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AI AND CHATGPT FOR ADVANCING TEACHING AND LEARNING ACTIVITIES

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Abstract
Over the last decade, technological advancements, especially artificial intelligence, have significantly transformed educational practices. Recently, the development and adoption of Generative Pre-trained Transformers (GPT), particularly OpenAI’s ChatGPT, has sparked considerable interest. The unprecedented capabilities of these models, such as generating humanlike text and facilitating automated conversations, have broad implications in various sectors, including education and health. Despite their immense potential, concerns regarding their widespread use and opacity have been raised within the scientific community. ChatGPT, the latest version of the GPT series, has displayed remarkable proficiency, passed the US bar law exam, and amassed over a million subscribers shortly after its launch. However, its impact on the education sector has elicited mixed reactions, with some educators heralding it as a progressive step and others raising alarms over its potential to reduce analytical skills and promote misconduct. This paper aims to delve into these discussions, exploring the potential and problems associated with applying advanced AI models in education. It builds on extant literature and contributes to understanding how these technologies reshape educational norms in the “new AI gold rush” era.

Keywords: Artificial intelligence, ChatGPT, educational technology, university education.

Introduction

The published scientific literature broadly suggests that AI technology possesses the potential to serve as a significant asset in education, occupying various roles that enrich both learning and pedagogical experiences. Authors have suggested that AI technology is an instrumental tool in essay grading [1], although the value and the efficacy of these AI-based grading tools remain largely unclear within the confines of the existing scientific literature. The literature has reported that ChatGPT exhibits the potential to automatize and improve the grading system and has suggested that ChatGPT could be utilized to semi automate the grading process for students’ work by discerning both the strengths and weaknesses within a given task in a broad spectrum of assignments, including research articles, academic essays, and other forms of written coursework. In this context, educators can adapt the reports generated by such a model to deliver beneficial feedback to students, whether in formative or summative assessment scenarios. Furthermore, with the assistance of ChatGPT, a more precise evaluation of a student’s learning challenges, and progression can be ascertained. This can aid teachers in pinpointing the areas where learners encounter difficulties, allowing them to target interventions more effectively [2].

The deployment of AI for grading short answer responses in an online learning environment has been evidenced successfully in past studies. Furthermore, ithas been argued that an AI-powered automatic grader (to be used to prepare an exam preparation) could potentially serve as a teaching aid for the students and help them achieve higher exam scores. Furthermore, AI graders may contribute to a more impartial grading process. However, it is worth considering that it is essential to study the importance of the grading explanation and transparency of the grading process that these systems are reporting to the students, which may be a pivotal aspect considering both ethical concerns related to the technology and its acceptability. Additionally, since AI systems rely on existing data from prior evaluations for training, they may be suited explicitly for assessing standardized tests, such as nationwide professional education examinations, where data from past tests are abundant and standardized assessment is a priority. However, these systems may be less competent when assessing individual university exams that often undergo annual format alterations and where past evaluation data might be limited. Moreover, deploying AI for evaluating complex assignments might prove insufficient, necessitating that AI grades be calibrated or weighted by considering various variables unique to each assignment. These variables could include the student's independent work and contribution, their comprehension and representation of the existing literature on a given topic, and scenarios with limited training data. A balanced evaluation procedure that synergizes both a transparent or explainable AI system (for perspectives and definitions of explainable AI, see, for example, and human involvement is likely to yield the most favorable results in terms of the quality of assessments and the acceptability of using AI for evaluating student work, at least in the foreseeable future [3].

Because of future AI support, teachers could potentially lessen their workloads, redirecting their primary focus towards crafting innovative lesson plans, engaging in professional development, and offering personalized coaching and mentorship to each student. All these activities are instrumental in enhancing students' learning performance for the skills and challenges of the future. The potential of AI tools extends beyond grading and assessment; they can also be deployed for translating educational materials and fostering interactive and adaptive learning environments. Notably, generative models, such as GPT-4, exhibit substantial promise in these domains. GPT-4 has demonstrated high proficiency in translation tasks, surpassing previous solutions in terms of quality. However, the novelty of this application is partially tempered due to the preexisting success of machine translation technologies, which have delivered satisfactory results in document translation already for several years [4]. Although this is not an entirely new development, it underscores the continuous advancements and improvements in the AI field, specifically in the sphere of machine translation. Envisioning learning materials translated quickly and automatically into several different languages is nowadays a potential perspective in the short term. These improvements hold the potential to further enhance and revolutionize learning experiences by providing precise and efficient translations of educational content. This not only expands the accessibility of materials to a more diverse student population but also contributes to creating more responsive and adaptable learning environments. The realm of individualized tutoring illustrates another dimension where AI

demonstrates its great utility. The AI systems could adapt the instructional approach to accommodate each student's unique learning style and progress.

Additionally, AI systems have seen successful deployments as tutors beyond the traditional academic disciplines, serving as personal mindset coaches. In the context of Adaptive Learning—where education is tailored to accommodate individual learning styles and progress - AI systems can play an instrumental role. It has been suggested that AI can offer a bespoke pedagogical approach finely tuned to each student's specific abilities, interests, and requirements. Such attempts have been reported in the scientific literature, underlining the feasibility and potential of this approach in enhancing learning experiences [5]. Thus, the emergence of AI as a powerful enabler of personalized learning attests to the technology's transformative potential and underscores its capacity to redefine educational experiences. As technology continues to evolve, the integration of AI within education is expected to become more sophisticated and effective.

The advanced features offered by ChatGPT present compelling opportunities for educators to enhance pedagogical practices by conceiving and integrating interactive classroom activities. According to, with the support of ChatGPT, educators are empowered to devise innovative teaching techniques. A case in point is the adoption of the flipped classroom approach, where learning opportunities are not confined to the classroom but extend to remote environments, thus fostering an atmosphere of independent study among students.

Atlas (2023) claims that the capabilities of ChatGPT extend far beyond assisting teachers in creating quizzes, exams, and syllabuses. It is also a powerful tool for producing comprehensive lesson plans, engaging presentations, and other educational resources. This added support allows teachers to adapt and enhance these materials in more dynamic and captivating ways to meet diverse learning needs. With the burden of routine tasks lessened, teachers gain more time to reflect, innovate, and devise new teaching techniques and activities. ChatGPT also serves as a platform for interactive communication, allowing teachers to orchestrate more engaging classroom activities. Teachers can utilize ChatGPT to help generate teaching aids, such as slides that present the expected learning outcomes and the criteria needed to complete coursework [6]. Moreover, the AI tool's ability to quickly generate a more significant number of questions and prompts based on the course materials may serve to stimulate the students' problem-solving and critical-thinking abilities, parts of the learning process that are crucial in the context of modern education.

Challenges and threats posed by ChatGPT in education

While ChatGPT's potential is vast, some concerns regarding the accuracy of its generated content must be addressed. Topsakal and Topsakal (2022) proposed using ChatGPT to generate raw dialogue materials for training course-specific chatbots. Upon verification of the content's accuracy, these materials could then be translated by ChatGPT into a format compatible with AI chatbots such as Google Dialogflow, thus providing students with a personalized and interactive learning environment. While, as discussed earlier, AI tools may help lecturers to decrease their current workload and therefore promote more research and lifelong learning activities (e.g., to improve the overall quality of the teaching and to implement new teaching

methods in the classroom), they could also lead to job cuts or outsourcing to the machines of a large portion of paid employment. The use of ChatGPT in education poses challenges related to its accuracy and reliability. Because ChatGPT is trained on a large corpus of unpolished, raw data, it may not be objective and critical inaccuracies have been reported. The efficacy of generative models hinges on the quality and diversity of the data used in their training. If these training datasets encompass biases, these biases invariably seep into the model. Consider an illustrative scenario where a model is trained using a dataset predominantly composed of essays from students belonging to a specific demographic. This lack of diverse representation may compromise the model's ability to evaluate essays written by students outside of that demographic. The origin of these biases can be traced back to factors such as overreliance on research data sourced from affluent nations or the use of textbooks that fail to address a global perspective [7]. As evidenced by the work of Pavlik (2023), ChatGPT is not familiar with crucial information relevant to evaluating media sources' quality and eventual biases. It has also been found that, in some cases, the information delivered by ChatGPT may be biased politically; as well on religion, race, gender, and fairness (for a review see [8]). However, these biases seem to have decreased in the latest version of the AI tool. In addition, ChatGPT's knowledge is by now limited to data before 2021. Taking into consideration the time required for AI systems to collect data and be updated, some level of delay between when the information is created (e.g., over the internet) and included in the model is also to be expected in the future (although this can be mitigated, e.g., by allowing the model to access information live on the internet, as in the implementation of ChatGPT into Bing or the recently released ChatGPT browsing beta). Therefore, its responses may not always be accurate or reliable, particularly for specialized subjects and recent events. Furthermore, ChatGPT may generate incorrect or even fabricated information, as often reported by both users and the scientific literature, and such issue can be problematic for students who rely on Chat-GPT to inform their learning. However, the problems regarding the false information provided by AI models (often referred to as "AI Hallucinations," see) are probably going to be mitigated in the future, and GPT4 already shows fewer of these hallucinations compared to the previous version of ChatGPT. The complex issue of student plagiarism has become a significant worry within educational institutions due to the widespread use of AI writing tools. The rampant misuse of intellectual property without appropriate citation raises ethical concerns and undermines the academic integrity of the educational process. To combat this, plagiarism-detection applications routinely uncover plagiarized content in student submissions. These software solutions use various methods, from similarity checking to advanced linguistic pattern analysis, to identify plagiarized material (for an in-depth analysis of these tools and their application, refer to). Despite these precautionary measures, recent studies have highlighted an alarmin trend where sophisticated AI models like ChatGPT can successfully circumvent these plagiarism detectors. It appears that ChatGPT, due to its ability to generate seemingly original text, can produce content that appears to be genuinely novel, thereby evading detection by traditional plagiarism software. Exacerbating this issue are findings that even plagiarism detectors designed to flag text generated by AI models might not be entirely trustworthy. Although these specific detectors have shown some promise, they are not infallible and occasionally cannot identify AI-generated content. This

inconsistency undermines the efficacy of these tools, contributing to the increasing complexity of plagiarism detection. This challenge is expected to escalate further as advancements in AI technology accelerate at an unprecedented rate. As artificial intelligence continues to evolve and improve, the capabilities of next-generation models are likely to increase correspondingly, making detecting AI-generated content even more intricate. The emerging sophistication of these models will require developing even more advanced detection tools capable of distinguishing between human-written and AI-generated text. The ongoing arms race between plagiarism detectors and AI technology underlines the importance of cultivating academic honesty and reinforcing the value of original work within educational settings. Further heightening the problem, it has been revealed that students utilizing Chat-GPT for their assignments are more likely to engage in plagiaristic behavior than their counterparts who do not use the tool [9]. The ease with which ChatGPT can produce relatively good-quality text can incentivize students to employ it as a shortcut, thereby contributing to a culture of academic dishonesty. This may compromise the academic integrity of in stitutions and challenge the fundamental objective of assessments, which is to gauge and reflect student learning accurately and equitably. However, it is worth noting that students may want to use AI tools such as ChatGPT not to cheat on an assessment but as a learning tool to learn how to write better essays. Furthermore, they may use the tool to improve the text they have previously written without external aids. For such cases, guidelines and regulations from national authorities are still unclear, and future efforts should be put into establishing what is to be considered a “fair use” of AI tools. A case-by-case evaluation might be more accurate and informative rather than automatically presuming that students use these AI tools to cheat on their academic tasks. One could argue that many students turn to these LLMs not for academic dishonesty but as a platform to acquire better skills and improve their grades. In the rapidly evolving educational landscape where technology has become deeply integrated, students continuously seek efficient methods to enhance their learning outcomes. Furthermore, students might be utilizing AI tools to observe how ideas can be expressed differently or to understand how to structure their thoughts coherently. A notable consequence of ChatGPT’s misuse is creating an unfair academic playing field. Students who use ChatGPT to generate unique content could gain an unfair advantage over their peers who do not have access to it or choose not to use it due to ethical considerations [10]. This disparity can skew grades and academic recognition, undermining the value of hard work and personal effort. Furthermore, there are potential future implications for students unaware of the full capabilities of AI tools like ChatGPT. Such students might inadvertently misuse the tool, leading to unintentional plagiarism. This highlights the need for comprehensive education on the ethical use of AI in academic settings. Perhaps the most alarming aspect of this issue is the impact on educators’ ability to evaluate student performance accurately. When students use AI tools, it becomes challenging for instructors to discern the student’s proper understanding and mastery of the learning material. This can mask learning deficiencies, making it difficult for educators to provide targeted feedback and develop necessary intervention strategies. Consequently, the educational process becomes less effective, and the true purpose of teaching and learning is compromised. Generative models like Chat-GPT, while demonstrating remarkable capabilities in text

generation, do fall short in certain vital aspects when compared to human teachers or tutors. One such area is the lack of humanlike interaction, empathy, and emotional intelligence in these models, which are often crucial in a learning environment. Human teachers can understand and respond to students' emotional states, which can significantly impact a student's motivation and learning outcomes. The absence of this nuanced interaction in AI models can disadvantage students who thrive in unique, empathetic learning environments. Studies have demonstrated that virtual tutors equipped with features enabling a higher level of empathy led to improved learning outcomes compared to tutors lacking such features. This suggests that future AI tutoring systems must exhibit humanlike behavior, including imitating human empathy, to be effectively utilized in teaching tasks. Generative models, like ChatGPT, only rely on statistical patterns learned from the data they were trained on. As a result, these models lack a genuine understanding of the concepts they are helping students to learn. Such limitations can hinder their ability to provide explanations or feedback tailored to students' unique needs or misconceptions. Such tailored feedback is critical to practical education, allowing educators to directly address and correct students' misunderstandings. Generative models operate by mimicking patterns observed in the data they were trained on, which traditionally placed limitations on the originality and creativity of their output. However, a recent shift in the AI landscape has seen the development of models demonstrating behaviors that resemble human creativity. Moreover, emerging research indicates that AI has begun to transcend mere emulation of existing artistic styles and has started demonstrating genuinely creative artistic capabilities. AI tools have been shown to be able to reproduce the styles of iconic artists as well as propose unique and novel artistic expressions [11]. AI's creative reach is not confined to one medium but has spread across various artistic domains, such as music composition and poetry writing. AI-created work has become so sophisticated that it often poses a challenge to differentiate it from human-created counterparts. Furthermore, blind evaluations have revealed that AI-generated artwork can garner high artistic appreciation and value. Therefore, due to its design, the lack of genuine creativity in AI has been shown to imitate human creativity to a higher degree already at the current state of the technology. However, how well such creativity could be adapted and implemented in teaching has yet to be comprehensively investigated. As these advancements continue and the integration of large language models into educational spheres becomes more prevalent, there is an emergent need to address data privacy and security concerns. Student data's sensitivity and personal nature elevate the risk of data breaches, unauthorized access, and potential misuse of data for noneducational purposes. Tlili and colleagues (2023) highlight the confusion that arises from such concerns, citing the example of OpenAI's ChatGPT. According to OpenAI's official webpage, conversations with ChatGPT are recorded and analyzed to improve the model's performance, yet the specifics of storage and use of these conversations are unclear. Interestingly, when the researchers posed these concerns directly to ChatGPT, it contradicted the information on the official page, stating that it does not retain any conversation data. This discrepancy could lead to uncertainty and risk for users, who might unintentionally disclose sensitive information in their interactions with AI models like ChatGPT.

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