Review Article

Opportunities, challenges, and strategies for using ChatGPT in higher education: A literature review

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ARTICLE INFO	ABSTRACT
	While there is a growing body of research on chat generative pre-trained transformer (ChatGPT) in education, there appears to be little research that provides a comprehensive review of challenges, opportunities, and strategies for the effective utilization of ChatGPT in higher education. This study aims to fill this research gap by focusing on the opportunities, challenges, and strategies for using ChatGPT in higher education. The study adopted a literature review approach and employed document analysis as a research design. It reviewed various types of documents, particularly research articles, published since 2022 when ChatGPT was launched. Based on the extensive review, the study shows that ChatGPT offers a variety of opportunities for higher education, including assessment innovation, instructional support, remote learning support, research design and development support, academic writing support, and administrative assistance and productivity. However, ChatGPT also presents a number of challenges and issues related to academic integrity, security and privacy, reliance on artificial intelligence, learning assessment, and information accuracy. The study offers a set of recommendations for the effective utilization of ChatGPT in higher education. It concludes that the application of ChatGPT in higher education presents both benefits and challenges; thus, efforts and strategies are needed to ensure the effective use of ChatGPT for academic purposes. **Keywords:** ChatGPT, opportunities, challenges, strategies, higher education

INTRODUCTION

In this fast-changing digital world, the rapid development of artificial intelligence (AI) has sparked discussion among researchers and practitioners worldwide about its tremendous impacts in their respective fields. One of the most cutting-edge AI tools to date is a chat generative pre-trained transformer (ChatGPT), which has rapidly attracted over 100 million global users after a few months of its public launch in November 2022 (Rahimi & Abadi, 2023). The number of unique users had significantly increased to over 180 million by August 2023 (Tong, 2023). This has resulted in the most growing application compared to that of other popular social media platforms, such as Instagram and TikTok (Hu, 2023).

ChatGPT was developed by an American AI company known as OpenAI. As a state-of-the-art language model with extensive training on the corpus of data derived from multiple internet sources, including websites, journal articles, and textbooks (Adiguzel et al., 2023; Choi et al., 2023; Kung et al., 2023), ChatGPT is capable of generating precise responses to an array of prompts and inquiries instantaneously (Qadir,

2022) and producing nearly flawless texts that are challenging to distinguish from humans' writing (Alneyadi & Wardat, 2023; Cotton et al., 2023; Susnjak, 2022; Talan & Kalinkara, 2023; Wardat et al., 2023).

However, recent research has highlighted various issues concerning the use of ChatGPT, including the risks of privacy and ethical issues (Chukwuere, 2023; Lund & Wang, 2023), misinformation about science or distribution of fake or inaccurate content (Liebrenz et al., 2023), biased responses or outputs (Halaweh, 2023; Kitamura, 2023; Lund et al., 2023), a lack of creativity and originality of AI-generated responses (Chakravarti, 2023; Dwivedi et al., 2023), and the restricted use of training data for ChatGPT (Gilson et al., 2023; Talan & Kalinkara, 2023). More specifically, as Dergaa et al. (2023) noted, given the limited data in the training data set and/or ChatGPT's inability to distinguish between reliable and unreliable sources, responses produced by ChatGPT contained misleading accuracies and misrepresentations, potentially causing a detrimental effect on users. Thus, although ChatGPT continually obtains updated data via user engagement to improve its capabilities, there are concerns arising from this fast AI development (Shoufan, 2023; van Dis et al., 2023).

In academia, the reception of ChatGPT tends to be controversial, as reflected by scholarly discussions on the benefits and shortcomings of ChatGPT (see Chukwuere, 2023; Karakose, 2023; Neumann et al., 2023). As AlAfnan et al.'s (2023) findings revealed, not only could ChatGPT provide educators with an innovative approach to incorporating technological tools into their teaching while giving their students real-world examples to discuss and analyze during workshops, but this AI tool could also offer students alternative ways to replace search engines that typically generate millions of search results, requiring a considerable amount of time and energy to digest them. In this sense, ChatGPT could revolutionize conventional pedagogy and assessment, as well as provide a more efficient and effective way for students and teachers to search for relevant topics, thus saving time and effort.

Considering the growing use of ChatGPT for research, it is beneficial to utilize this intelligent AI application to enhance scientific language use, particularly text succinctness, English grammatical accuracy, and language translation (Graf & Bernardi, 2023). Dergaa et al. (2023) argued that ChatGPT could have the capability to support researchers in various ways, such as designing experiment procedures, analyzing and interpreting data, drafting manuscripts, generating research hypotheses and questions, and designing research methodology. It is, therefore, obvious that ChatGPT, an intelligent chatbot, is going to have significant impacts on teaching, learning, and research.

Notwithstanding the benefits provided by ChatGPT, prior research has also raised some considerable concerns associated with its usage. The concerns have focused on academic honesty and plagiarism issues (Cotton et al., 2023), overdependence on AI (Crawford et al., 2023; Jarrah et al., 2023; Sok & Heng, 2023), misleading information (Karakose et al., 2023; Zhuo et al., 2023), and biased learning assessment (Rasul et al., 2023). It is also important to note that the responses generated by ChatGPT may be inaccurate and unreliable since this AI tool can only function with the data set on which it was trained (Lee, 2023; Loh, 2023). Given that ChatGPT can produce a massive amount of data instantly (Pavlik, 2023), students may use it for cheating on examinations, homework, and assignments (Flanagin et al., 2023). This can lead to discrepancies in learning results and the rise of academic misconduct that harms the quality of teaching and learning (Cotton et al., 2023). Due to these issues, ChatGPT has been banned by some educational institutions. For instance, the Department of Education of New York City prohibited access to ChatGPT on educational devices and networks in response to concerns related to the negative effects of ChatGPT on students' learning as well as concerns over plagiarism and academic dishonesty among students (Elsen-Rooney, 2023).

Despite an increasing body of research on the benefits and drawbacks of using ChatGPT in education (Lo, 2023; Sok & Heng, 2023; Xames & Shefa, 2023), there seems to be limited research that provides a comprehensive review of the opportunities, challenges, and strategies regarding the use of ChatGPT in higher education. This study, therefore, aims to fill this knowledge gap through an extensive review of the literature on the opportunities, challenges, and strategies for

using ChatGPT in higher education. It begins by outlining the research design employed for the study. The study then discusses the potential opportunities afforded by ChatGPT. It then examines the challenges associated with the widespread utilization of ChatGPT in higher education, followed by a discussion of the strategies for effectively using ChatGPT in higher education. The study concludes with suggestions for future research.

METHODOLOGY

This study was designed as a literature review and employed document analysis as a research method (Creswell, 2009). According to Coffey (2014), documents are "versions of reality, scripted according to various kinds of convention, with a particular purpose in mind" (p. 329). They are also "textual or visual devices that enable information to be shared and 'stories' to be presented" (p. 369, emphasis in original). In this review article, a systematic analysis of documents was adopted (Coffey, 2014). The focus was on research articles or relevant documents published within the last few years (2022-2023), which discuss the benefits, challenges, and strategies related to the use of ChatGPT in higher education. According to Paré and Kitsiou (2017), a literature review method is essential for providing an overview of what has been written about a topic; identifying trends or patterns in a specific research area; gathering empirical data to support evidence-based practice; developing new frameworks or theories; and identifying research topics for further investigation. Thus, this research design is deemed situatable for examining the burgeoning topic of ChatGPT.

The following methods guided the review:

First, the first researcher conducted database searches to identify relevant studies about ChatGPT. Keywords that were used for database searches included: challenges of using ChatGPT, risks of using ChatGPT in higher education, opportunities or benefits of using ChatGPT in higher education, ChatGPT for academic research and education, and strategies or recommendations of utilizing ChatGPT in higher education. The databases in which the keywords were searched included Connected Papers, Google Scholar, PubMed, and Summon (e-library of a university in the United Kingdom).

Second, researchers discussed and decided on the inclusion criteria for the review. As a result, relevant articles that met the following inclusion criteria were selected for review:

1. Articles that are published between 2022 and 2023.

2. Articles that are written in English.

3. Articles that are published in any form, including research articles, review articles, commentary articles, perspective articles, editorials, newspaper articles, or research reports.

Based on the inclusion criteria, a total of 53 articles were included in the review. It is crucial to note that the database search was conducted between March and May 2023; thus, this review did not include articles that were published after the search period. In addition, given the nature of this new, fast-evolving topic, the review only included articles published in various forms above, leaving out potential studies published in

other forms such as books, book chapters, and dissertations, as well as those published in languages other than English. Future research should address these shortcomings.

RESULTS & DISCUSSION

The results of this review are divided into three categories: opportunities, challenges, and strategies regarding the use of ChatGPT in higher education. Each of the categories is discussed in the following sections.

Opportunities of Using ChatGPT in Higher Education

Our review revealed a number of opportunities related to the utilization of ChatGPT in higher education. These opportunities are related to assessment innovation, instructional support, remote learning support, research design and development support, academic writing support, and administrative assistance and productivity. These are discussed below.

Assessment innovation

Research has shown that ChatGPT could help teachers produce high-quality assessments while simultaneously reducing teachers' workloads. Despite its lack of capability to produce creative outputs (Sullivan et al., 2023), ChatGPT could enable teachers to establish any form of evaluation as a teaching tool in higher education, making it more innovative (Gimpel et al., 2023). ChatGPT can also help teachers create learning evaluations such as monthly tests, semester tests, or even projects or assignments (Kasneci et al., 2023; Lee, 2023; Zhai, 2023). In a similar vein, educators can leverage ChatGPT to quickly generate scenarios, quizzes, and exercises for evaluating students' learning (Khan et al., 2023; Wang et al., 2023). Prior to the advent of ChatGPT, this quick assessment process was not possible, requiring hours of preparation time to develop such assessment tasks to meet learning objectives. In this sense, through ChatGPT, some main duties that take up much of teachers' time could be reduced, allowing teachers to have adequate time to focus on adjusting assessment contents and improving the quality of assessment items with greater criticality and creativity.

While assessment and feedback are the cornerstones of learning in higher education, ChatGPT has the potential to assess any form of learning evaluation and give feedback to students immediately (Atlas, 2023; Baidoo-Anu & Ansah, 2023; Cotton et al., 2023; Ray, 2023), which is the catalyst for enhancing students' learning growth and saving teachers' time. Cotton et al. (2023), for instance, stated that ChatGPT can be used for grading students' assignments automatically, especially for written assignments. Therefore, it is convenient for teachers to give feedback to students on their essays in a timely manner (Farrokhnia et al., 2023; Mizumoto & Eguchi, 2023). Teachers could also have more time to concentrate on other important aspects of teaching to boost students' learning and development, such as providing individualized support and attending continuous professional development (Sok & Heng, 2023).

Instructional innovation & support

ChatGPT could also be used to assist teachers in developing novel strategies to foster pedagogical practices that could enhance teaching productivity and learning outcomes. Specifically, ChatGPT could be leveraged to help teachers prepare the instructional materials required for their teaching and ensure quality assurance (Cox & Tzoc, 2023; Kraugusteeliana et al., 2023; Megahed et al., 2023; Topsakal & Topsakal, 2022). As Kraugusteeliana et al. (2023) stated, AI applications, such as ChatGPT, can be utilized by teachers to help with preparing the instructional materials for each module, offering guidance to students, enhancing the quality of written work, undertaking academic research, and working more efficiently and productively. With the support of AI tools like ChatGPT, teachers could deliver higher-quality instruction that will be of benefit to their students (Kraugusteeliana et al., 2023). Megahed et al. (2023) conducted a test by giving prompts to ChatGPT to produce a course syllabus for an undergraduate-level statistics module. It was found that the syllabus generated by ChatGPT could be directly used without requiring major revision. In this regard, it is evident that ChatGPT has a crucial role in helping teachers with instructional design, thus maximizing the effectiveness of their pedagogical practices in higher education and reducing their preparation time and effort.

The integration of language models like ChatGPT also has the potential to enable teachers to create a range of stimulating and fun activities, resulting in an increase in student engagement. As Sabzalieva and Valentini (2023) pointed out, teachers could facilitate collaborative learning by assigning students to work as a team and encouraging them to utilize ChatGPT in the classroom to search for answers by entering prompts and follow-up queries. Students could then be required to present their responses to their peers. In this context, teachers' role is to facilitate the discussion and/or debate, allowing students to lead the class activities. This approach could empower students to assess their own learning and develop their approaches to addressing problems (Rudolph et al., 2023). Moreover, in addition to stimulating students' critical thinking and problem-solving skills, students from diverse knowledge and skill levels can be encouraged to participate in the classroom through answers or responses generated by ChatGPT (Kasneci et al., 2023). Thus, it becomes apparent that embedding AI tools like ChatGPT in the teaching process would help streamline instructional practices and foster student collaboration through various classroom activities.

Support for remote learning

As a large language model, ChatGPT has the capability to serve as a virtual tutor, assisting students in their academic pursuits with self-paced learning and real-time feedback. As Fauzi et al. (2023) found, students could be assisted by ChatGPT in many areas, including developing language skills, encouraging teamwork, enhancing time management and effectiveness, gaining motivation and support, and especially obtaining helpful resources and information. The assistance and facilitation are deemed advantageous for self-learning and development.

More specifically, with ChatGPT, it is possible to set up an online assistant or tutor capable of providing students with real-time feedback on their specific tasks in response to their inquiries or prompts (Anders, 2023; Khan et al., 2023), as well as answering questions at various levels of complexity (Farrokhnia et al., 2023). In this sense, despite the lack of human interaction, students can still learn from the responses generated by ChatGPT through reflection and follow-up questions or queries. This will help to cultivate learning autonomy and elevate critical thinking skills essential for students in the context of the Fourth Industrial Revolution.

In light of its impressive ability to generate timely responses, ChatGPT could assist students in dealing with academic assignments. Kasneci et al. (2023) noted that students can find insightful resources and information by using ChatGPT to help them complete their projects and assignments. ChatGPT also has the ability to recommend books and articles relevant to the topics or projects that students are undertaking (AlAfnan et al., 2023; Cooper, 2023; Fauzi et al., 2023). With this assistance, students can find the supporting materials quickly, providing them with a sense of self-efficacy and inspiration toward the completion of their academic assignments.

Due to the fact that students may experience difficulties that could affect their psychological and emotional well-being while completing their work, ChatGPT is capable of acting as a counselor or supportive peer to assist with basic psychological or emotional needs. As Crawford et al. (2023) noted, by giving students a sense of mastery over their writing assignments, ChatGPT has the ability to fulfill students' basic needs for psychological autonomy. Moreover, although students are required to know how to provide appropriate prompts in order for ChatGPT to generate concise outputs (Anders, 2023), this AI tool could be used to ask for pieces of advice if proper prompts to communicate concerns and anxieties are provided (Haleem et al., 2022). Thus, ChatGPT has the potential to assist students in dealing with academic stress – a common issue in higher education.

Support for research design & development

ChatGPT can also be employed as a valuable application for facilitating research design and development. Prior studies have demonstrated the possibility of using ChatGPT for scientific research in various aspects of the writing process (Cox & Tzoc, 2023; Dergaa et al., 2023; Khan et al., 2023; Rahman et al., 2023; Vaishya et al., 2023). Given the complexity of research design, it is vital to utilize AI tools like ChatGPT for support in simplifying research components, brainstorming research topics, and summarizing articles (Cox & Tzoc, 2023). Khan et al. (2023) stressed that ChatGPT can assist researchers in outlining articles and generating references. Moreover, despite ChatGPT's possible inaccuracies while generating outputs, Donmez et al. (2023) argued that ChatGPT could be leveraged to assist in summarizing ideas, suggesting article titles, writing limitations, shortening language use, and drawing a conclusion. As Rahman et al. (2023) recommended, it is pivotal for researchers to leverage ChatGPT for pinpointing relevant results from the literature and summarizing lengthy texts. This suggests that the integration of AI chatbots for research purposes can provide researchers with greater consistency, better flexibility, enhanced speed, and strengthened objectivity (Alshater, 2022). Thus, ChatGPT could encourage students and lecturers to further conduct scholarly research with a sense of confidence and productivity.

Academic writing support

ChatGPT is useful for boosting the effectiveness and efficiency of research writing, which is perhaps one of the most challenging domains for university lecturers and students, particularly non-native English speakers. Dergaa et al.'s (2023) research indicated that the utilization of large language models, such as ChatGPT, could elevate the efficiency of academic writing. More specifically, as Graf and Bernardi (2023) highlighted, not only is ChatGPT capable of correcting sentence structure and grammar, but it can also help with writing and editing. This application is, therefore, deemed a supportive and effective tool to facilitate non-English speakers or writers in overcoming linguistic barriers (Firaina & Sulisworo, 2023; Sallam, 2023).

Furthermore, AI chatbots like ChatGPT also have the potential to enhance the accuracy of research by spotting and fixing mistakes in analysis or even data (Alshater, 2022). It is, therefore, plausible to leverage ChatGPT to confirm the veracity of study findings or to uncover errors or discrepancies in financial data (Alshater, 2022). Thus, it is undeniable that ChatGPT could serve as a language assistant and linguistic accuracy verifier that plays a critical role in assisting both teachers and students in optimizing their academic writing and research.

Administrative support & productivity

In addition to a number of benefits it offers for academic and research purposes, ChatGPT could also be used to improve administrative workflows, particularly in terms of reducing workloads. Although research in this area is still limited, Sabzalieva and Valentini (2023) argued that ChatGPT could assist in enhancing the administrative process in higher education. Given its capacity, ChatGPT can be utilized to assist in a range of administrative tasks, such as screening and selecting students' admission applications (e.g., personal statements, recommendation letters, curriculum vitae), and suggesting to admission committees to make informed decisions (see Tajik & Tajik, 2023).

However, it is pivotal for admission teams to double-check and verify to ensure validity, transparency, and equitability, as ChatGPT may generate biased outputs. ChatGPT can also be leveraged for automating administrative operations (Dwivedi et al., 2023; Rasul et al., 2023). This could involve replying to frequently asked questions, marking tests, giving students structured feedback, and summarizing and clarifying emails (Dwivedi et al., 2023). In this sense, the utilization of ChatGPT can minimize administrators' work, resulting in time and energy savings. Administrators can therefore shift their attention from basic administrative work to monitoring and evaluation, research, and oversight of the implementation strategies, which could enhance administrative processes. **Table 1** provides a summary of all the opportunities of using ChatGPT in higher education.

Table 1. Opportunities of using ChatGPT in higher education

Opportunities of using ChatGPT in higher education	Examples of literature
Assessment innovation	Gimpel et al. (2023), Kasneci et al. (2023), & Khan et al. (2023)
Instructional innovation & support	Kraugusteeliana et al. (2023), Megahed et al. (2023), and Sabzalieva & Valentini (2023)
Support for remote learning	Anders (2023), Kasneci et al. (2023), & Khan et al. (2023)
Support for research design & development	Cox and Tzoc (2023), Donmez et al. (2023), & Rahman et al. (2023)
Academic writing support	Alshater (2022), Dergaa et al. (2023), & Graf and Bernardi (2023)
Administrative support & productivity	Dwivedi et al. (2023), Sabzalieva and Valentini (2023), & Tajik and Tajik (2023)

Challenges of Using ChatGPT in Higher Education

This study also revealed a number of challenges related to the use of ChatGPT in higher education. These challenges are mainly related to issues with academic integrity, privacy and security, factual inaccuracy, overdependence on AI, and learning assessment biases. These challenges are discussed below.

Issues of academic integrity

Despite a range of opportunities that ChatGPT can offer, there are a number of challenges when it comes to using this AI tool in higher education. Many researchers have raised concern about academic integrity among students due to the potential misuse or unethical use of ChatGPT (see Anderson et al., 2023; Atlas, 2023; Crawford et al., 2023; Cotton et al., 2023; Eke, 2023; Sallam, 2023; Sok & Heng, 2023; Sullivan et al., 2023; Thurzo et al., 2023; van Dis et al., 2023). This issue could involve cheating, misuse, and plagiarism. Many higher educational institutions and academic staff have expressed concerns about the increasing risks associated with cheating and plagiarism, as students use ChatGPT to produce their essays and complete other tasks (Sabzalieva & Valentini, 2023). In this sense, misconduct in academic integrity could occur when students utilize ChatGPT to generate essays, reports, or articles without any proper citations. Halaweh (2023), for example, stated that plagiarism could be committed when students claimed the texts produced by ChatGPT as their own work; that is, they handed in the work to their lecturers without any revision or proper citations. These issues have caused some educational institutions (e.g., University of Hong Kong) to prohibit the use of ChatGPT and other AI tools among students (Yau & Chan, 2023). Halaweh (2023), however, argued that it would not constitute plagiarism when researchers or students leveraged ChatGPT to generate an essay and properly cited the ideas they gained from reverse searching. In this context, it is imperative to provide students with comprehensive training and guidance to help them learn to use ChatGPT ethically and responsibly to prevent academic misconduct that may harm their academic success.

Issues of privacy & security

Despite an increase in the number of users, the utilization of ChatGPT in higher education can be challenging, particularly in terms of data privacy and security, because students and lecturers may share their personal or sensitive information while interacting with ChatGPT. This could entail the risks of using students' information for other activities beyond the realm of academia, illegal access to learners' data, and security breakdowns (Kasneci et al., 2023).

As Dwivedi et al. (2023) stated, sensitive student information (e.g., writing essays or assignments) could be accessed by ChatGPT, thereby guaranteeing that the data is safeguarded and leveraged to comply with the relevant privacy legislation. If the data ends up in the wrong hands, ChatGPT could be used in a hazardous way (Dwivedi et al., 2023). This issue can pose a considerable challenge for lecturers and students who are usually non-tech savvy or are less aware of internet security (Tlili et al., 2023).

Issues of factual inaccuracies

Although ChatGPT has the capability to generate responses within seconds, research has shown that the outputs generated by it might be misleading (Day, 2023; Gordijn & Have, 2023; Hügle, 2023; Sallam, 2023; Tlili et al., 2023; Wen & Wang, 2023), which could in turn cause a destructive effect on users, particularly teachers and students. Hügle (2023), for example, noted that when asking ChatGPT to generate references for his literature search, some of the responses were erroneous, as he could not find the suggested references in Google or PubMed. This evidence is further substantiated by Day (2023) who found that neither references nor citations produced by ChatGPT were accurate. Thus, not only could students be at risk of using fake information, but teachers or researchers could also face a problem while using ChatGPT for their instructional or research purposes. This means that users need to rigorously verify responses generated by ChatGPT to prevent unethical or wrong use of information, particularly for academic purposes.

Issues of overdependence on artificial intelligence

With the ease and benefits given by ChatGPT, the utilization of this advanced application can create an issue of overreliance on AI. This occurs when students employ ChatGPT to generate an entire written assignment or text without applying their critical and analytical thinking skills. This issue can affect students' enthusiasm to undertake research and develop their own solutions or strategies for learning success (Farrokhnia et al., 2023; Kasneci et al., 2023). Indeed, students' learning outcomes may be restricted if they are solely dependent upon ChatGPT for producing their written work and fail to engage in reflection and critical thinking (Firat, 2023; Rasul et al., 2023). Overdependence on AI will also impede a range of students' necessary skills, including problem-solving and critical thinking abilities (Farrokhnia et al., 2023; Rahman & Watanobe, 2023), reasoning and creativity skills (Farrokhnia et al., 2023), and reflection skills (Malik et al., 2023). In light of these negative consequences, it is imperative that students be taught not to heavily rely on ChatGPT but rather to leverage it as an assistive tool for academic and research purposes.

Table 2. Challenges of using ChatGPT in higher education

Challenges of using ChatGPT in higher education	Examples of literature
Issues of academic integrity	Atlas (2023), Crawford et al. (2023), & Sok and Heng (2023)
Issues of privacy & security	Dwivedi et al. (2023), Kasneci et al. (2023), & Tlili et al. (2023)
Issues of factual inaccuracies	Gordijn and Have (2023), Tlili et al. (2023), & Wen and Wang (2023)
Issues of overdependence on AI	Farrokhnia et al. (2023), Kasneci et al. (2023), & Rasul et al. (2023)
Issues of biased learning assessment	AlAfnan et al. (2023), Cotton et al. (2023), & Rahman and Watanobe (2023)

Issues of biased learning assessment

While the utilization of ChatGPT in higher education has become ubiquitous, the assessment of students' learning performance is becoming a concern. Several studies have demonstrated that the use of ChatGPT by students could lead to unfair assessment (AlAfnan et al., 2023; Cotton et al., 2023; Sok & Heng, 2023). Given that ChatGPT could be leveraged to produce written assignments that are indistinguishable from humans (Rahman & Watanobe, 2023; Thurzo et al., 2023), it is hard, if not impossible, for lecturers to identify whether the work is written by students or ChatGPT. Thus, some students could get good grades and outperform their peers because of their AI use (Cotton et al., 2023), while their peers may not have the same opportunity. Consequently, this situation may lead to biased learning assessments. **Table 2** shows all the challenges of using ChatGPT in higher education.

Strategies to Enhance the Use of ChatGPT in Higher Education

This study also showed a number of strategies that have been employed to enhance the use of ChatGPT in higher education. These strategies focus on developing skills and academic policies related to ChatGPT, using AI detector software, improving teachers' leadership skills, and changing teaching approaches. These strategies are discussed below.

Developing skills for using ChatGPT

Given that ChatGPT is an emerging AI tool, it is integral to upgrade the skills of faculty members and students by designing and delivering training content on how to leverage ChatGPT in higher education to optimize its strengths (Sabzalieva & Valentini, 2023; Sok & Heng, 2023). While ChatGPT offers a lot of benefits for academic purposes, its use could have considerable downsides. In this context, it is important that educational policymakers collaborate closely with information technology teams to initiate training schemes that are aligned with the training needs of lecturers and students. The training content can, for example, include the benefits and limitations of using ChatGPT for academic purposes (Lee, 2023), with the aim of equipping students and lecturers with the necessary skills to evaluate and analyze the outputs generated by ChatGPT. With the training on how to use ChatGPT, not only could students stay away from academic misconduct, but they could also acquire essential skills to succeed in their future academic or professional endeavors.

Developing academic policies on ChatGPT

Considering the risk of ChatGPT use for academic integrity and fairness in student assessment, it is necessary to develop internal academic policies and procedures to ensure alignment with the trends of technological advancements (Cotton et al., 2023; Firat, 2023; Sabzalieva & Valentini, 2023). The academic integrity policies with detailed guidelines need to be thoroughly revised or developed and strictly applied to guarantee the ethical use of ChatGPT for academic purposes. One important policy is the policy on plagiarism. For example, as long as students directly use (copy and paste) the texts generated by ChatGPT or other advanced AI chatbots without proper acknowledgement of the sources, it is plagiarism. Therefore, rather than prohibiting the utilization of ChatGPT, it would be advantageous for higher educational institutions to urge students and teachers to take full accountability and be cautious while using ChatGPT for their academic activities. Moreover, it is also important to revise existing learning assessments to ensure equity, transparency, and trustworthiness while assessing students' academic performance. As advised by Malik et al. (2023), the learning assessment should consider prominent aspects, such as oral tests, in-class exams that are case study-focused or problem-based, and exams given in the context of the material being taught. Sullivan et al. (2023), similarly, suggested various formats of assessment, such as assigning students to conduct in-class presentations, producing podcasts, working on group projects, and attending lab activities, to name a few. These activities are considered hard for ChatGPT to replicate. It is also essential for teachers to innovate the assessment approach based on learners' needs and abilities, time limitations, and the module's objectives and goals.

Using artificial intelligence detector software

Although it is hard to differentiate between AI- and human-generated texts, AI detector applications or software can be used to check students' work to see whether it is written by students or AI (Halaweh, 2023). At present, there is relatively little evidence that advanced plagiarism software (e.g., Turnitin, GPTZero, and Copyleaks) could effectively detect AI-generated texts (see Chaudhry et al., 2023), but this software could help lecturers detect the suspicious use of ChatGPT or other similar AI tools for written texts. These state-of-the-art AI detector tools, nonetheless, are rapidly developing their capabilities to detect AI-generated texts. Turnitin, for example, announced in February 2023 that its newly developed software could recognize 97% of the texts produced by ChatGPT and ChatGPT3 (Turnitin, 2023). If students' written assignments are found to have been produced by AI, it is suggested that lecturers conduct a comprehension check by asking follow-up queries to verify students' understanding.

Enhancing teacher leadership skills

As teacher leadership is essential for influencing students' learning behavior, optimizing teacher leadership could be another effective strategy for using ChatGPT. To prevent misuse or unethical use of AI tools such as ChatGPT, Crawford

Table 3. Strategies to enhance use of ChatGPT in higher education

Strategies to enhance use of ChatGPT in higher education	Examples of literature
Developing skills for using ChatGPT	Sabzalieva and Valentini (2023), Sok and Heng (2023), & Lee (2023)
Developing academic policies on ChatGPT	Cotton et al. (2023), Firat (2023), & Sabzalieva and Valentini (2023)
Using artificial intelligence detector software	Halaweh (2023) & Turnitin (2023)
Enhancing teacher leadership skills	Crawford et al. (2023)
Applying a practice-&-learn approach	Gimpel et al. (2023) & Sok and Heng (2023)

et al. (2023) suggested that it is necessary to instill in learners a sense of moral character. In so doing, teacher leadership skills play a significant role in influencing students to develop their moral character. Teachers should serve as role models, effective decision-makers, and positive thinkers. They should also demonstrate compassion, motivation, and enthusiasm while teaching students. This approach could help develop students' critical thinking and morals, enabling them to use AI tools more effectively and responsibly while upholding academic integrity. It could also help prepare them to be employment-ready, possibly leading to success in their future careers (Crawford et al., 2023).

Thus, in the ever-changing context of AI with its immense impacts on education, it is essential that teachers enhance their roles and serve as role models for their students, particularly when it comes to utilizing ChatGPT and other AI tools for academic purposes. The goal is to equip students with the mindset to use AI responsibly and ethically to avoid potential repercussions that may arise from unethical or irresponsible use of AI.

Applying a practice-&-learn approach

Since there is limited evidence regarding which strategy will work best for embedding ChatGPT or other large language models in higher education, it is important to apply a learning-by-doing or practice-and-learn approach. This approach involves exploring the use of ChatGPT, reflecting on it, and making improvements. As Gimpel et al. (2023) noted, "while there are plenty of ideas and discussions on managing and leveraging [AI tools], lecturers should first learn how ChatGPT, and comparable tools operate and modify their teaching methods, contents, and processes accordingly" (p. 41).

Practice-and-learn strategies may help higher educational institutions and teachers improve their practices through ongoing reflections from all relevant stakeholders. Given the importance of actual practices with regular reflections, it is suggested that both faculty members and students start to use special features of the ChatGPT application, such as prompts, follow-up questions, virtual assistance, language translations, and misleading information identification, to learn the strengths and limitations of the tool (Sok & Heng, 2023). Following that, it is imperative for faculty members to set up a weekly or biweekly meeting to share their best practices, challenges, and possible solutions. In addition, it is important to conduct action research on the use of ChatGPT in order to further investigate the effectiveness of pedagogical practices and the implementation of academic policies (Sok & Heng, 2023). **Table 3** summarizes the strategies that can be used to improve the utilization of ChatGPT in higher education.

CONCLUSIONS

This study has examined the opportunities, challenges, and strategies regarding the use of ChatGPT in higher education through a review of relevant literature on the topic. Key opportunities include learning assessment innovation, instructional support and innovation, support for remote learning, support for research design and development, academic writing support, and administrative support and productivity. Major challenges concern issues related to academic integrity, security and privacy, overdependence on AI, learning assessment biases, and factual inaccuracies. To address the challenges, a number of strategies have been proposed or implemented. They include developing skills for using ChatGPT, developing academic policies, using AI detector software, enhancing teacher leadership skills, and applying a practice-and-learn approach.

The study has shown that the application of ChatGPT in higher education presents both benefits and challenges. Therefore, it is essential for faculty members and students to adopt cautious and accountable approaches while utilizing ChatGPT for academic purposes. This is to ensure the effectiveness, efficiency, and equity of using ChatGPT and to prevent committing intentional or unintentional academic dishonesty. To achieve this goal, higher education institutions need to develop clear and realistic policies that provide guidelines on how to use ChatGPT or other similar AI tools effectively and ethically. Moreover, higher education institutions need to provide training to academic staff and students to ensure that they have the necessary knowledge and skills to effectively take advantage of AI for academic purposes.

This study is not without limitations. A key weakness is a lack of primary data as the study was designed as a literature review. Another limitation concerns the inclusion criteria, which may have excluded other useful articles on the topic. In light of the limitations and findings presented in this study, future researchers are suggested to examine how ChatGPT can be effectively and ethically employed for academic purposes, particularly for scientific writing. Future research should also investigate the perceptions of academic staff and students on the opportunities, challenges, and strategies to deal with the concerns and issues in relation to ChatGPT use in higher education. The goal is to ensure that AI tools can be effectively and ethically employed to improve the effectiveness and efficiency of learning, teaching, and research. In addition, it is important for future research to focus on the effects or consequences of AI utilization in higher education on students' learning outcomes and teachers' teaching effectiveness. Research into the incorporation of ChatGPT or other AI tools into the classroom to enhance teaching and learning is also recommended.

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