Contemporary Educational Technology, 2023, **15**(2), ep421
ISSN: 1309-517X (Online)

OPEN ACCESS

Research Article

ChatGPT in education: Strategies for responsible implementation

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

ARTICLE INFO

Received: 12 Feb 2023

Accepted: 05 Mar 2023

ABSTRACT

Since the launch of ChatGPT for public use, educators have expressed a variety of concerns about its integration into educational settings. This paper has been written to provide an in-depth examination of these issues and explore the potential use of ChatGPT in educational contexts. Specifically, it aims to (i) present an argument in favor of incorporating ChatGPT into education and (ii) provide educators with a set of strategies and techniques to ensure responsible and successful implementation of ChatGPT in teaching or research. By doing so, this paper aims to promote a more informed discussion around the use of ChatGPT in education.

Keywords: ChatGPT, artificial intelligence (AI), education, educational technologies

INTRODUCTION

ChatGPT (ChatGPT Playground) (Chat Generative Pre-Trained Transformer) is an AI-based tool developed by OpenAI, which enables texts generation based on user prompts. It is designed to understand natural language and generate intelligent and relevant responses to user queries. It has been trained on large amounts of data, but models are trained on data until 2021, so they may not have knowledge of events produced after that date (OpenAI, 2022); however, it is expected to be updated soon by OpenAI to reflect up-to-date data. ChatGPT tool has received tremendous attention and, within two months of launching in November 2022, it has reached 100 million users (The Guardian, 2023). OpenAI has announced the launch of a new subscription plan, which will cost $20 per month. Subscribers to this plan will enjoy a variety of benefits, such as having unrestricted access to ChatGPT, particularly during busy periods, as well as quicker response times (OpenAI, 2022). This technology has the potential to revolutionize various activities in educational settings, such as searching for information, answering specific questions, enquiring about any topic; engaging in open conversations and discussions; writing and editing reports and essays; generating software codes; providing tutoring by explaining codes; providing samples of data for databases and analysis; and solving mathematical calculations and statistical analysis, as well as translating texts to other languages. However, there are several concerns associated with using ChatGPT, stemming from its AI-based nature from one hand and its use in education specifically on the other hand; these include potential bias and discrimination due to its reliance on natural language processing; privacy concerns as search and query data may be saved and used for unintended purposes; concerns about job loss (substituting instructors and academic writers), the lack of creativity and critical thinking, as well as inaccuracies and plagiarism (Atlas, 2023; D'Amico et al. 2023; Mhlanga, 2023; van Dis et al., 2023). In this paper, we develop an argument to address the core concerns of using ChatGPT in education with the aim to support using it. Secondly, we propose strategies and techniques to use ChatGPT in a practical and responsible way that does not violate academic honesty.

LITERATURE REVIEW

Due to its novelty, there is limited related research (peer reviewed) on the use of ChatGPT in education, and it is still in its exploration stage at the time of writing this paper (three months after its release for public use). However, this paper presents some relevant articles identified in Google Scholar about using ChatGPT in the education context.

ChatGPT can be a valuable resource in higher education for improving writing, as it can generate texts, summarize information, and outlines to save time and improve the quality of work. Additionally, it can detect grammar and style errors, making written content more comprehensible (Atlas, 2023). ChatGPT can also help students to develop research skills by providing them with information and resources on a particular topic, suggesting undiscovered aspects, and introducing them to new research topics, enabling them to gain a better understanding and evaluation of the topic (Kasneci et al., 2023). Kung et al. (2023) found that it can assist with medical education and clinical decision-making, as it produces accurate answers in medical licensing exams. Rudolph et al. (2023) referred to several advantages of ChatGPT, such as its ability to generate human-like conversations, its speed and efficiency, as well as its cost-effectiveness since no human labor is required.

As with any new technology, especially when the evaluation of knowledge or skills is mediated by technology, there are concerns about its applications and usage. For example, as the case with online learning during the COVID-19 pandemic, doubts raised about the validity of the learning experience (García-Peñalvo, 2023). With using ChatGPT, there are concerns that students may copy and paste texts without critically analyzing what has been highlighted or chosen from a source, without citing the original sources, and without recognizing the potential for plagiarism. This problem makes ChatGPT generated text unsuitable for academic writing (García-Peñalvo, 2023). Issues of plagiarism detection in write-ups generated by ChatGPT have been raised, as well as how to distinguish between fact and fiction text generated (Chatterjee & Dethlefs, 2023; Khalil & Er, 2023). Instructors are increasingly worried that students may use ChatGPT to produce their written assignments, as it has been demonstrated to generate reports in a matter of seconds without being detected by plagiarism detectors. However, Atlas (2023) has argued that it is a myth that disclosing the use of GPT-3 (language model created by OpenAI) would be considered plagiarism, and he indicated that plagiarism actually refers to presenting someone else's ideas as your own without giving proper credit to source. Therefore, when using GPT-3, authors or students should make it clear that the model was used and cite or reference it appropriately.

Khalil and Er (2023) conducted an experiment to determine whether plagiarism detection tools could detect essays written using ChatGPT, and found that of the 50 essays tested, 40 had a similarity score of 20% or less, demonstrating a high degree of originality. Similarly, Susnjak (2022) used ChatGPT in an experiment to assess its ability to engage in critical thinking rather than simply information retrieval, and the results were highly accurate and precise, as well as logically coherent. In contrast, Dowling and Lucey (2023) noted that although ChatGPT has advantages for ideas generation and data identification, it is weaker when it comes to literature synthesis and creating appropriate testing frameworks in the context of finance research.

As a result of the abovementioned concerns, some schools have chosen to block ChatGPT, as students may use it to automatically produce assignments or other coursework (Ropek, 2023). However, attempting to prevent or ban its use will not be effective in deterring students (García-Peñalvo, 2023). Rather, it is anticipated that ChatGPT will become an essential part of the writing process, akin to how calculators and computers have revolutionized math and science (McMurtrie, 2022).

In this paper, we forgo discussing the traditional concerns of AI such as discrimination, bias, privacy, and human substitution, as these topics have been extensively covered in the literature for various AI applications. Instead, we focus on the key debate and concern of ChatGPT in the education context, considering the unique issues related to education concerning authentic learning and academic honesty.

ARGUMENT FOR USING ChatGPT

In order to support the argument presented in this paper, various indicators and facts must be considered. First, experimental research has demonstrated that ChatGPT produces outputs of a high quality that have a high probability of passing plagiarism detection software (Khalil & Er, 2023; Susnjak, 2022). Secondly, AI

contents detector tools exist, which can detect with high degree of accuracy whether text has been generated by a human or an AI such as one used by OpenAI (classifier) and many others. For example, recently in February 2023, Turnitin (2023) announced that it developed an AI tool that identifies 97% of ChatGPT and GPT-3 authored writing. Thirdly, ChatGPT tool is easily accessible to everyone, thus increasing the likelihood that students and faculty may make use of it. As revealed, the number of users who subscribed/created an account in just three months exceeded 100 million (The Guardian, 2023), signifying that the tool may soon become ubiquitous, similar to how mobile phones are today. Consequently, universities should take a proactive rather than a reactive approach, and adopt AI technology in the realm of education, learning, and assessment. Universities should strive to revamp their perspectives on education. The introduction of ChatGPT in the education field has caused a drastic shift in the landscape. During the COVID-19 pandemic, universities developed new policies to respond to the change in the environment and set controls for using the new technologies for online learning and proctoring software for exams. Similarly, with this new disruptive technology (ChatGPT), universities should not prevent or ignore its use. Rather, regulate and utilize it responsibly.

While there are general concerns about the use of AI technology, there are also specific worries about the use of ChatGPT particularly in educational settings, which are related to plagiarism and academic honesty, when it comes to writing reports, essays, theses and software codes. We categorize the core concerns into two main issues to understand the roots of these concerns as follow:

Concerns Stem From Text Generation

Obviously, ChatGPT can be very useful as it can help to save time and effort in quickly generating texts that would otherwise take a long time to create by human. There should be no worries to be expressed regarding its efficiency in generating texts or its capacity for discovering, summarizing, writing and editing texts (in English, for instance, which is the most widely-utilized language in the world). To illustrate, let us consider Google, which is employed for finding hyperlinks for electronic documents and information in one click, and is more effective and efficient than traditional methods such as searching libraries and reading printed books, magazines and newspapers. Additionally, MS Excel has been used to assist with calculations, sorting and filtering data, and no issues have been raised about its utilization in a plethora of educational disciplines as it reduces the amount of time and energy required to perform these tasks manually. Similarly, ChatGPT can be a useful assistant tool with capabilities that surpass those of Google and MS Excel, for example. Using a tool like ChatGPT to aggregate and summarize information is beneficial as it saves time, energy and effort that would have otherwise been spent on searching hundreds of webpages and databases, downloading files and filtering them.

Furthermore, the issue of writing and editing texts in English should not be a major concern, as the main focus of courses or academic programs is not to improve English writing. Most universities around the world enforce a minimum English level (e.g., IELTS score 6 or 6.5) to enroll in courses, so students have already met the requirements. On the other hand, students can still consult proofreaders even without using ChatGPT hence editing and phrasing texts are not a concerns if they are completed using such tools. Universities and faculties should not be concerned with the use of ChatGPT to generate, edit, or paraphrase texts as this does not assess students' learning and competencies in fields such as computing, mathematics, art and design, medicine, or any other field. This is not to say that students should not have English skills; there are minimum levels required before joining any academic program, and once this stage is passed, students can use the tool to help with text editing and improving their writing. For English courses, it is important to ensure real-time writing of essays and reports (on paper) to meet the required skills for that subject, but this is not necessarily required for other areas of study or throughout their career after graduating. Rather, educators should focus more on developing their students' skills in presentation and defense, evaluating information, correcting information and referencing work, and for developing new creative ideas as will be discussed in the next section.

Although English writing is still important for communication, the skills required for success in the 21st century have expanded beyond the traditional skills. Dilekci and Karatay (2023) emphasize that the technological advancements in the information age necessitate students to possess 21st century skills such as

critical thinking, problem solving, creative thinking, cooperative working skills, and technology skills including digital and information literacy.

Students can now apply reverse searching with help of tools such as ChatGPT, which is faster and more efficient. Reverse searching is a new concept we introduce here, which through students try to use outputs to find out supporting evidence and references for text generated by ChatGPT. Students should be equipped with the skills to choose the right questions and keywords, evaluate and compare results and references, and make judgements.

Concerns Stem From Ideas Generation

Critical thinking and originality of ideas are essential components of genuine learning or research. Plagiarism involves taking someone else's work or ideas and presenting them as one's own, without giving credit to the original source or author. Thus, if a student or academic writer utilized ChatGPT to produce an essay and gave proper credit for the ideas sourced through reverse searching, this would not be considered plagiarism. Students or researcher or academic writers can still plagiarize work even without ChatGPT, but what is different now is that they can do it much faster. This, however, is no excuse to avoid using ChatGPT. It all comes down to how it is used by users (students or faculty). If they are properly informed and educated on how to use it responsibly, it will not be considered as plagiarism. However, without using ChatGPT, one could still write an assignment report or paper that could include ideas taken from others without it being detected. Therefore, to explicitly identify others' ideas and ideas that were developed or extended by student or researcher, a system should be put in place. Interestingly, this becomes possible with ChatGPT, as the outputs and queries used can be saved and tracked and downloaded. Furthermore, ChatGPT can be used to find all potential ideas/issues related to one subject, which can be identified by a majority of students and repeated. This enables instructors to quickly identify any new, original ideas or arguments that have not been repeated and identified by the tool. Moreover, allowing everyone to use the tool provides a level playing field, helping to identify who has developed the most interesting ideas or done the most in-depth research on a particular topic (if the same topic is assigned to all students). Students must go through multiple queries to obtain full and relevant information, requiring them to develop the necessary skills to produce satisfactory outcomes. When the tool does not produce the desired results, students must document the cases and explain how they adjusted the parameters until the topic was refined. An audit trail must be included in the report, containing a record of the questions asked, the generated texts (answers), and the reflections on how the process was conducted; demonstrating the effort taken to produce useful and relevant results. Additionally, any original ideas must be reported in a separate section.

Considering the above arguments, texts and ideas can be generated by human (i.e., students, researchers), or by an AI tool, or by a human-AI tool collaboration. The latter provides higher quality outputs and efficiency. This paper suggests that educators should encourage the use of human-AI tool augmentation for performing tasks such as finding information and ideas, editing texts and improving writing. By combining ChatGPT and human authors, the output is superior in terms of creativity, originality, and efficiency than if either one was to work alone. AI-generated texts alone lack originality and violate academic honesty standards. Similarly, while traditional human-authored texts and ideas can still be practiced, they may not be efficient and original. ChatGPT enables the identification of a large number of ideas around one topic that already published and stored in databases and found by ChatGPT, making it easier for humans to determine if their ideas are original or already exist, and also build up on existing ideas, and this can be done in a super-fast way. AI can assist in augmenting human capabilities through hybrid human-AI collaboration in the context of learning.

By utilizing the intelligence of both humans and AI, tasks can be distributed in such a way that is more intelligent than either entity could achieve on its own (Molenaar, 2022). However, it is important to mention that human-AI collaboration is achieved at two levels: ideas generation and development, texts editing and paraphrasing, and this augmentation and collaboration should not mean that human writes some texts and AI tool (e.g., ChatGPT) writes some others texts. We consider texts produced by ChatGPT as one page in an article, report, or webpage. This page (ChatGPT output) will have a lot of generated ideas and texts, which must be referenced. Someone has pointed out that the ChatGPT algorithm has found, aggregated, summarized, and presented these ideas and texts. Thus, any chunk of texts and ideas taken from ChatGPT

output should be paraphrased and referenced to sources. Failing to do that should be considered plagiarism and violating academic honesty.

To summarize, ChatGPT can be used to generate ideas around one topic and get familiar with aspects and issues of topic or problem or generate possible codes for application program but produced texts should not be considered someone final output. Reverse searching should be used to find more about the issues and ideas found and cite them properly. Also, the tool can be used to paraphrasing texts and checking English writing and provide suggestions for improvement.

Strategies and Techniques to Support Using ChatGPT in Education

The section proposes five essential strategies and techniques that should be implemented simultaneously when ChatGPT is used by students. These ensure transparency, creditability, and academic honesty, and authentic learning.

Policy for ChatGPT

Faculty should explicitly state in the course syllabus or assessment (e.g., project or assignment) that ChatGPT can be used and even encouraged to be utilized. The policy should explain the purpose of using the tool, as well as provide clear instructions and guidelines for its use. The following basic policy has been developed based on author's experience of using the tool, and experience of crafting academic policies.

1. ChatGPT is an AI-based tool that helps you generate texts in a very short amount of time, making it easier and more efficient to search for and find summarized information and ideas related to the subject of interest, and to improve your writing.
2. You need to examine and evaluate the information generated by ChatGPT, as it may produce irrelevant or inaccurate information. You need to check the source of the information and cite it properly. Texts generated by ChatGPT copied and submitted as your final writing is considered plagiarism.
3. You should explicitly acknowledge the assistance of ChatGPT in the creation of you work (sections or parts included ideas/issues initially identified via ChatGPT, or tasks achieved such as editing and paraphrasing, or calculations)
4. When submitting your final report, you should provide two files: an audit trail of queries and a reflection report/note.
5. All reports and assignments created with the help of ChatGPT will be evaluated through viva and presentation to ensure comprehension and understanding of the topics and issues, defending ideas or proof of understanding of program codes, and you should be ready for any questions or adjustments requested by the instructors in real-time during presentation.
6. As students might be asked to write a report on a single topic or program code for an application, it is expected that there may be some degree of similarity between student reports. However, in all cases, students must ensure that their work has a low percentage of similarity (as per the university policy) and is free of plagiarism. Furthermore, the contents of the report must be largely generated by human (taking into account the tool used for editing and paraphrasing), not AI-generated; this can be verified by using AI content detection software tools.
7. The instructor will carefully inspect any texts that are suspected of plagiarism or have been generated largely by AI, as indicated by detection software, and make a judgment on such cases to take the most appropriate action, taking into consideration the context of the course and the specific assignment.

Reflection note/report

Students should document the steps of writing a ChatGPT supported report/text, including any odd things found, contradictory findings, texts without references, new ideas or developments, ideas that already exist and how the student has built upon them, and any judgments made by the student that ChatGPT did not support with an answer. In the case of program code generation, students should demonstrate their adjustment/improvements of the code and be prepared to show a real-time demonstration of their understanding of the code, if asked to do so by the instructor.

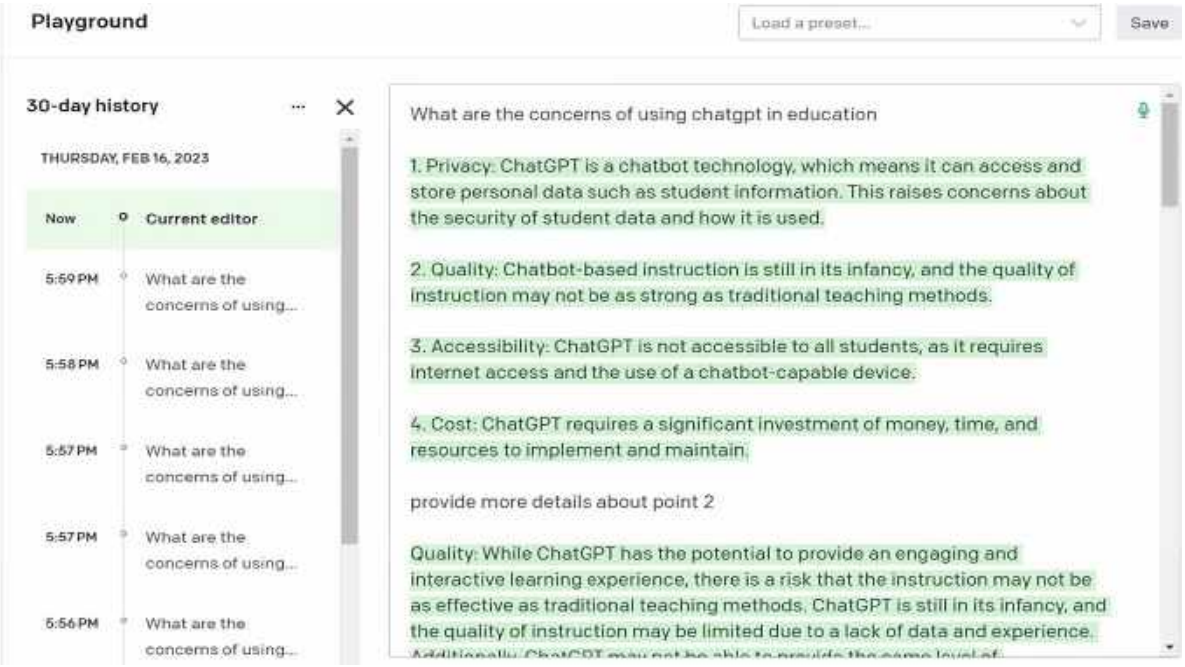

Figure 1. ChatGPT output-1 (Source: Authors, using ChatGPT Playground)

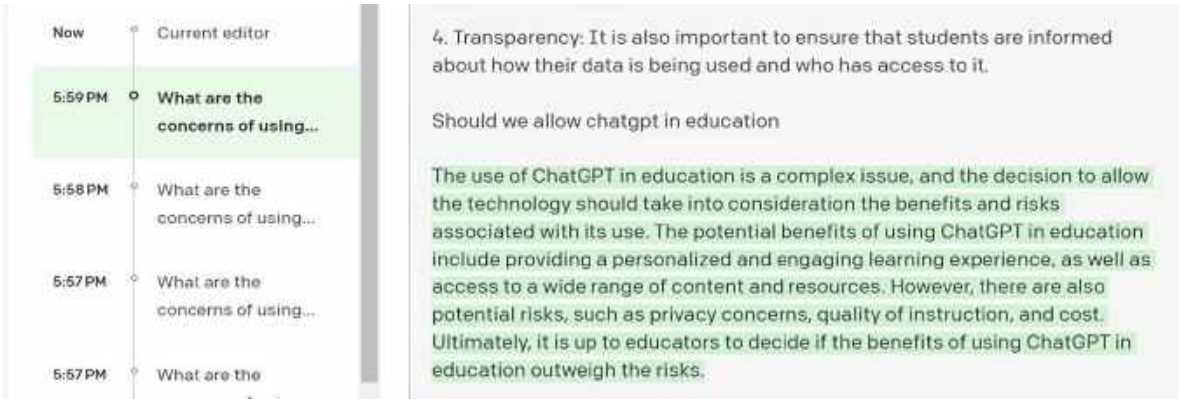

Figure 2. ChatGPT output-2 (Source: Authors, using ChatGPT Playground)

We suggest that reflection note to be short, concise and precise. In this paper, for example, when ChatGPT was asked to explain what ChatGPT is, it responded with the incorrect abbreviation (conversational graph parsing transformer) resulting in its rejection. This paper was started with general idea about the concerns of using ChatGPT, and provided several concerns, which are basically related to technology or AI or Chatbot in general, as shown in **Figure 1**, this included issues of privacy, cost, quality, and transparency.

When asked ChatGPT "should we allow ChatGPT in education" the topic of this paper, the answer was that is complex and concluded that is up to educator and just presented briefly benefits and risks (**Figure 2**) so it did not provide clear decision or argument for supporting its use, which this paper seeks to answer.

Also, when asked ChatGPT to provide references, it returned references to websites (as shown in **Figure 3**) but not journals, so we asked ChatGPT again to provide journal references as appeared in **Figure 4**. However, the journal references were not exactly related to ChatGPT as it is known that ChatGPT released in November 2022, so the references are not relevant to ChatGPT as it comes after references publication date (2020). Furthermore, the references were not accurate as for example, we checked the first reference as shown in **Figure 4** "1. Cruz, C., Silva, L., & Oliveira, R. (2020). Chatbot-based education: A systematic review and synthesis of current practices. Journal of Educational Computing Research". We did not find this in Google, Google Scholar, and even the journal search webpage, and even each issue (six issues of the mentioned journal) did not have such publication. In this paper, the identified concerns were very general and not related to ChatGPT or education. For example, plagiarism was not mentioned at all (in ChatGPT output) so the point

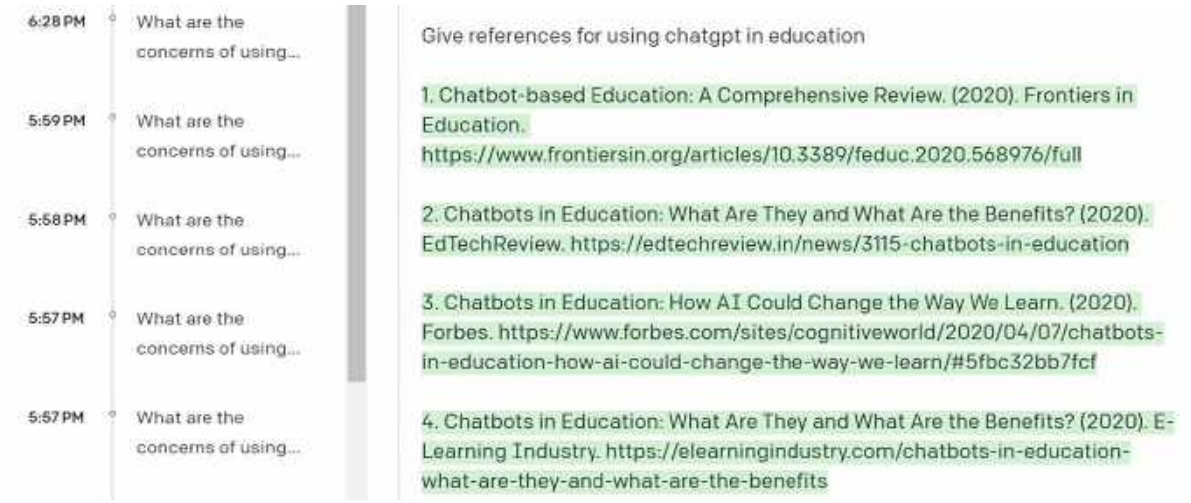

Figure 3. ChatGPT output-3 (Source: Authors, using ChatGPT Playground)

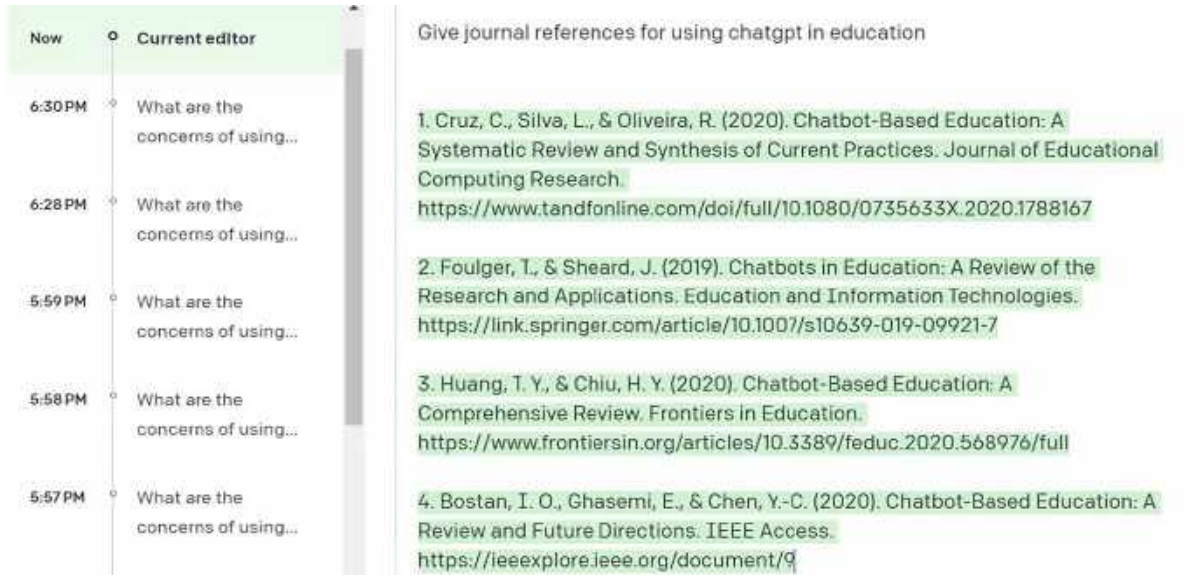

Figure 4. ChatGPT output-4 (Source: Authors, using ChatGPT Playground)

that we have retrieved all papers related to ChatGPT from Google Scholar and reviewed them manually and no text was taken from ChatGPT related to literature review section, considering that also that all references and contents published after the release of the ChatGPT tool. However, some issues such as privacy and bias were found (in ChatGPT output) and they were supported with references (reverse searching) to support the issues in the context of ChatGPT concerns in education.

As stated before, the tool can be used to paraphrasing texts and checking English writing and provide suggestions for improvement (see example in **Figure 5**).

In the current paper, we developed argument and new concepts. For example, we conceptualized the argument into concerns related to text and ideas generation, which are new conceptual development, and these are our original ideas, we inherited concepts such as audit trail (next section) from qualitative research, which is not part of the search questions nor the answers and not even stated in the literature in the context of ChatGPT but it would be employed when using ChatGPT. We also developed concepts such as reverse searching, which is a new concept here as it was not mentioned before where from summarized and refined information we search for references and citations to support it. Also we developed a policy for using ChatGPT. All these ideas and contributions are not part of the outputs produced by ChatGPT, nor mentioned or discussed in the literature.

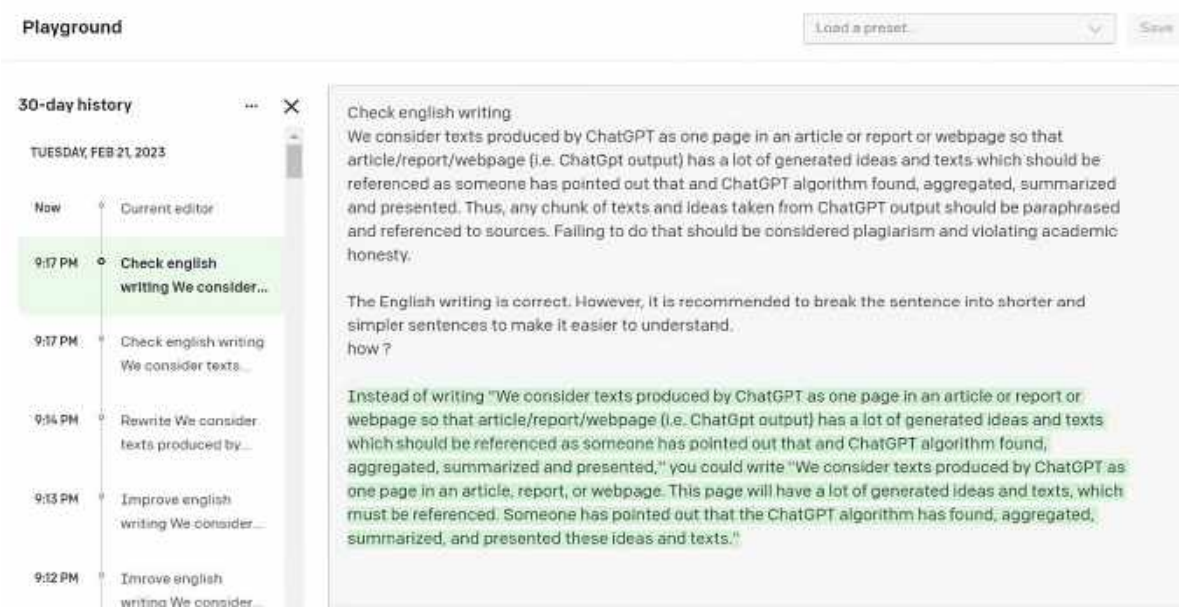

Figure 5. ChatGPT output-5 (Source: Authors, using ChatGPT Playground)

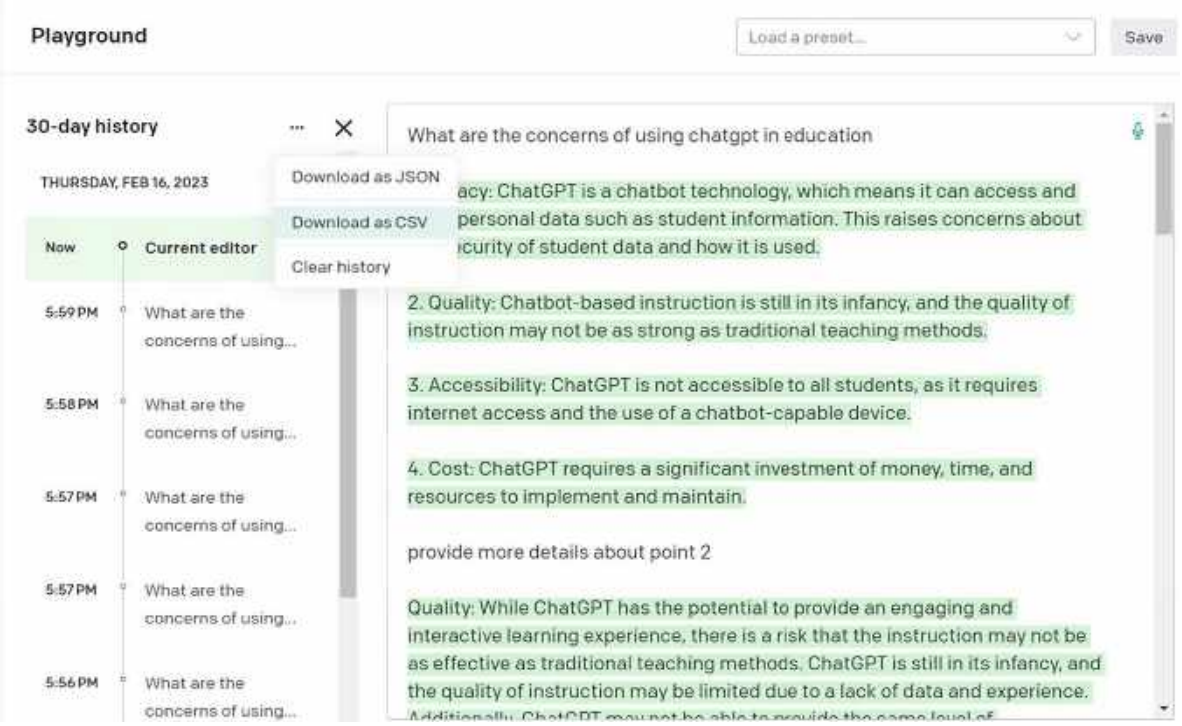

Figure 6. ChatGPT output-6 (Source: Authors, using ChatGPT Playground)

Audit trail of queries

Students should provide records of questions and queries asked and answers and these can also be downloaded in excel format from ChatGPT, as shown in **Figure 6** (download as CSV file), or screenshots including questions and answers are provided. These will ensure transparency and credibility when evaluating the ideas, as they will help differentiate between the ideas generated by ChatGPT and those that have been developed independently by students.

Use AI detector tools

Instructor and students need to check the final work using reliable AI contents detector tools. These tools inform if the content was created by human, or AI and human, or human. Some tools provide percentage of

probability producing the contents by human or AI. However, the results produced by these tools need to be interpreted carefully like contents similarity/ plagiarism detection tools produced by Turnitin.

Swap roles

Instructor can swap role with students in order to evaluate the authenticity of learning and critical and creative thinking. The instructor could generate texts for one assignment topic using ChatGPT, and the students are required to evaluate the text (i.e., information), check accuracy, criticize it, search for more relevant texts, synthesize it, and build on it. This technique can be used as an effective way to assess the critical/ creative thinking and ensure authenticity of learning. Additionally, other strategies and techniques should also be implemented when this role is swapped.

DISCUSSIONS AND CONCLUSION

As ChatGPT is still emerging tool, many faculty members and students may not be aware of it or have only heard of it without trying or exploring it. To ensure they are able to utilize the tool properly, training should be provided to educate them on its functions, how to evaluate accuracy and information, and how to track queries as outlined in the paper. Additionally, they should be informed of the distinction between text generation (which focuses on proper English writing and editing and paraphrasing) and idea generation (which concentrates on creating new concepts and synthesizing them as well as making judgments).

This paper suggested that educators should allow the use of ChatGPT and initiate its use, as students are likely to use it regardless. Allowing students to use the tool gives them an equal chance to develop ideas and improve their writing, as it is encouraged by the faculty. By doing so, instructors can identify students who have put in more effort and generated more ideas or developed new ones than others. Currently, the tool is free, but if OpenAI decides to set fees and subscriptions, universities might provide it at no cost to students, and potentially integrate it with a learning management system (e.g., Moodle) as one of the resources required for education. It is anticipated that OpenAI's further development of ChatGPT will result in more sophisticated models and features as well as a higher level of accuracy due to the advancements in AI technology. OpenAI could create a specialized version tailored to academia (ChatGPT Academia). This version would contain customized functions and features related to academic contexts and needs, similar to Google Scholar.

ChatGPT will foster creativity and innovation through the contrast between what it has generated and what has not been produced by the tool. Everyone can access ChatGPT and review its output, but original ideas can still be identified as being generated by humans so it can be identified if we know too much about a topic from ChatGPT. This creativity can also be assessed through reflection notes discussed previously, viva, and presentations, which are essential for gauging understanding of a topic and discovering original ideas from simply memorizing and summarizing information identified.

The education field is undergoing rapid transformations due to the emergence of new technologies (ChatGPT) and the resultant demand for a different set of skills than those of previous generations. Students will be expected to demonstrate more critical thinking in their evaluation of information, as well as to develop and present new ideas. Moreover, presentation skills will be essential for successful learning and for defending one's work, both of which are necessary competencies for the real world of work. Presentation/viva and defending one's work will become standard assessments in the educational environment, in order to verify the learning specially when assessment are done in collaboration with ChatGPT.

Finally, this paper provided practical examples of the utilization of ChatGPT for academic writing. The techniques proposed in this paper may be adopted for the purpose of academic research and publication by journals. Universities and instructors are encouraged to consider the suggested policy, modifying or extending it to fit the individual needs of their institutions and courses.

Funding: The author received no financial support for the research and/or authorship of this article.

Acknowledgments: ChatGPT was used to generate texts regarding the use of this technology in education. This was done to gain an understanding of the existing issues related to the subject of the current research. However, since the technology is new, no relevant results found, and the texts included just an overview of concerns of AI in education. All unique ideas were developed, literature and references were used in this paper, without the aid of ChatGPT. ChatGPT

was mainly used for editing the author's generated text, checking and improving English writing, and formatting references according to APA style. This paper has been verified as having 0% similarity in Turnitin and is guaranteed human-generated texts (by the author), as identified by AI content detection software.

Ethics declaration: The author declares that ethics approval was not required for this research as it does not involve human or live subjects.

Declaration of interest: The author declares no competing interest.

Data availability: Data generated or analyzed during this study are available from the author on request.

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