ChatGPT’s capability to produce content and assist in various tasks, indicating its utility as an educational tool. Terms like “medical”, “language”, “code”, and “writing” emphasize the
diverse applications of ChatGPT, from aiding in medical education to supporting language learning and coding. The visual aggregation of these terms paints a picture of ChatGPT as a versatile aid that can potentially transform how students learn and teachers instruct, providing personalized assistance and enriching the learning experience across disciplines.

Moreover, many of our papers come from medical fields.

Figure 4. Number of articles published in each journal.
Figure 5. Word cloud for article abstracts.

Figure 6. Word cloud for ChatGPT benefits.

Figure 7. Word cloud for ChatGPT limitations.

Figure 7 captures the key concerns surrounding ChatGPT’s limitations within an educational context. Central terms like “concern”, “plagiarism”, “bias”, and “information”
suggest a focus on ethical and quality issues related to the use of ChatGPT in learning environments. Meanwhile, the prominence of the terms “generated” and “content” alongside “limitations” and “potential” implies a critical view of the reliability and originality of the material produced by ChatGPT. “Data” and “bias” appear near one other, highlighting worries about the originality of ChatGPT outputs, and the word “student” at the center reflects the centrality of the learner’s experience in these discussions. This collection of terms illustrates the cautionary stance researchers and educators take regarding the adoption of AI tools like ChatGPT, emphasizing the need to address these significant challenges for responsible integration into academic settings.

3. Results and Discussion

The data suggest that while ChatGPT is appreciated for its ability to enhance performance evaluation, natural language processing capabilities, and text generation, there are significant concerns regarding the quality and bias of its responses as well as issues related to plagiarism and content authenticity. The advantages and disadvantages indicate a nuanced view of ChatGPT in higher education, where its potential is recognized but an awareness of its limitations and challenges also exists. All the papers that were screened for the advantages and disadvantages of ChatGPT are cited in Table 3.

Table 3. Included articles in each theme.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
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<tbody>
<tr>
<td>Natural Language Processing</td>
<td>Error recognition</td>
</tr>
<tr>
<td>Enhanced Communication</td>
<td>Plagiarism and Authenticity</td>
</tr>
<tr>
<td>Learning Engagement and Accessibility</td>
<td>Quality of Responses and Bias in AI</td>
</tr>
<tr>
<td>Performance Evaluation</td>
<td>Other</td>
</tr>
<tr>
<td>Text Generation</td>
<td>Dependency</td>
</tr>
<tr>
<td>Versatility—ability to adapt to many different functions</td>
<td>Privacy and Data Security</td>
</tr>
</tbody>
</table>

3.1. Advantages of ChatGPT in Teaching and Learning

- Learning Engagement and Accessibility (45 occurrences): This category includes articles that discuss the role of ChatGPT in engaging students and making learning more accessible, which is the most frequently mentioned advantage in the included articles. ChatGPT can make learning more engaging and accessible, especially for students with disabilities. In their study, Hsu and Ching, 2023 categorized the applications of ChatGPT for learning, stating that teachers can use ChatGPT for support in the following ways: (1) assistance with teaching; (2) help with student assessment; (3) support for student learning; (4) suggestions for improving teaching; and (5) assistance with teacher–student and teacher–parent communication [27]. For students, the chatbot can provide support in the following areas: (1) personalized learning;
(2) creative thinking; (3) assessment; and (4) reading and writing comprehension [27]. Rodrigues and Rodrigues, 2023 emphasized the potential of ChatGPT to facilitate more personalized and adaptive learning due to its interactivity [11]. This enables the execution of effective learning mechanisms, with feedback being a core feature of learner support that is highly effective in supporting learning. In a special case, Houston et al., 2023 showed that libraries can benefit from this solution by improving their reference practices, developing their collections, and transforming and creating metadata [18].

- Natural Language Processing (NLP) (31 occurrences): ChatGPT’s ability to understand and generate human-like text is a significant advantage. Students can practice conversational skills in different languages with ChatGPT, enhancing their language proficiency. Farrokhnia et al. 2023 reported that ChatGPT’s natural language model is sophisticated and generates plausible, personalized, and real-time answers while self-improving [22]. In another study, Clark, 2023 found that ChatGPT’s responses demonstrate strong language processing abilities, performing better on questions that require generalizable information rather than specific skills, particularly the skills taught in lectures [60]. Masters, 2023 noted that ChatGPT can be helpful in the grading process, especially for written assignments [66].

- Text Generation (29 occurrences): The capability of ChatGPT to generate text is highlighted in this category. ChatGPT can help students overcome writer’s block by generating ideas or outlines for essays and research papers. NLP covers text generation; however, we created a separate category for text generation because it is an essential aspect of education and has attracted significant attention from authors in this field. It can also assist teachers in creating educational content, such as lesson plans or example texts for class discussions. For example, generative-AI chatbots excel at quickly generating plausible answers for any question [104]. Marquez et al., 2023 conducted a study focusing on biobased materials education, finding that it was possible to use AI-powered text generation to brainstorm biobased materials and products and develop academic written text by applying a scientific method approach [106]. As an AI-powered assistant, ChatGPT can answer questions, generate text, write code, summarize papers, evaluate responses, and more. It offers a range of relevant topics and ideas that can be included in a course’s curriculum [80].

- Performance Evaluation (19 occurrences): Teachers can use ChatGPT to provide instant feedback on students’ assignments or essays. For example, Ruiz et al., 2023 found that this virtual assistant tool allows teachers to provide real-time personalized support by answering student queries and offering additional information [100]. Additionally, Karabacak et al., 2023 highlighted opportunities to improve medical education through the use of personalized feedback and evaluation methods [43]. Clark et al., 2023 emphasized the potential of chatbots to support student learning in an interactive way by providing real-time feedback, thereby increasing student engagement [60].

- Versatility (20 occurrences): ChatGPT can be applied across various academic fields. In science, it can be used to explain complex concepts, while in history, it can provide historical context. When used in mathematics, ChatGPT can solve problems and explain the steps in the process. Indeed, it can be used for a wide variety of tasks, for example, to evaluate task performance, provide feedback, generate human-like writing, offer expert solutions to complex tasks, and assist in solving mathematical problems [23]. Therefore, ChatGPT is likely to have a major impact on work and education, as it provides quick and easily understandable answers to a variety of questions [39].

- Enhanced Communication (12 occurrences): This category refers to the potential for improved communication and interaction using ChatGPT. For example, Lozano and Fontao, 2023 noted that ChatGPT has great potential for improving communication between teachers and students. It can be used to generate innovative methodologies to improve the teaching–learning process, thereby increasing student performance [1].
AI assistants like ChatGPT can help by explaining complex concepts in simple language. This modern approach can help medical students learn more efficiently and provide better patient care [76]. Students can practice conversational skills in different languages with ChatGPT, enhancing their language proficiency. Moreover, ChatGPT can serve as an intermediary for students who may be shy or reluctant to ask questions in class or for students with disabilities [13]. Integrating ChatGPT with speech-to-text technology can support inclusive education for students with visual impairments or dyslexia.

- Other (12 occurrences): This category includes responses that do not fit neatly into the predefined themes. For example, Schen et al., 2023 focused on ChatGPT voice response automation, which could overcome issues with response behavior or response quality [30]. Other examples include thinking about the current instrumentalization in education [47], debugging code [61], and clinical decision-making [76].
- Not Applicable (10 occurrences): This category includes papers that were fully reviewed but did not discuss any advantages related to the use of ChatGPT in teaching and learning.

3.2. Disadvantages of ChatGPT in Teaching and Learning

- Quality of Responses and Bias in AI (51 occurrences): Concerns about the accuracy of ChatGPT’s responses and potential biases in AI models are the most frequently cited disadvantages. The accuracy of ChatGPT’s responses may not always be reliable, and there can be biases in the AI model. This requires teachers to double-check information and discuss these biases with students. Rawas, 2023 mentioned that the potential for bias in AI implementation must be approached with caution and a clear understanding of the opportunities and challenges involved [13]. Moreover, Iskender, 2023 argued that ChatGPT could exacerbate existing biases in education, such as socio-economic and racial disparities [7]. Tsang, 2023 expressed concerns about the reliability of ChatGPT due to hallucinations and its training sources, which limit its use as a clinical support resource and evidence-based research tool [74]. Naidu and Sevnaravan, 2023 emphasized that the quality of the responses provided by ChatGPT are contingent on the quality of the input received, and it can generate better answers if the questions and prompts are clear [31].
- Plagiarism and Authenticity (39 occurrences): It is challenging to ensure the originality and authenticity of content generated by ChatGPT. Moreover, there is a risk that students might submit ChatGPT-generated text as their own work. Educators need to emphasize the importance of academic integrity and may need to use plagiarism detection tools. Indeed, Dalalah and Dalalah, 2023 warned that plagiarism could become commonplace and endanger scientific research, leading to the loss of uniqueness and creativity in writing and art [63]. Furthermore, Wilby and Esson, 2023 highlighted ethical concerns regarding academic misconduct, model bias, robustness, and toxic output [96]. Thomas, 2023 reported that educators are concerned about cheating and may resort to oral exams [73]. Many are warning students that the use of ChatGPT will result in a failing grade.
- Error Recognition (17 occurrences): ChatGPT may not always recognize its own errors. Teachers and students should be aware of this limitation and cross-verify information with credible sources. For instance, Houston and Corrado, 2023 showed that ChatGPT’s proficiency in generating text is best in the language it has been extensively trained on, namely, English [18]. Its ability to produce quality responses in other languages may not be as good as its responses in English, and there might be inconsistencies or errors in its language generation. Further, the importance of continually updating AI models with the latest medical knowledge has been emphasized to ensure that they remain reliable and accurate in the rapidly evolving field of medicine [111]. Failure to do so could cause ChatGPT to provide inaccurate responses. In the context of programming, Borger et al., 2023 noted that relying on ChatGPT-generated code
requires users to have a fundamental understanding of programming concepts to avoid erroneous outputs [84].

- Dependency (15 occurrences): There is a risk of overreliance on AI tools in learning environments, which can hinder students’ ability to think critically and solve problems independently. Educators need to balance the use of AI with traditional teaching methods. For example, Hosseini et al., 2023 warned that clinicians may become overly reliant on ChatGPT-like systems, putting their clinical reasoning skills at risk [87]. Similarly, Marzuki et al., 2023 reported that some educators are concerned that excessive use of these AI tools for language refinement and idea generation may limit students’ creative thinking and originality [82]. Ratten and Jones [107] expressed concerns about students relying too heavily on ChatGPT in completing their assignments, impeding their development of intuitive skills and potentially altering assessment practices.

- Privacy and Data Security (11 occurrences): The use of ChatGPT in education raises concerns about data privacy and security. Schools and educational institutions must ensure that they are using AI tools in compliance with data protection laws and regulations. For instance, Marquez et al., 2023 noted using ChatGPT in education raises ethical concerns regarding privacy, data ownership, and algorithmic bias [106]. Michel-Villarreal et al., 2023 argued that is crucial for universities to address data privacy, algorithmic bias, and responsible use of AI-generated content to avoid skepticism around the implementation of ChatGPT [67].

- Other (6 occurrences): This includes miscellaneous concerns that do not fit into the predefined categories. For example, Dergaa et al., 2023 pointed out that this technology has the potential to generate harmful outputs, such as spam and ransomware, which is a cause for concern in modern societies [28]. Other examples include environmental concerns, an inability to be used in highly specialized contexts, and a lack of contextual and nuanced understanding [6,46,90].

- Not Applicable (14 occurrences): This category includes papers that were fully reviewed but did not discuss any disadvantages related to the use of ChatGPT in teaching and learning.

4. Recommendations

Through this extensive analysis, the authors suggest that ChatGPT should be integrated thoughtfully into curricula, complementing traditional teaching methods rather than replacing them [24]. This integration should focus on enhancing student engagement and providing supplementary learning support. To ensure effective integration, educators should receive training on the technical use of ChatGPT as well as its limitations, including potential biases and inaccuracies. Such awareness is crucial for guiding students effectively. Additionally, institutions should establish guidelines for the ethical use of AI tools, emphasizing the importance of academic integrity and the prevention of plagiarism. Courses should include components that teach students how to critically evaluate AI-generated information, which is a vital skill in the modern digital age, where information is abundant and varied in quality.

There are different avenues for future studies on the long-term effects of AI tools on learning processes and outcomes. This research should include diverse educational settings and consider different student demographics. Moreover, it is crucial to develop policies within the educational institution that ensure equitable access to AI technologies like ChatGPT so that all students have equal opportunities to benefit from these advancements. It is important to balance the innovative potential of ChatGPT with caution and awareness of its limitations and challenges to support educators and institutions in harnessing the benefits of AI while mitigating its risks [120].

As an educator, it is important to understand the benefits and limitations of using ChatGPT in teaching. While ChatGPT can enhance student engagement and provide diverse learning materials, it is essential to critically assess its output to avoid misinformation and plagiarism [53,121]. For policymakers, developing policy guidelines for AI tools in
education is crucial, including addressing content authenticity, bias in AI, and promoting critical thinking skills in students who use these technologies [122]. Further empirical research is needed to determine the impact of ChatGPT and other AI tools on learning outcomes, student engagement, and the development of critical thinking skills.

5. Conclusions

The analysis of ChatGPT’s benefits and limitations in higher education reveals a complex landscape. On one hand, ChatGPT’s capabilities in natural language processing, text generation, and performance evaluation offer significant opportunities to enhance the educational experience. These aspects align with the increasing interest in adaptive learning technologies that can provide personalized education experiences. On the other hand, concerns about the quality and bias of ChatGPT’s responses, plagiarism, and content authenticity pose significant challenges. These findings resonate with ongoing debates in educational technology regarding the ethical and practical implications of AI use in learning environments.

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Abbreviations

AI Artificial Intelligence
NLP Natural Language Processing

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