Impact of ChatGPT on Student Writing in Construction Management: Analyzing Literature and Countermeasures for Writing Intensive Courses

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On November 30, 2022, OpenAI released ChatGPT. This paper conducts a comprehensive literature review of the current state of its application in construction writing and the regulations of academic institutions. It explores ChatGPT's potential uses and risks as an educational tool to improve construction management writing skills, emphasizing the need for clear usage guidelines to maintain originality and critical thinking in students' work. The study also includes a survey of 110 students from the Department of Construction Management at East Carolina University participating in two writing-intensive courses, to assess their use, attitudes toward ChatGPT and its influence on their writing proficiency. The results suggest that ChatGPT is likely to positively impact students' writing skills, boost their self-confidence, and enhance the overall learning experience if clear guidelines are regulated and implemented.

Key Words: ChatGPT, AI Writing, Construction Management, Integrity Policies, Critical Thinking

Introduction

In recent years, the emergence of advanced natural language processing (NLP) technologies has dramatically changed all aspects of education, including writing-intensive programs. Among these transformative technologies, ChatGPT, developed by OpenAI, has pioneered language modeling for its ability to generate coherent and contextually relevant text. It can be used to draft emails, provide customer support through chatbots, generate content for blogs and articles, draft resumes, assist in coding and programming tasks, summarize lengthy texts and documents, and offer creative writing assistance and prompts, among others. Some studies have shown that it even has the ability to earn a college degree (Choi, Hickman, Monahan, & Schwarcz, 2023). Since its release on November 30, 2022, ChatGPT has experienced explosive growth. As of November 2023, ChatGPT had around 180.5 million users. Reports suggest that about one-third of college students are using it (Intelligent, 2023). At the same time, a plethora of related tools have sprung up at a rapid pace. For example, Chatbot Integrations, AI Writing Assistants, Coding Assistance Tools, and Content Creation Tools.

ChatGPT is not alone. AI Writer, ChatPDF, ChatDoc, Paper Digest, Gamma, Scholarcy, and TXYZ are just a few examples.

Many scholars have provided insights into the potential use of ChatGPT as an educational resource and the associated risks. However, of all disciplines, engineering has the lowest number of relevant papers (Imran & Almusharraf, 2023) not to mention architecture. And within this relevant literature, survey data is even scarcer. The ChatGPT covered in this article is based on the Generative Pre-trained Transformer version 3.5 (GPT-3.5). Literature includes journal papers, conference publications, and a few online articles that are obtained from the following databases: IEEE Xplore, Scopus, Web of Science, and Google Scholar. Each of these databases uses ChatGPT, writing, and construction as search strings to search for papers that contain these terms in the title, abstract, or keywords. The publication period was designated as 2022-present.

ChatGPT's Academic Applications and Risks

Construction management education is a specialized field that requires students to develop strong written communication skills. The American Council for Construction Education (ACCE) outlines 17 Student Learning Outcomes (SLOs) for construction education programs. The first of these SLOs, i.e., SLO-1, emphasizes the ability to "create written communications appropriate to the construction discipline." This learning outcome focuses on ensuring that students can effectively convey ideas, plans, and concepts through written means, which is a critical skill in the construction industry for clear and precise communication (Accreditation of Construction Education (ACCE), 2023). The ability to communicate effectively in written form is essential for success in the construction industry, as it is necessary to convey complex information to various stakeholders, including clients, contractors, and regulatory bodies. However, students often struggle with writing assignments, particularly those that require critical analysis and technical writing skills. In this context, ChatGPT can provide valuable support to students in generating content, refining grammar and sentence structure, and improving their overall writing style.

Scholars generally recognize the role of AI tools such as ChatGPT as an aid in improving the efficiency and quality of writing. For example, assisting in literature search, data management (Chen, 2023; Huang & Tan, 2023; Nguyen, 2023; Salvagno, Taccone, & Gerli, 2023; Shah, 2023), reviewing and correcting grammatical errors (Choi et al., 2023; Farhat, Sohail, & Madsen, 2023; Fitria, 2023; Hargreaves, 2023), speeding up writing, developing outlines, adding details, and helping to improve writing style (Huang & Tan, 2023; Lund, 2023; Yan, 2023).

Despite the many potential benefits of using ChatGPT as a writing support tool, scholars have also commonly expressed concerns about using ChatGPT. One of the primary concerns is the potential for plagiarism and loss of originality. As ChatGPT is trained on a vast corpus of texts, there is a risk that students may simply replicate the language generated by the AI model, rather than engage in critical thinking and developing their own unique ideas. Scholars believe that students completing writing tasks by resorting to ChatGPT may make them lazy to think turn to steal others' ideas directly (Baidoo-Anu & Owusu Ansah, 2023; Fitria, 2023; Huang & Tan, 2023; Sallam, 2023). Once this is condoned, it is conceivable that students' ability to write, think critically, and make independent judgments about the quality of their writing will be drastically diminished (Kasneci, Sessler, Fischer, Gasser, & Groh, 2023).

Second, ChatGPT has limited up-to-date knowledge; it does not include information beyond 2021. This causes it to be ignorant of what has happened in the last two years (Baidoo-Anu & Owusu Ansah, 2023).

Also, there are concerns about the accuracy of ChatGPT's information because it is unable to distinguish between factual, fictional, and unreliable information, and may even fabricate answers (Baidoo-Anu & Owusu Ansah, 2023; Dergaa, Chamari, Zmijewski, & Ben Saad, 2023; Sallam, 2023; Shah, 2023). Farhat clearly states that ChatGPT should not be used for bibliometric analysis at this time (Farhat et al., 2023). Such incorrect or even illogical answers can in turn perpetuate privacy, security (El-Seoud, Ayman, Nagaty, & Karam, 2023; Nguyen, 2023; Ray, 2023), and social biases, such as racial, gender, and cultural biases (Fitria, 2023).

To address these concerns, scholars have proposed many strategies to deal with them. For example, plagiarism detection software can be used to ensure the originality of an article (Huang & Tan, 2023); information can be reviewed and verified through multiple sources of information (Ge & Lai, 2023; Huang & Tan, 2023; Kasneci et al., 2023) reshaping the honor code to standardize the use of language models (Choi et al., 2023; Dergaa et al., 2023; Khalil & Er, 2023; Perkins, 2023; Rudolph, Tan, & Tan, 2023), as well as providing appropriate training in their use (El-Seoud et al., 2023). In addition, it has also been suggested to increase manual review to prevent plagiarism (Belagere, 2023; Sallam, 2023). This is highly dependent on how well teachers know their students. Teachers need to be familiar with students' knowledge levels, language patterns, and idiomatic expressions.

University Policies

Over the past year, many academic institutions have acted to respond to the academic risks associated with student use of ChatGPT with policies. The authors searched a total of 55 well-known universities, including the United States (28), the United Kingdom (5), France (3), China (10), Australia (3), Japan (3), South Korea (2), and India (1), for their current published policies on the use of ChatGPT. Due to space limitations, only a brief introduction is given here.

Among the 55 universities, 15 universities have not yet made a clear stance. Among the 40 universities that have made their stance clear, all universities in China will allow the use of ChatGPT after August this year; the vast majority of universities in the United States recommend that faculty and staff control the use of ChatGPT in their course syllabus according to the situation; Japan and the United Kingdom have also lifted the ban on ChatGPT; Australia is expected to lift the ban in 2024; while India and France still be conservative.

In terms of specific implementation, some colleges prohibit students from accessing ChatGPT (Dibble, 2023) while some colleges do the opposite by encouraging students to embrace AI tools like ChatGPT or even providing technical support for students. For example, the University of Michigan developed an AI writing tutor, M-Write, to provide students with feedback on their writing. Table 1 provides the attitude of some of the reputed institutions towards ChatGPT as of date (October 2023) and the response time. Institutions with uncertain attitudes or those with only some departments taking a position are not included in this table. It is worth noting that after a period of caution, many colleges are updating their policies. This article references their most recent policies.

Upon compiling the regulations of numerous institutions regarding ChatGPT use, the authors discovered that as time passes, an increasing number of universities are lifting their bans on the app. Additionally, the debate in these universities has shifted from whether or not to forbid ChatGPT to

how best to regulate its use. Even training courses using ChatGPT have started to be delivered in several colleges (Office of Community Standards, 2023). The phrase "AI era" has started to be used widely at universities to describe current affairs. To address the potential risks associated with ChatGPT, some universities limit daily access to ChatGPT (The University of Hong Kong (HKU), 2023), some limit usage scenarios (Kelley & Chronicle, 2023), and more colleges empower faculties with the final say on the use of ChatGPT while the officials merely provide technical and case support (Eberly Center, 2023).

Research Approach

This study used a questionnaire in the Likert scale to understand students' understanding, usage, and attitudes toward ChatGPT. The design of the questionnaire followed the Five-point scales of the Likert scale, that is, Strongly Agree - Agree - Neutral - Disagree - Strongly Disagree. Since there were many questions, the options were assigned values for convenience during statistical analysis. That is, Strongly Disagree is scored as -2, Disagree is scored as -1, Neutral is scored as 0, Agree is scored as 1, and Strongly Agree is scored as 2. Higher scores meant that students agreed more with this view.

This study selected a total of 110 students from 5 classes participating in intensive writing courses in the Department of Construction Management of East Carolina University (ECU) to participate in the survey. These students come from the second and third years of college and have a certain understanding of writing tasks in the field of construction. The survey was released in class by the instructors of the writing courses. The survey has 19 multiple-choice questions and is expected to take 5-8 minutes to complete. The questionnaire is open for 10 days, so students' learning progress is basically the same, and its impact is negligible. The questionnaire is anonymous.

The questionnaire explored the following five aspects: (1) ChatGPT Usage, (2) ChatGPT's Benefits, (3) ChatGPT's Drawbacks, (4) Students Attitudes, and (5) Integrity Policies. The 19 questions are summarized as follows:

- Have you ever heard of ChatGPT?
- Have you used ChatGPT?
- Have you used ChatGPT as a writing aid for your course assignments?
- Is writing a challenging task for you?
- Do you think ChatGPT can relieve the stress that writing assignments bring you?
- Do you find ChatGPT helpful in generating ideas for your writing assignments?
- Has ChatGPT helped you with proofreading and editing your written work?
- Do you believe ChatGPT has helped you better understand writing concepts or techniques?
- Do you think ChatGPT has significantly saved you time when working on writing assignments?
- Do you verify the content generated by ChatGPT against reliable sources?
- Have you ever encountered challenges in integrating ChatGPT-generated content into your own writing seamlessly?
- Do you think using ChatGPT has had any negative impact on your creativity as a writer?
- There are obvious disadvantages to using AI tools for writing assignments.
- Can you distinguish between ChatGPT-generated content and human writing?
- Do you believe using ChatGPT has improved your overall writing skills?

- Has using ChatGPT made you more confident in your writing abilities?
- The University Academic Integrity Policy is unclear regarding the extent of permitting and incorporating ChatGPT tools on writing assignments.
- If ChatGPT were properly regulated by teachers, do you think it would significantly help improve your writing skills or learning outcomes?
- Do you think ChatGPT should be banned from writing-intensive courses?

Results and Discussion

This study received a total of 73 responses. The survey results are summarized below (see figure 1). Given space constraints, the display of questions is incomplete. Please refer to the previous section for a complete list of questions.
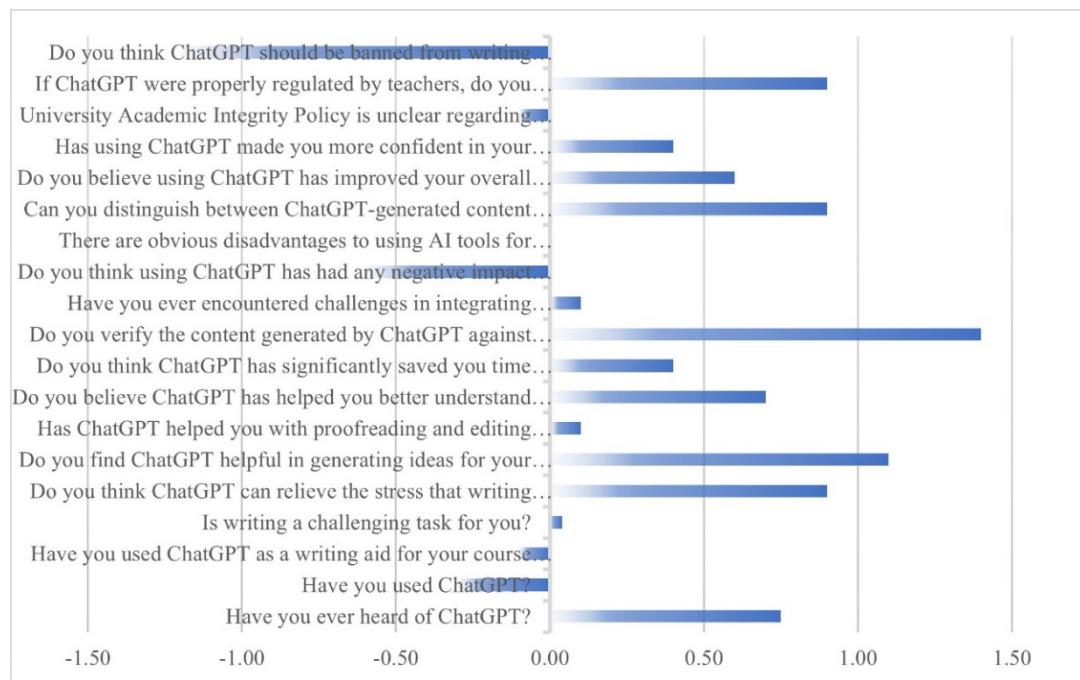

Figure 1. Questionnaire results

ChatGPT Usage

1. 88% of students have heard of ChatGPT.
2. 35% of students have used ChatGPT and 65% have not. 45% of students who have used ChatGPT use it as a writing aid.

It can be seen that the understanding and use of ChatGPT by students in the Department of Construction Management of ECU is in line with the average level of use by one-third of students in U.S. colleges and universities (Intelligent, 2023).

ChatGPT's Benefits

1. 60% of students believe that ChatGPT can reduce the stress of writing tasks to a certain extent, and the other 40% of students are neutral.
2. 80% of students believe that ChatGPT is helpful in providing writing ideas.
3. 50% of students do not use ChatGPT for writing polish.
4. 60% of students believe that ChatGPT can help them understand and master writing concepts and techniques.

It can be seen that students highly recognize the role of ChatGPT in providing writing ideas, but it does not help them much in correcting errors, polishing, learning writing skills, and overall easing the challenge of writing tasks. Whether this is due to a lack of understanding is open to further research.

ChatGPT's Drawbacks

1. 82% of students believe that writing assignments are challenging, but 60% of students believe that ChatGPT cannot significantly save time spent on writing assignments.
2. All students spend time on confirming the content generated by ChatGPT, and 50% of them think it is necessary to always check.
3. Students were generally neutral on the difficulty of integrating ChatGPT-generated content into their own writing.

It can be seen that students are wary of the content generated by ChatGPT. They believe that it is not difficult to seamlessly integrate the content generated by ChatGPT, but it is necessary to confirm the content. Overall, most students believe that ChatGPT cannot significantly speed up their writing tasks.

Students Attitudes

1. Students do not agree with the view that ChatGPT has a negative impact on creativity. Among them, 40% of students chose to oppose and 60% chose to be neutral.
2. Students' overall attitudes toward the disadvantages of using AI tools in writing assignments are very varied. The number of people in favor and against was exactly the same.
3. Students generally feel confident in distinguishing content generated by ChatGPT. Only 10% of students thought they could not tell the difference at all.
4. 60% of students believe that using ChatGPT can help improve their overall writing skills.
5. However, only 40% of students believe that using ChatGPT improves their confidence in writing tasks.

It can be seen that students are not very enthusiastic about the help provided by ChatGPT, but they also do not agree with scholars' common concerns that ChatGPT harms creativity. They believe that the content generated by ChatGPT is significantly different from the content generated by humans, and this content does not significantly improve their writing results for them.

Integrity Policies

1. 30% of students believe that the integrity policy provided by ECU is clear while 40% of students are opposed to it.

2.   60% of students believe that reasonable standards can significantly improve writing learning outcomes.
3.   No students believe ChatGPT should be banned.

It can be seen that under the current circumstances, students' demand for ECU to adjust ChatGPT-related policies is not urgent. However, no students agreed to ban the use of ChatGPT in writing.

In general, students currently don't know much about ChatGPT, and students who try to use ChatGPT in writing assignments have not become dependent on it. On the contrary, they only highly recognized some of ChatGPT's functions, such as providing writing ideas, while other functions were of little help. In addition, they do not fully trust the content generated by ChatGPT. They generally spend a lot of time examining the content it generates and believe it is significantly different from content produced by humans. At the policy level, students recognize that more reasonable ChatGPT usage regulations can bring significantly improved learning outcomes, and firmly believe that ChatGPT should not be banned.

Conclusion and Future Work

This paper contributes to the current discussion and evolving dialogue around the integration of AI Technologies into educational settings with a specific focus on construction management courses that are writing intensive. After reviewing the policies of 55 globally recognized colleges and universities in response to the ChatGPT, this study explores the role of AI tools like ChatGPT in building writing courses from the perspective of students, especially in the context of standardizing writing-intensive courses such as construction management. This article advocates for a proactive stance in utilizing ChatGPT as an aid in writing while simultaneously quickly addressing its possible dangers, being vigilant about and minimizing any negative effects.

The inclusion of ChatGPT in construction management education has the potential to positively enhance student learning outcomes. However, it is crucial to consider potential risks and implement appropriate safeguards to ensure responsible use of AI tools. By examining the pros and cons of ChatGPT in writing-intensive courses, we can gain a deeper understanding of AI's influence on education and develop strategies to maximize the benefits while minimizing the drawbacks.

Based on the results of this survey, the authors highlight some areas warranting further debate and in-depth discussion. For example, when answering questions about the advantages and disadvantages of ChatGPT, many students chose neutrality, which might stem from a lack of understanding. Around 40% of the participants pointed out that a more explicit AI usage policy was necessary. In the guidelines, what the specifics should cover, and whether students can distinguish content generated by ChatGPT.

From the perspective of educators, facing cutting-edge technologies such as ChatGPT in daily teaching practices, especially in writing courses, presents several challenges. These challenges center include firstly, bolstering students' foundational writing skills in a manner that strengthens rather than diminishes their capabilities; secondly, the need to reform conventional methods of evaluating student writing, moving away from traditional assessment models; and thirdly, the imperative to cultivate critical thinking skills in students through the adoption of avant-garde assessment strategies. These tasks demand a nuanced understanding of the interplay between technology and education, aiming to leverage AI tools like ChatGPT to complement and enhance the educational experience rather than replace fundamental teaching methodologies.

The authors plan to extend their research on these topics promising to disseminate more exhaustive findings during further study.

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