Enhancing Classroom Learning: ChatGPT's Integration and Educational Challenges

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Abstract

Artificial intelligence is rapidly reshaping various aspects of society, including the realm of education. The emergence of ChatGPT in November 2022 has ignited global discourse, prompting numerous studies to explore its potential benefits and drawbacks, particularly within higher education. ChatGPT offers numerous advantages for teaching and learning, such as promoting personalized education, assisting in research paper writing, refining grammar, and writing skills, and fostering critical thinking. However, alongside its benefits, concerns regarding ethical considerations and academic integrity have been raised. This paper delves into the role of ChatGPT as an AI tool, examining studies conducted between 2022 and 2023. It also addresses the ethical and academic dilemmas associated with its widespread use. Additionally, the paper discusses the challenges impeding the seamless integration of AI in education, particularly in developing countries like Jordan. Furthermore, it sheds light on Jordan's efforts to embrace artificial intelligence in education and underscores the necessity for an education-centric AI policy to cultivate skilled professionals capable of navigating the global AI revolution. Despite varying conclusions across studies, this review underscores the importance of prioritizing the education sector within Jordanian AI policies. Such prioritization is crucial given the sector's role in nurturing skilled individuals and implementing curricula effectively, thus facilitating national development. This paper holds significance for researchers, educational technology practitioners, and policymakers alike, offering insights into the multifaceted implications of AI integration in education and advocating for informed policy decisions to harness its potential effectively.

Keywords: *Artificial Intelligence (AI), ChatGPT, Technology, OpenAI*

INTRODUCTION

The education sector is experiencing significant changes due to the rapid advancements in technology. These changes are affecting various aspects of education, and educators are required to adapt to these new developments and integrate them into their teaching practices. This adaptation is particularly crucial in the context of the fourth industrial revolution, which is characterized by technological progress and innovation. One notable technological innovation that is currently generating global attention and has the potential to revolutionize the education landscape is ChatGPT, developed by OpenAI. ChatGPT is an advanced artificial intelligence (AI) system that utilizes deep learning and smart algorithms to perform language-related tasks. It can generate text, answer questions, and translate languages while comprehending the contextual nuances of human language. The emergence of ChatGPT signifies a significant shift in how the education sector is perceived by all stakeholders. It showcases the transformative potential of AI in education and highlights the increasing interest in exploring its applications and impacts in various domains. Educators, policymakers, and researchers are now recognizing the potential of AI technologies like ChatGPT to enhance learning experiences, facilitate personalized instruction, and improve educational outcomes (Wardat et al., 2023; Falode & Mohammed, 2023).

By integrating ChatGPT into educational settings, educators can leverage its capabilities to provide students with interactive and engaging learning experiences. For example, ChatGPT can assist in generating instructional materials, providing real-time feedback on assignments, and facilitating intelligent tutoring systems. It can also support language learning by offering translation services and assisting in language practice. Moreover, ChatGPT has the ability to enhance accessibility in education. It can aid students with disabilities by providing speech-to-text and text-to-speech functionalities, enabling them to participate more effectively in learning activities. Additionally, ChatGPT can cater to diverse learning styles and preferences, accommodating

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individualized instruction and promoting inclusive education practices. However, while the emergence of ChatGPT presents exciting possibilities for the education sector, it also raises important considerations and challenges. Ethical concerns regarding data privacy, bias in AI algorithms, and the equitable distribution of AI resources must be addressed. Educators and policymakers need to ensure that the integration of AI technologies like ChatGPT aligns with principles of fairness, transparency, and accountability (AlAli & Al-Barakat, 2023; Lund et al., 2023).

ChatGPT, a cutting-edge AI tool developed by OpenAI, is designed to generate text in response to user prompts, harnessing its advanced natural language comprehension capabilities to deliver intelligent and contextually aware responses (Halaweh, 2023). Since its launch in November 2022, ChatGPT has rapidly gained widespread attention and popularity. Within just two months, it attracted an impressive 100 million active users (The Guardian, 2023), and astonishingly, it reached one million users within a mere five days (Biswas, 2023; Fırat, 2023). Positioned as a large language model (LLM) and a natural language processing (NLP) tool (Taecharungroj, 2023), ChatGPT serves as a conversational AI chatbot model, engaging users in text-based dialogues (Atuhaire, 2022). It operates as an AI agent that possesses the ability to comprehend and generate human-like text (Adiguzel et al., 2023). What sets ChatGPT apart is its remarkable self-learning capability. Hack and Knight (2023) highlight that it is the first text generation program that can adapt to users' writing styles, allowing for coherent conversations rooted in linguistic understanding and contextual awareness (Gilson et al., 2023; Pavlik, 2023).

By being exposed to vast amounts of text data and utilizing sophisticated deep learning techniques, ChatGPT has achieved impressive language generation capabilities. It can generate responses that closely resemble human language, making it a valuable tool for a wide range of applications, including customer support, content creation, and educational interactions. The ability of ChatGPT to adapt its responses to individual users' styles and preferences enhances its conversational nature and creates a more personalized user experience (Adiguzel et al., 2023; Hack and Knight, 2023). However, it is important to note that while ChatGPT's language generation capabilities are impressive, it is not immune to limitations. It may occasionally produce incorrect or nonsensical responses, and there have been instances where it has exhibited biased or offensive content (The Guardian, 2023). OpenAI acknowledges the challenges associated with bias and strives to improve ChatGPT's behavior and address ethical concerns through ongoing research and development (Atuhaire, 2022).

Since its inception, ChatGPT has experienced remarkable growth in user adoption, finding applications in various fields such as software development, academic writing, translation, and music composition (Gonsalves, 2023). Its versatility has made it popular among researchers who utilize ChatGPT for a wide range of tasks, including essay writing, summarizing articles, conducting literature reviews, drafting manuscripts, identifying research gaps, and even performing coding and statistical analyses (van Dis et al., 2023). This widespread usage across different industries highlights the potential of ChatGPT to enhance productivity and efficiency, sparking discussions about its expanding role (Xames & Shefa, 2023). Critics of ChatGPT often base their concerns on resistance to change rather than pointing out inherent technological flaws, as noted by García-Peñalvo (2023). The tool offers several benefits that can greatly assist educators in their teaching and research endeavors. Will (2023) outlines some of these advantages, including lesson planning, resource discovery, report generation, and automated grading of student work. By automating certain administrative tasks, ChatGPT can free up valuable time for educators, allowing them to focus more on teaching and engaging in research activities (Rouhiainen, 2019). Furthermore, the integration of ChatGPT into educational settings has the potential to revolutionize traditional teaching methods. It can assist in creating lesson plans that are tailored to individual student needs, taking into account their learning preferences and abilities. Additionally, ChatGPT can facilitate the discovery of relevant educational resources, providing educators with a wealth of information and materials to enhance their teaching practices. The tool can also generate reports and summaries, allowing for more efficient and streamlined communication with students, parents, and administrators. In terms of student assessment, ChatGPT can play a significant role by automating the grading process. It can provide timely and consistent feedback on assignments, saving educators considerable time and effort. With the assistance of ChatGPT, educators can focus on providing targeted support and personalized instruction to students, fostering a more engaging and effective learning environment. However, it is important to recognize that while ChatGPT

presents numerous potential benefits, there are also challenges and ethical considerations to address. Ensuring the tool's accuracy, avoiding biases, and safeguarding student data and privacy are crucial aspects that need to be carefully managed and addressed by educators and developers (Wardat et al., 2024).

This article aims to discuss the advantages and disadvantages of integrating ChatGPT into teaching and learning contexts, addressing ethical considerations and the challenges associated with its seamless integration.

Research Purpose

The purpose of this study is to explore the integration of ChatGPT into teaching and learning contexts and to examine its potential advantages, disadvantages, ethical considerations, and challenges. The study aims to provide insights into how ChatGPT can be utilized in education to enhance productivity, efficiency, and student learning outcomes. Additionally, the study seeks to address concerns regarding accuracy, bias, and data privacy associated with the use of ChatGPT in educational settings. Through a comprehensive analysis, the study aims to inform educators, policymakers, and developers about the implications of integrating ChatGPT into the education sector and to guide informed decision-making regarding its implementation.

Research Questions

What are the potential ethical considerations and concerns associated with implementing ChatGPT in educational settings, particularly regarding data privacy, bias, and equitable access?

How do educators perceive the use of ChatGPT in their teaching practices, and what factors influence their attitudes and acceptance toward its adoption?

What strategies and best practices can be recommended to ensure the responsible and effective integration of ChatGPT in teaching and learning contexts, taking into account the diverse needs and preferences of students and educators?

Theoretical Framework

The theoretical framework for the integration of ChatGPT in education can draw from several theoretical perspectives. One such framework could be based on the Technology Acceptance Model (TAM), which posits that users' acceptance and adoption of a technology are influenced by perceived usefulness and ease of use. In the context of ChatGPT, educators' perceptions of its usefulness in enhancing teaching and learning outcomes, as well as their perceived ease of use in integrating it into their instructional practices, would be central to its adoption.

Another relevant theoretical perspective is the Community of Inquiry (CoI) framework, which emphasizes the importance of social presence, cognitive presence, and teaching presence in fostering meaningful online learning experiences. Applying the CoI framework to ChatGPT integration would involve examining how the tool contributes to building a sense of social presence among students and educators, facilitates cognitive engagement and critical discourse, and supports effective teaching presence through guided facilitation of learning activities.

Additionally, the framework could incorporate principles from Constructivist Learning Theory, which emphasizes active, experiential learning and the construction of knowledge through interaction with learning materials and peers. From this perspective, ChatGPT could be seen as a tool for scaffolding student learning, providing personalized feedback, and fostering collaborative knowledge construction in online and blended learning environments.

Overall, the theoretical framework for integrating ChatGPT in education should consider its alignment with established theories of technology acceptance, online learning, and constructivist pedagogy, while also acknowledging the unique affordances and challenges posed by AI-driven conversational agents in educational contexts figure 1.
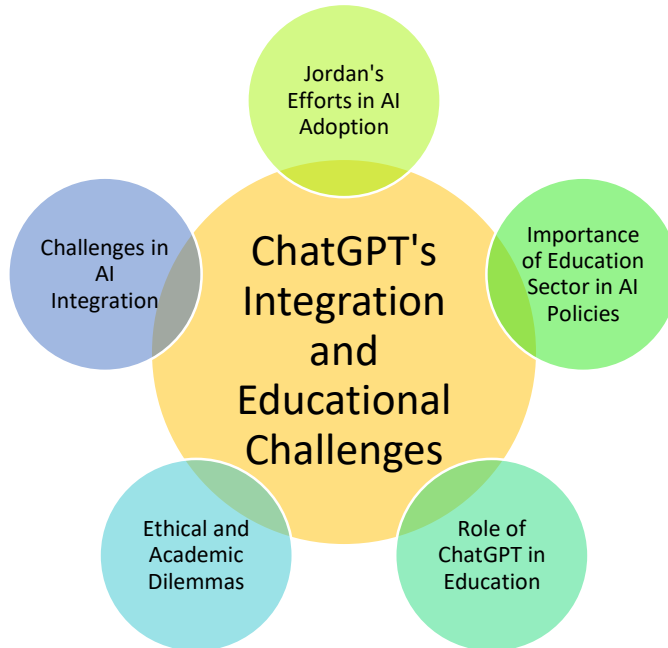
Figure1: *a conceptual Theoretical framework of ChatGPT's Integration and Educational Challenges*

LITERATURE REVIEW

ChatGPT, being a relatively new area of research, has attracted considerable attention from scholars, leading to numerous studies exploring its potential and implications. Kasneci et al. (2023) investigated how ChatGPT could enhance learning for students and assist teachers. While acknowledging its significant potential, they also highlighted concerns regarding privacy, security, and ethical considerations. Rudolph et al. (2023) focused on the utilization of ChatGPT in higher education and emphasized its importance in improving the learning experience. They provided valuable recommendations for teachers and educational institutions as a whole. Sullivan et al. (2023) conducted a study on the impact of ChatGPT on learning, particularly in higher education. While recognizing its benefits, concerns were raised regarding academic integrity issues. Firaina and Sulisworo (2023) examined the use of ChatGPT in higher education and identified its potential in various tasks such as information retrieval, idea generation, text translation, and suggesting alternative questions to enhance understanding. However, the study emphasized the importance of verifying information from ChatGPT with more reliable sources and maintaining a critical approach when using it (Zakariya & Wardat, 2023).

Zhai (2022) employed ChatGPT to write an academic paper on AI for education and found that it produced clear and informative content, showcasing its potential for enhancing academic writing. Similarly, Chen (2023) tested ChatGPT in the field of scientific writing, demonstrating its potential usefulness for language translation. Aydın and Karaarslan (2022) conducted a study aiming to generate a literature review using ChatGPT. While it proved helpful, the study also highlighted serious concerns such as the risk of academic plagiarism. Khalil and Er (2023) conducted an experiment to assess the ability of plagiarism detection tools to identify essays written with ChatGPT. Out of the 50 essays tested, 40 had a similarity score of 20% or less, indicating a high level of originality. Baidoo-Anu and Owusu Ansah (2023) reviewed the potential benefits of ChatGPT in teaching and learning, acknowledging advantages such as personalized learning. However, they also raised issues related to misinformation and privacy concerns. Gao et al. (2022) argued in their study that ChatGPT has the ability to generate original content, although it may still be identifiable as AI-generated. This highlights the ongoing challenge of distinguishing between human and AI-generated content (AlAli & Wardat, 2024).

Limna et al. (2023) conducted a survey to gather insights from educators and students regarding the use of ChatGPT in education, particularly in the digital era. The study involved interviews with ten educators and 15 students from various schools in Krabi, Thailand. The findings indicated that both educators and students

generally viewed ChatGPT as a beneficial tool in education. They identified its usefulness in providing quick feedback, answering questions, and supporting students. Educators also highlighted its potential in handling routine queries, thereby allowing them to focus on more important tasks. However, concerns were raised regarding the accuracy of information generated by ChatGPT and the potential loss of personal interaction with teachers. Privacy and data security were also emphasized as important considerations. Thorp (2023) expressed concerns about the impact of ChatGPT on education, specifically noting that although it can generate articles, its proficiency in academic writing is still developing. Similarly, Susnjak (2022) conducted an experiment to explore ChatGPT's capabilities beyond information retrieval and found that it could engage in critical thinking. The results of the experiment demonstrated accuracy, precision, and logical coherence in the responses generated by ChatGPT. However, Dowling and Lucey (2023) pointed out that while ChatGPT is effective in generating ideas and identifying data, it may not be as strong in constructing literature or creating appropriate testing frameworks, particularly in the context of finance research. AlAfnan et al. (2023) investigated the use of ChatGPT as an educational tool in communication, business writing, and composition courses. Through 30 theory-based and application-based tests involving ChatGPT, the study revealed that ChatGPT could serve as a viable alternative to search engines for students, providing them with accurate and reliable information. It also offered opportunities for students to obtain answers and generate ideas while enabling instructors to incorporate technology in the classroom. However, ethical concerns were raised regarding the potential misuse of ChatGPT, which could lead to a decline in human intelligence and learning. Instructors may face challenges in differentiating between students who rely on meticulous work and those overly dependent on automation, which can impact their ability to assess learning outcomes effectively (AlAli & Wardat, 2024).

Several studies have examined the performance of ChatGPT in various exams, including the US bar exam, the United States Medical Licensing Examination (USMLE), and the GRE. Choi et al. (2023), Katz et al. (2023), Gilson et al. (2022), and Kung et al. (2023) reported positive outcomes, suggesting that ChatGPT performed well in these exams. However, it is worth noting that Huh (2023) disagreed with the notion of using ChatGPT for exams, implying a difference of opinion on its suitability in this context. Yeadon et al. (2023) conducted a study comparing short essays on physics open-ended questions. The findings revealed that ChatGPT was capable of generating essays similar to those produced by students with comparable scores in the first grade. Additionally, ChatGPT was found to support experiential learning, personalized learning, and the development of writing skills, particularly in English language learning. Rasul et al. (2023) explored the utilization of ChatGPT and other large language models in higher education. The study highlighted the potential benefits of ChatGPT in assisting students with various tasks such as generating ideas for assessments, research, analysis, and writing assignments. By providing these capabilities, ChatGPT has the potential to enhance the learning experiences of students in higher education (Jarrah et al., 2022).

In a recent research article, Xames and Shefa (2023) highlighted that ChatGPT had been credited as a co-author in at least four research articles, raising questions about the acceptance of AI tools as authors by publishers such as Science, Nature, and JAMA Network. However, Xames and Shefa (2023) delved into the potential adoption of ChatGPT in research, emphasizing its benefits for editors, researchers, and reviewers in streamlining the research and publication process. Another study by Malinka et al. (2023) explored the impact of ChatGPT on education and examined whether AI is prepared to contribute to university-level degrees. The study aimed to assess the readiness of AI tools like ChatGPT in meeting the rigorous academic standards of higher education. Halaweh (2023) focused on the responsible implementation of ChatGPT in education and proposed strategies for its ethical and effective use. The study emphasized the importance of considering ethical considerations and developing guidelines to ensure responsible utilization of AI tools like ChatGPT in educational settings. Crawford et al. (2023) argued for leadership in ensuring the ethical use of AI in education, with a specific focus on character development, assessment methods, and the impact of AI on learning outcomes. The study emphasized the need for proactive measures to address ethical concerns and promote positive learning experiences when incorporating AI tools like ChatGPT in educational contexts. Firat (2023) conducted a survey involving seven scholars and 14 PhD students from Turkey, Sweden, Canada, and Australia to examine the effects of ChatGPT, an AI language model, on students and universities. The survey responses yielded nine key themes, including changes in learning and education, the evolving role of educators, the impact

of ChatGPT on assessment practices, ethical and social considerations, implications for future employment and work, personalized learning experiences, digital literacy, AI as an extension of human intelligence, and the significance of human characteristics in education. The study highlighted the potential benefits and challenges of integrating AI into education and identified future research areas, such as exploring ethical implications, developing privacy strategies, and preparing educational institutions for the integration of AI technologies.

Integrating ChatGPT in education offers several benefits that enhance the learning experience for students and streamline administrative tasks. Here are the detailed explanations of the benefits.

Facilitates Adaptive Learning: ChatGPT supports adaptive learning, an educational approach that tailors learning experiences to meet the unique needs of individual learners. By leveraging computer algorithms and artificial intelligence, ChatGPT provides personalized feedback and resources, enabling students to learn at their own pace and receive content tailored to their specific requirements (Rasul et al., 2023).

Personalized Learning: ChatGPT enables personalized learning by generating prompt-based, user-generated content that aligns with the individual needs and preferences of students. This approach, rooted in constructivism, allows students to build on existing knowledge and learn in a manner that suits their learning style and pace. Additionally, students can consume user-generated content, further enriching their learning experience (Rasul, 2023).

Offers Individualized Feedback: AI tools like ChatGPT have the capability to provide accurate and efficient individualized feedback and automated grading. However, it is important for users to review the outputs carefully, as they depend on the quality of prompts provided. Individualized feedback enhances students' comprehension of subjects, boosts motivation, and improves overall performance (Rudolph et al., 2023; Rasul, 2023).

Enhancing Critical Thinking: Interaction with ChatGPT can help foster and improve students' critical thinking skills. By engaging in dialogue and problem-solving tasks with the software, students are encouraged to think critically, analyze information, and develop logical reasoning abilities.

Formulation of Lesson Resources: ChatGPT provides instructors with a valuable tool for creating lesson materials, developing lesson plans, sourcing relevant literature for learning materials, and even generating assessment questions. This simplifies the workload for educators, allowing them to focus more on instructional design and student support.

Offers Numerous Learning Avenues: ChatGPT opens up diverse avenues for students to learn and access materials. Through simple interactions, students can tackle challenging tasks, complete assignments, and discover additional learning resources that enhance their educational journey.

Simplifying Research Writing: In higher education, ChatGPT and other large language models can significantly assist researchers and students with research and writing tasks. These tools excel at tasks such as text generation, language translation, and responding to academic queries, effectively streamlining the research writing process and boosting productivity (Rasul, 2023; Dwivedi et al., 2023; Kasneci et al., 2023; Lund et al., 2023).

Offers Automated Administrative Support: Integrating ChatGPT can create a supportive learning environment by providing timely and accurate information to students. It also helps reduce administrative burdens for educators and administrators, offering a cost-saving measure for higher education institutions. Previous research has shown that deploying chatbots and online chat systems positively contributes to student engagement in higher education (Abbas et al., 2022).

The Adoption of ChatGPT in Education on A Global Scale Has Sparked Debates and Raised Ethical Concerns

Particularly regarding plagiarism, academic integrity, and the responsible use of AI technology. Educators hold differing opinions on the integration of ChatGPT into educational settings (Baidoo-Anu & Owusu Ansah, 2023). Some educators believe that this AI application has the potential to bring significant changes to various

fields, including education (Bozkurt, 2023; Sallam, 2023). However, others express concerns about the ethical challenges associated with ChatGPT and view it as a disruptive technology (Haque et al., 2023; Sardana et al., 2023). AlAfnan et al. (2023) have also raised serious concerns, warning that if students misuse ChatGPT, it may lead to a decline in human intelligence and hinder the learning process. This poses challenges for instructors in distinguishing between students who use ChatGPT responsibly and those who excessively rely on automation, ultimately affecting their ability to accurately assess learning outcomes (Tashtoush et al., 2023).

A study by Aydın and Karaarslan (2022) found that utilizing ChatGPT to create a literature review on digital twins for healthcare could potentially lead to issues such as plagiarism or inadequate paraphrasing. These shortcuts jeopardize academic integrity and hinder active learning. To ensure the responsible and ethical use of ChatGPT, it is crucial to handle the information generated by the model carefully in order to avoid misrepresenting facts (Keith, 2022; Sullivan et al., 2023).

Furthermore, the use of ChatGPT raises concerns about students copying and pasting content without critically analyzing it or citing original sources, which can lead to plagiarism (García-Peñalvo, 2023). Detecting plagiarism in ChatGPT-generated text and distinguishing between factual and fictional content are additional challenges (Chatterjee & Dethlefs, 2023; Khalil & Er, 2023). Instructors worry that students may utilize ChatGPT to quickly generate reports without being detected by plagiarism detection tools. However, Atlas (2023) argues that revealing the use of ChatGPT should not be considered plagiarism; true plagiarism occurs when someone presents another person's ideas as their own without proper credit. Therefore, when utilizing ChatGPT, authors or students should be transparent about its use and appropriately cite or reference it (Hidayat & Wardat, 2023).

While concerns surrounding the adoption of ChatGPT in higher education persist, experts in academia have not reached a unanimous consensus regarding its potential threat. Some experts argue that the situation is more nuanced, acknowledging that while ChatGPT may have its limitations, such as mistakes and biases, it can actually enhance the learning experience for students. This perspective suggests that teachers may need to adapt their teaching methods and assessment strategies to align with the new reality where AI tools are widely available (Liu et al., 2023; García-Peñalvo, 2023; Rudolph et al., 2023).

In essence, these AI tools provide an opportunity to reevaluatethe emphasis on written tasks and instead prioritize the development of higher-level critical thinking skills among students (Hess, 2023). Additionally, AI tools like ChatGPT enable students to comprehend complex ideas through simplified language, making education more inclusive for individuals with communication disabilities (Hemsley et al., 2023).

Consequently, universities and educators should focus on teaching students how to responsibly and ethically utilize ChatGPT and similar tools, while fostering critical thinking skills. This approach ensures that students leverage AI as a supportive tool rather than rely solely on automated solutions (Liu et al., 2023; García-Peñalvo, 2023; Rudolph et al., 2023).

A significant debate currently exists within the research community regarding whether ChatGPT can be considered a co-author. Some journals have recently designated the OpenAI tool as a co-author, while others have objected, arguing that AI cannot be held accountable for research outputs and, therefore, should not be eligible for authorship (van Dis et al., 2023; Liebrenz et al., 2023). This debate highlights the ongoing discussion surrounding the role of AI in research and scholarly contributions.

The utilization of large language models like ChatGPT in higher education presents significant challenges, particularly concerning the potential introduction of bias and false information during the information processing stage (Chen et al., 2023). One critical concern is that ChatGPT-generated text may contain factual biases derived from the biases present in the training data, which can inadvertently reinforce misconceptions held by learners (Karim, 2023). This issue raises questions about the reliability and accuracy of the information provided by ChatGPT.

Another challenge lies in the potential impact on student learning experiences. If students primarily interact with ChatGPT, there is a risk of missing out on valuable opportunities for collaborative learning and discussions, which are essential for critical evaluation of information and the constructive construction of knowledge according to the principles of constructivist theory (Muhajirah, 2020; Zajda, 2021). By relying too

heavily on ChatGPT, students may not engage in the active learning processes that foster deeper understanding and critical thinking skills.

Furthermore, there are concerns regarding the possibility of ChatGPT generating falsified information and references, which can potentially mislead students (Hsu & Thompson, 2023). The AI model's ability to generate text raises the question of how to ensure the integrity and accuracy of the information produced, especially in academic settings where reliable and credible sources are crucial (Stoica & Wardat, 2021).

In a survey conducted in January 2023, which involved over a thousand university students, it was revealed that more than one-third of them were utilizing ChatGPT for writing assessments. Interestingly, 75% of these students acknowledged that using ChatGPT for academic purposes constituted cheating, yet they continued to employ it regardless (Intelligent, 2023). These findings have prompted certain universities to implement bans on the use of ChatGPT, while academics have expressed concerns and labeled these AI tools as a "threat" and a "plague on education" (Sawahel, 2023).

Furthermore, studies have reported cases where ChatGPT was employed for cheating on significant examinations, including university entrance exams. Individuals have claimed that ChatGPT can successfully pass exams in fields such as MBA, medical licensing, and business degrees (Erdem, 2023). This demonstrates the potential for AI tools to facilitate academic dishonesty and raises serious ethical concerns (Khalil et al., 2024).

Cheating has long been a pressing issue in academia, and the advancements in AI technology have unfortunately made it easier to engage in such misconduct. Several factors contribute to this phenomenon, including intense competition among students, high levels of stress, poor time management, and the desire to achieve good grades (Sullivan et al., 2023). The accessibility and capabilities of AI tools like ChatGPT exacerbate these challenges by providing an easy and seemingly undetectable means of cheating (Alneyadi & Wardat, 2023).

Scholars have voiced significant ethical concerns regarding the use of ChatGPT in various areas, including data privacy, confidentiality, fairness, transparency, and the risk of misapplication. One prominent issue is that ChatGPT occasionally provides answers that seem reasonable but are incorrect, thereby complicating the task of distinguishing accurate information from distorted facts (Jam et al., 2013). Additionally, ChatGPT has the potential to amplify both human and algorithmic biases, creating challenges in ensuring unbiased outputs. This poses a substantial risk for editors, researchers, and reviewers who may unknowingly approve biased and incorrect information (Xames & Shefa, 2023).

In response to these concerns, several educational institutions have taken measures to block or restrict the use of ChatGPT. The fear is that students might rely on it to automatically generate assignments or coursework, potentially undermining the learning process and academic integrity (Ropek, 2023). However, García-Peñalvo (2023) argues that attempting to prevent or ban the use of ChatGPT may not effectively deter students. Instead, it is expected that ChatGPT will become an integral part of the writing process, similar to how calculators and computers revolutionized mathematics and scientific research (McMurtrie, 2022).

The comparison to calculators and computers highlights the potential evolution and integration of ChatGPT and similar AI tools within educational contexts. Just as calculators and computers transformed the way mathematical calculations and scientific research are conducted, ChatGPT may similarly reshape the writing process. It is envisioned that educators and institutions will need to adapt their teaching methods and assessment strategies to account for the presence of AI tools like ChatGPT, ensuring that students learn how to leverage them effectively and responsibly (Wardat et al., 2021).

The existing body of research on the use of ChatGPT for instructional purposes does not yield a definitive conclusion. Rather, it presents a range of perspectives, both in favor of and against its use. While some studies highlight the potential benefits and positive outcomes associated with ChatGPT, others raise concerns and identify limitations. As a result, further research is needed to explore these issues more comprehensively, identify any existing gaps, and ultimately provide more convincing and well-informed positions. Additional studies can contribute to a deeper understanding of the impact of ChatGPT on teaching and learning. These studies can investigate various aspects such as student engagement, learning outcomes, the development of

critical thinking skills, the role of collaboration and discussion, and ethical considerations. By examining these factors in a rigorous and systematic manner, researchers can contribute to the ongoing discourse surrounding the use of ChatGPT in instructional settings. Moreover, conducting further research will help identify potential areas where ChatGPT can be enhanced, addressing current limitations and concerns. This includes refining its ability to provide accurate and unbiased information, improving its responsiveness to nuanced queries, and ensuring transparency and explainability in its decision-making processes. By addressing these gaps, researchers can help shape the future development and implementation of AI tools like ChatGPT in education.

Integrating Artificial Intelligence (AI) In the Jordanian Education Sector Is Accompanied by Several Challenges. These Challenges Include:

Limited awareness and understanding: Many education stakeholders in Jordan, including teachers, administrators, and policymakers, may have limited awareness and understanding of AI and its potential applications in education. This lack of awareness can result in resistance to change and reluctance to explore the benefits of AI in teaching and learning. Promoting awareness through training programs, workshops, and information campaigns is crucial to address this challenge.

Insufficient infrastructure: The effective integration of AI in education requires a robust technological infrastructure. However, some regions in Jordan, especially rural areas, may lack reliable internet connectivity, adequate access to computers or devices, and the necessary software and hardware. This infrastructure gap can limit the implementation of AI tools and platforms in educational institutions.

Lack of skilled personnel: Integrating AI in education demands professionals with expertise in both AI technologies and educational practices. However, there may be a shortage of skilled personnel in Jordan who possess the necessary knowledge and skills in AI and its application in an educational context. Investing in training programs, promoting AI-related disciplines in higher education institutions, and offering professional development opportunities can help address this challenge.

Ethical and privacy concerns: AI technologies often involve the collection, analysis, and processing of large amounts of data, including sensitive student information. Ensuring ethical use and protecting privacy are paramount when integrating AI in the education sector. Jordan needs to establish clear guidelines, regulations, and policies to safeguard student privacy and address ethical concerns related to AI implementation in educational settings.

Language and content limitations: AI systems are typically developed and trained using specific languages and datasets. This can pose challenges in Jordan, where Arabic is the primary language and localized educational content may be limited. Adapting AI tools and resources to the local context and ensuring the availability of educational content in Arabic or other local languages are essential for effective integration.

Resistance to change: Resistance to change is a common challenge when introducing new technologies, including AI, in the education sector. Educators, students, and parents may have concerns about job displacement, loss of human interaction, or skepticism towards the benefits of AI in education. Overcoming this resistance requires effective communication, engaging stakeholders in the decision-making process, and providing evidence of the positive impact of AI on teaching and learning outcomes.

Cost considerations: Implementing AI technologies can involve significant costs, including acquiring hardware, software licenses, and ongoing technical support. Limited financial resources can pose challenges for educational institutions, particularly those with constrained budgets. Government support, public-private partnerships, and exploring cost-effective solutions can help address the financial constraints associated with AI integration in education.

Integration with existing systems: Integrating AI into existing educational systems and workflows can be complex. Compatibility with existing technologies, platforms, and curricula needs to be ensured to avoid disruption and facilitate a seamless integration process. Collaboration among education institutions, technology providers, and policymakers is crucial to navigate the integration process effectively.

Jordan has been making significant strides in its journey towards adopting artificial intelligence (AI) and recognizing its potential for various sectors, including education. As part of this process, there is a growing recognition of the need for an education-based AI policy to guide the integration of AI in Jordan's education sector. This policy would outline the goals, strategies, and guidelines for implementing AI technologies effectively in educational settings.

One key driver behind the push for an AI policy in education is the recognition that AI has the potential to transform teaching and learning processes, enhance educational outcomes, and prepare students for the demands of the digital age. The integration of AI can improve personalized learning experiences, facilitate adaptive learning pathways, and enable intelligent tutoring systems that provide tailored support to students (Al-Jarrah, Aljarrah, & Alkhamaiseh, 2020).

To effectively harness the benefits of AI in education, a policy framework is needed to address several important considerations. First, the policy should address the infrastructure requirements for AI implementation. This includes ensuring reliable internet connectivity, access to necessary hardware and software, and data storage capabilities (Al-Jarrah et al., 2020). Adequate infrastructure is crucial to support the implementation of AI tools and platforms in schools and universities.

Second, an AI policy should focus on developing the skills and capacity of educators and education stakeholders to effectively use AI technologies. This involves providing professional development programs, training opportunities, and resources to enhance digital literacy and AI competency among teachers and administrators (Al-Jarrah et al., 2020). Building the necessary human capital is essential for successful AI integration in the education sector.

Third, an education-based AI policy should address ethical considerations and data privacy concerns. AI technologies often involve the collection and analysis of vast amounts of data, including student information. Safeguarding privacy, ensuring data security, and establishing ethical guidelines for AI use in education are paramount (Al-Jarrah et al., 2020).

The importance of an education-based AI policy in Jordan has been recognized by organizations such as the Ministry of Digital Economy and Entrepreneurship. They have emphasized the need for comprehensive AI policies that encompass various sectors, including education, to ensure the responsible and effective use of AI technologies (Ministry of Digital Economy and Entrepreneurship, 2020).

CONCLUSION

In conclusion, the integration of ChatGPT and other AI technologies in education holds tremendous promise for transforming teaching and learning experiences. Through personalized education, enhanced research support, and the fostering of critical thinking skills, ChatGPT has the potential to revolutionize educational practices in higher education institutions worldwide.

However, alongside these benefits, there are significant ethical and academic considerations that must be addressed. Concerns regarding plagiarism, academic integrity, and the responsible use of AI technology underscore the importance of implementing clear guidelines and policies to ensure ethical AI usage in educational settings.

Moreover, challenges related to infrastructure, skills development, and data privacy need to be carefully navigated, especially in developing countries like Jordan. The establishment of education-centric AI policies is essential to address these challenges and cultivate skilled professionals capable of harnessing the potential of AI for national development.

Despite the varying conclusions across studies, it is evident that prioritizing the education sector within AI policies is crucial for nurturing skilled individuals and implementing effective curricula. By embracing AI integration in education and making informed policy decisions, stakeholders can harness its potential to enhance teaching and learning outcomes, ultimately contributing to the advancement of education on a global scale.

RECOMMENDATIONS

Based on the findings and insights presented in this paper, the following recommendations are proposed:

Develop Clear Ethical Guidelines: Educational institutions and policymakers should collaborate to develop clear ethical guidelines for the responsible use of AI technologies like ChatGPT in education. These guidelines should address issues such as plagiarism, academic integrity, data privacy, and fairness in AI usage.

Provide Training and Professional Development: Invest in training programs and professional development opportunities for educators to enhance their digital literacy and AI competency. This will ensure that educators have the skills and knowledge necessary to effectively integrate AI tools into their teaching practices.

Promote Awareness and Understanding: Launch awareness campaigns and information sessions to promote understanding among educators, students, parents, and policymakers about the potential benefits and challenges of AI integration in education. This will help mitigate resistance to change and foster support for AI initiatives in educational settings.

Invest in Infrastructure: Allocate resources to improve technological infrastructure, particularly in rural and underserved areas, to ensure equitable access to AI tools and resources for all students and educators.

Establish Collaboration and Partnerships: Foster collaboration and partnerships between educational institutions, government agencies, industry stakeholders, and AI developers to facilitate the seamless integration of AI technologies into educational settings. These partnerships can help address challenges related to infrastructure, skills development, and data privacy.

Conduct Further Research: Encourage and support further research on the impact of AI integration in education, including studies on student learning outcomes, pedagogical approaches, and ethical considerations. This research will contribute to a deeper understanding of the potential benefits and challenges of AI in education.

Continuously Monitor and Evaluate: Implement mechanisms to continuously monitor and evaluate the effectiveness of AI integration initiatives in education. This includes collecting feedback from stakeholders, assessing learning outcomes, and adjusting strategies as needed to optimize the use of AI technologies for teaching and learning.

By implementing these recommendations, educational institutions, policymakers, and stakeholders can maximize the potential of AI integration in education while addressing ethical concerns and ensuring equitable access to AI resources for all students.

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REFERENCES

Abbas, N., Whitfield, J., Atwell, E., Bowman, H., Pickard, T., & Walker, A. (2022). Online chat and chatbots to enhance mature student engagement in higher education. International Journal of Lifelong Education, 41(3), 308-326. https://doi.org/10.1080/02601370.2022.2066213

Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. Contemporary Educational Technology, 15(3), ep429. https://doi.org/10.30935/cedtech/13152

Adiguzel, T., Kaya, M. H., & Cansu, F. K. (2023). Revolutionizing education with AI: Exploring the transformative potential of ChatGPT. Contemporary Educational Technology, 15(3), ep429. https://doi.org/10.30935/cedtech/13152

African Development Forum (1999). The process of developing national information and communications infrastructure (NICI) in Africa. https://www.uneca.org/adf99/nici.htm

AlAfnan, M.A., Dishari,S., Jovic,M., & Lomidze, K. (2023). ChatGPT as an Educational Tool: Opportunities, Challenges, and Recommendations for Communication, Business Writing, and Composition Courses. Journal of Artificial Intelligence and Technology, 23, 60-68. https://doi.org/10.37965/jait.2023.0184

AlAli, R. ., & Wardat, Y. (2024). Exploring the impact of Kahoot! as a collaborative gamified mathematics learning platform for Jordanian junior school gifted students. Journal of Asian Scientific Research, 14(2), 227–236. https://doi.org/10.55493/5003.v14i2.5061

AlAli, R. M., & Al-Barakat, A. A. (2023). Leveraging The Revolutionary Potential of Chatgpt to Enhance Kindergarten Teachers' Educational Performance: A Proposed Perception. Eurasian Journal of Educational Research, 106(106), 50-69.

AlAli, R., & Wardat, Y. (2024). How ChatGPT Will Shape the Teaching Learning Landscape in Future?. Journal of Educational and Social Research, 14.

Alneyadi, S., & Wardat, Y. (2023). ChatGPT: Revolutionizing student achievement in the electronic magnetism unit for eleventh-grade students in Emirates schools. Contemporary Educational Technology, 15(4), ep448. https://doi.org/10.30935/cedtech/13417

Atlas, S. (2023). ChatGPT for higher education and professional development: A guide to conversational AI. https://digitalcommons.uri.edu/cba_facpubs/548

Atuhaire, R. (2022). What is ChatGPT? https://www.dignited.com/104384/what-is-chatgpt-and-how-does-it-work

Aydın, Ö., & Karaarslan, E. (2022). OpenAI ChatGPT generated literature review: Digital twin in healthcare. In Ö. Aydın (Ed.), Emerging computer technologies 2 (pp. 22-31). İzmir Akademi Derneği.

Baidoo-Anu, D. & Owusu Ansah, L. (2023, January 25). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. http://dx.doi.org/10.2139/ssrn.4337484

Biswas, S. (2023, February). Role of ChatGPT in education. https://ssrn.com/abstract=4369981

Bitzenbauer, P. (2023). ChatGPT in physics education: A pilot study on easy-to-implement activities. Contemporary Educational Technology, 15(3), ep430. https://doi.org/10.30935/cedtech/13176

Bozkurt, A. (2023). Generative artificial intelligence (AI) powered conversational educational agents: The inevitable paradigm shift. Asian Journal of Distance Education, 18(1), 198-204, https://doi.org/10.5281/zenodo.7716416

Chatterjee, J., & Dethlefs, N. (2023). This new conversational AI model can be your friend, philosopher, and guide … and even your worst enemy. Patterns, 4(1), 100676. https://doi.org/10. 1016/j.patter.2022.100676

Chen, E., Huang, R., Chen, H. S., Tseng, Y. H., & Li, L. Y. (2023). GPTutor: A ChatGPT-powered programming tool for code explanation. arXiv. https://doi.org/10.48550/arXiv.2305.01863

Chen, T. J. (2023). ChatGPT and other artificial intelligence applications speed up scientific writing. Journal of the Chinese Medical Association. Epub ahead of print. https:// doi.org/10.1097/JCMA.0000000000000900

Choi, J. H., Hickman, K. E., Monahan, A., & Schwarcz, D. (2023). ChatGPT-3.5 goes to law school. SSRN. http://dx.doi.org/10.2139/ssrn.4335905.

Crawford, J., Cowling, M., & Allen, K. A. (2023). Leadership is needed for ethical ChatGPT: Character, assessment, and learning using artificial intelligence (AI). Journal of University Teaching & Learning Practice, 20(3), 02. https://doi.org/10.53761/1.20.3.02

Dowling, M., & Lucey, B. (2023). ChatGPT for (finance) research: The Bananarama conjecture. Finance Research Letters, 103662

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M. Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M. A., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D... & Wright, R. (2023). 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, 71, 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Erdem, E. (2023, January 26). ChatGPT: Exciting or terrifying? The Tufts Daily. https://www.proquest.com/wire-feeds/chatgpt-exciting-terrifying-tufts-daily/docview/2769546664/se-2?accountid=10675

Falode, O. C., & Mohammed, I. A. (2023). Educational technology undergraduates' performance in a distance learning course using three courseware formats. International Review of Research in Open and Distributed Learning, 24 (4), 1-19. https://doi.org./10.19173/irrodl.v24i4.7219

Federal Republic of Nigeria (2019). National Policy on ICT in Education. Abuja: Federal Ministry of Education. https://education.gov.ng/wp-content/uploads/2019/08/national-policy-on-ict-in-education-2019.pdf

Firaina, R., & Suliswro, D. (2023). Exploring the usage of ChatGPT in higher education: Frequency and impact on productivity. Buletin Edukasi Indonesia, 2(01), 39–46. https://doi.org/10.56741/bei.v2i01.310

Firat, M. (2023). What ChatGPT means for universities: Perceptions of scholars and students. Journal of Applied Learning & Teaching, 57-63. https://doi.org/10.37074/jalt.2023.6.1.22

Gao, C. A., Howard, F. M., Markov, N. S., Dyer, E. C., Ramesh, S., Luo, Y., & Pearson, A. T. (2022). Comparing scientific abstracts generated by ChatGPT to original abstracts using an artificial intelligence output detector, plagiarism detector, and blinded human reviewers. bioRxiv, 2022-12.

García-Peñalvo, F. J. (2023). The perception of Artificial Intelligence in educational contexts after the launch of ChatGPT: Disruption or panic? Education in the Knowledge Society, 24, 1-9. https://doi.org/10.14201/eks.31279

Gilson, A., Safranek, C., Huang, T., Socrates, V., Chi, L., Taylor, R. A., & Chartash, D. (2022). How well does ChatGPT-3.5 do when taking the medical licensing exams? The implications of large language models for medical education and knowledge assessment. medRxiv, 1-9

Gonsalves, R. A. (2023, January 17). Using ChatGPT as a creative writing partner – part 2: Music. Towards Data Science. https://towardsdatascience.com/using-chatgpt-as-a-creative-writing-partner-part-2-music-d2fd7501c268

Hack, K., & Knight, C. (2023). Higher education in the era of AI. AdvanceHE. https://www.advance-he.ac.uk/news-and-views/higher-education-era

Halaweh, M. (2023). ChatGPT in education: Strategies for responsible implementation. Contemporary Educational Technology, 15(2), ep421. https://doi.org/10.30935/cedtech/13036

Haque, M. U., Dharmadasa, I., Sworna, Z. T., Rajapakse, R. N., & Ahmad, H. (2022). "I think this is the most disruptive technology": Exploring sentiments of ChatGPT early adopters using Twitter data. ArXiv preprint. arXiv:2212.05856. https://doi.org/10.48550/arXiv.2212.05856

Hartmann, J., Schwenzow, J., & Witte, M. (2023). The political ideology of conversational AI: Converging evidence on ChatGPT's pro-environmental, left-libertarian orientation. ArXiv. https://doi.org/10.48550/arXiv.2301.01768

Hemsley, B., Power, E., & Given, F. (2023, January 19). Will AI tech like ChatGPT improve inclusion for people with communication disability? The Conversation. https://theconversation.com/will-ai-tech-like-chatgpt-improve-inclusion-for-people-with-communication-disability-196481

Hess, F. (2023, February 8). Will ChatGPT be a blow to learning, or a boom? We'll decide. Forbes. https://www.forbes.com/sites/frederickhess/2023/02/08/will-chatgpt-be-a-blow-to-learning-or-a-boon-well-decide/?sh=29824ba66651

Hidayat, R., Wardat, Y. A systematic review of Augmented Reality in Science, Technology, Engineering and Mathematics education. Educ Inf Technol (2023). https://doi.org/10.1007/s10639-023-12157-x

Hsu, T., & Thompson, S. A. (2023, February 13). Disinformation researchers raise alarms about AI. Chatbots. The New York Times. https://www.nytimes.com/2023/02/08/technology/ai-chatbots-disinformation.html

Hu, Y., & Min, H. K. (2023). The dark side of artificial intelligence in service: The "watching-eye" effect and privacy concerns. International Journal of Hospitality Management, 110, 103437. https://doi.org/10.1016/j.ijhm.2023.103437

Intelligent. (2023, January 23). Nearly 1/3 college students have used ChatGPT on written assessments. Intelligent. https://www.intelligent.com/nearly-1-in-3-college-students-have-used-chatgpt-on-written-assignments/

Jam, F. A., Akhtar, S., Haq, I. U., Ahmad-U-Rehman, M., & Hijazi, S. T. (2010). Impact of leader behavior on employee job stress: evidence from Pakistan. European Journal of Economics, Finance and Administrative Sciences, (21), 172-179.

Jarrah, A. M., Wardat, Y., & Gningue, S. (2022). Misconception on addition and subtraction of fractions in seventh-grade middle school students. Eurasia Journal of Mathematics, Science and Technology Education, 18(6), em2115. https://doi.org/10.29333/ejmste/12070

Jam, F. A., Mehmood, S., & Ahmad, Z. (2013). Time series model to forecast area of mangoes from Pakistan: An application of univariate ARIMA model. Acad. Contemp. Res, 2, 10-15.

Kaplan, A. (2021). Higher education at the crossroads of disruption: The university of the 21st century. Emerald Group Publishing.

Karim, R. (2023, February 13). ChatGPT: Old AI problems in a new guise, new problems in disguise. Monash University. https://lens.monash.edu/@politics-society/2023/02/13/1385448/chatgpt-old-ai-problems-in-a-new-guise-new-problems-in-disguise

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., Stadler, M., Weller, J., Kuhn, J., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Katz, D. M., Bommarito, M. J., Gao, S., & Arredondo, P. (2023). Gpt-4 passes the bar exam. SSRN 4389233. http://dx.doi.org/10.2139/ssrn.4389233

Keith, T. (2022, February 16). Combating academic dishonesty, Part 1 – understanding the problem. The University of Chicago. https://academictech.uchicago.edu/2022/02/16/combating-academic-dishonesty-part-1-understanding-the-problem

Khalil, I. A., Al-Aqlaa, M. A., Al-Wahbi, T. A., & Wardat, Y. (2024). Evaluating Students' Perception of Visual Mathematics in Secondary Geometry Education: A Mixed Methods Investigation. International Journal of Information and Education Technology, 14(4).

Khan, T. I., Nisar, H. G., Bashir, T., & Ahmed, B. (2018). Impact of aversive leadership on job outcomes: Moderation and mediation model. NICE Research Journal, 56-73.

Khalil, M., & Er, E. (2023). Will ChatGPT get you caught? Rethinking of plagiarism detection. arXiv. https://doi.org/10.35542/osf.io/fnh48

King, M. R., & ChatGPT. (2023). A conversation on artificial intelligence, chatbots, and plagiarism in higher education. Cellular and Molecular Bioengineering, 16(1), 1-2. https://doi.org/10.1007/s12195-022-00754-8

Liebrenz, M., Schleifer, R., Buadze, A., Bhugra, D., & Smith, A. (2023). Generating scholarly content with ChatGPT: ethical challenges for medical publishing. The Lancet Digital Health, 5(3), e105-e106. https://doi.org/10.1016/S2589-7500(23)00019-5

Limna, P., Jakwatanatham, S., Siripipattanakul, S., Kaewpuang, P., & Sriboonruang, P. (2022, March 14). A review of artificial intelligence (AI) in education during the digital era. Advance Knowledge for Executives, 1(1), 1-9. https://ssrn.com/abstract=4160798

Limna, P., Kraiwanit, T., Jangjarat, K., Klayklung, P., & and Chocksathaporn, P. (2023). The use of ChatGPT in the digital era: Perspectives on chatbot implementation. Journal of Applied Learning & Teaching, 6(1), 64-74. https://doi.org/10.37074/jalt.2023.6.1.32

Liu, A., Bridgeman, D., & Miller, B. (2023, February 28). As uni goes back, here's how teachers and students can use ChatGPT to save time and improve learning. The Conversation. https://theconversation.com/as-uni-goes-back-heres-how-teachers-and-students-can-use-chatgpt-to-save-time-and-improve-learning-199884

Lund, B. D., Wang, T., Mannuru, N. R., Nie, B., Shimray, S., & Wang, Z. (2023). 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, 74(5), 570-581. http://dx.doi.org/10.1002/asi.24750

Malinka, K., Perešíni, M., Firc, A., Hujňák, O., & Januš, F. (2023). On the educational impact of ChatGPT: Is Artificial Intelligence ready to obtain a university degree? arXiv preprint. arXiv:2303.11146. https://doi.org/10.48550/arXiv.2303.11146

McMurtrie, B. (2022). AI and the future of undergraduate writing. The Chronicle of Higher Education. https://www.chronicle.com/article/ai-and-the-future-of-undergraduate-writing

Muhajirah, M. (2020). Basic of learning theory: (Behaviorism, cognitivism, constructivism, and humanism). International Journal of Asian Education, 1(1), 37-42. https://dx.doi.org/10.46966/ijae.v1i1.23

National Information Technology Development Agency (NITDA) (2020). National Centre for Artificial Intelligence and Robotics. https://nitda.gov.ng/ncair

Obi, U. V., Ole, N. C., & Uzoigwe, S. (2023). Artificial intelligence (AI) systems use in Nigeria: Charting the course for AI policy development. https://www.lexiology.com/library/detail.aspx?g=600a8ee0-5b28-44da-8415-0e07c7f33fe

Owan, V.J., Abang, K.B., Idika, D. O., Etta, E. N., Bassey, B. A. (2023). Exploring the potential of artificial intelligence tools in educational measurement and assessment. EURASIA Journal of Mathematics, Science and Technology Education, 2023, 19(8), em2307. https://doi.org/10.29333/ejmste/13428

Pavlik, J.V. (2023). Collaborating with ChatGPT: considering the implications of generative artificial intelligence for journalism and media education. Journalism & Mass Communication Educator, 78(1), 84–93. https://doi.org/10.1177/10776958221149577

Rasul, T., Nair, S., Kalendra, D., Robin, M., de Oliveira Santini, F., Ladeira, W. J., Sun, M., Day, I., Rather, R. A., & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. Journal of Applied Learning & Teaching, 6(1), 41-56. https://doi.org/10.37074/jalt.2023.6.1.29.

Ropek, L. (2023). New York City schools ban ChatGPT to head off a cheating epidemic. Gizmodo. https://gizmodo.com/new-york-city-schools-chatgpt-ban-cheating-essay-openai-1849949384

Rouhiainen, L. (2019). How AI and data could personalise higher education. Business Education. Harvard Business Review. http://hbr.org/2019/10/how-ai-and-data-could-personalize-higher-education

Rudolph, J., Tan, S., & Tan, S. (2023). ChatGPT: Bullshit spewer or the end of traditional assessments in higher education? Journal of Applied Learning and Teaching, 6(1), 1-22. https://doi.org/10.37074/jalt.2023.6.1.9

Sallam, M. (2023). ChatGPT utility in health care education, research, and practice: Systematic review on the promising perspectives and valid concerns. Healthcare, 11(6), 887. MDPI. https://doi.org/10.3390/healthcare11060887

Sardana, D., Fagan, T. R., & Wright, J. T. (2023). ChatGPT: A disruptive innovation or disrupting innovation in academia? The Journal of the American Dental Association. https://doi.org/10.1016/j.adaj.2023.02.008

Sawahel, W. (2023, February 7). Embrace it or reject it? Academics disagree about ChatGPT. University World News. https://www.universityworldnews.com/post.php?story=20230207160059558

Stoica, G., & Wardat, Y. (2021). An inequality can change everything. The American Mathematical Monthly, 128(9), 810. https://doi.org/10.1080/00029890.2021.1949218

Sullivan, M., Kelly, A., & McLaughlan P. (2023). ChatGPT in higher education: Considerations for academic integrity and student learning. Journal of Applied Learning & Teaching, 6 (1), 1-10. https://doi.org/10.37074/jalt.2023.6.1.17

Susnjak, T. (2022). ChatGPT: The end of online exam integrity? arXiv. https://doi.org/10.48550/arXiv.2212.09292

Taecharungroj, V. (2023). What can ChatGPT do? Analysing early reactions to the innovative AI chatbot on Twitter. Big Data and Cognitive Computing, 7(1), 35. https://doi. org/10.3390/bdcc7010035

Tashtoush, M. A., Wardat, Y., & Elsayed, A. M. (2023). Mathematics Distance Learning and Learning Loss During COVID-19 Pandemic: Teachers' Perspectives. Journal of Higher Education Theory and Practice, 23(5). https://doi.org/10.33423/jhetp.v23i5.5933

The Guardian. (2023). ChatGPT reaches 100 million users two months after launch. The Guardian. https://www.theguardian.com/technology/2023/feb/02/chatgpt-100-million-users-open-ai-fastest-growing-app

Thorp, H. H. (2023). ChatGPT is fun, but not an author. Science, 379 (6630), 313. https://www.science.org/doi/10.1126/science.adg7879

van Dis, E. A., Bollen, J., Zuidema, W., van Rooij, R., & Bockting, C. L. (2023). ChatGPT: Five priorities for research. Nature, 614(7947), 224-226. https://doi.org/10.1038/d41586-023-00288-7

Wardat, Y., Jarrah, A. M., & Stoica, G. (2021). Understanding the meaning of the equal sign: a case study of middle school students in the United Arab Emirates. European Journal of Educational Research, 10(3), 1505-1514. https://doi.org/10.12973/eu-jer.10.3.1505

Wardat, Y., Tashtoush, M. A., AlAli, R., & Jarrah, A. M. (2023). ChatGPT: A revolutionary tool for teaching and learning mathematics. Eurasia Journal of Mathematics, Science and Technology Education, 19(7), em2286.

Wardat, Y., Tashtoush, M., AlAli, R., & Saleh, S. (2024). Artificial Intelligence in Education: Mathematics Teachers' Perspectives, Practices and Challenges. Iraqi Journal for Computer Science and Mathematics, 5(1), 60-77.

Xames, M.D., & Shefa J. (2023). ChatGPT for research and publication: Opportunities and challenges. Journal of Applied Learning & Teaching, 6 (1), 390-395. https://doi.org/10.37074/jalt.2023.6.1.20

Yeadon, W., Inyang, O. O., Mizouri, A., Peach, A., & Testrow, C. P. (2023). The death of the short-form physics essay in the coming AI revolution. Physics Education, 58(3), 035027

Yusuf, M. O. (2005). Information and communication technology and education: Analyzing the Nigerian national policy for information technology. International Education Journal, 6 (3), 316-321. https://files.eric.ed.gov/fulltext/Ej854985.pdf

Zajda, J. (2021). Constructivist learning theory and creating effective learning environments. In J. Zajda (Ed.), Globalisation and education reforms: Creating effective learning environments (pp. 35-50). Springer. https://doi.org/10.1007/978-3-030-71575-5_3

Zakariya, Y.F., Wardat, Y. Job satisfaction of mathematics teachers: an empirical investigation to quantify the contributions of teacher self-efficacy and teacher motivation to teach. Math Ed Res J (2023). https://doi.org/10.1007/s13394-023-00475-9

Zhai, X. (2022). ChatGPT user experience: Implications for education. https://www.researchgate.net/publication/366463233