

Exploring the Influence of Providing Context and User Roles in ChatGPT Conversations within Educational Settings

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SUMMARY

ChatGPT holds considerable promise for enhancing education; however, effectively leveraging its capabilities remains a challenge. Thus, the study aimed to explore the effective utilization of ChatGPT within educational settings. An exploratory case study was employed to analyze a ChatGPT-assisted lesson plan, interaction transcripts, and researcher notes. Inductive analysis revealed two central themes: context and user role. The first theme emphasized that ChatGPT's capability to comprehend context plays a pivotal role. The second theme highlighted that users should be mindful of the techniques and strategies required for effective engagement with ChatGPT. This study demonstrates ChatGPT's potential in supporting learning experiences while also pointing to its limitations. To address these, educators are encouraged to adopt tailored communication styles, iterative revision methods, and careful validation of the tool's outputs. The findings contribute to broader discussions about integrating AI into education, offering practical insights for educators and instructional designers aiming to incorporate ChatGPT effectively into their pedagogical practices.

Keywords: Artificial intelligence in education, ChatGPT, exploratory case study

INTRODUCTION

Recently, the use of artificial intelligence (AI) has become increasingly popular, especially in education. It holds significant promise for enhancing instruction, learning, evaluation, and administration. This promise arises from its ability to provide students with more personalized and flexible learning experiences, improve teachers' understanding of students' learning processes, and offer immediate feedback and machine-supported inquiries, all accessible at any time and from any location (Chiu et al., 2023). Both teachers and students are utilizing AI-powered chatbots, especially ChatGPT (Chat Generative Pre-Trained Transformer), for various purposes, ranging from seeking quick responses to inquiries to creating new instructional materials. Despite concerns such as accuracy, reliability, and ethical issues, ChatGPT distinguishes itself among chatbots used in education because of its advanced natural language processing (NLP) capabilities and sophisticated language generation (Labadze et al., 2023).

ChatGPT, developed and launched by OpenAI in November 2022, was trained on an extensive corpus of publicly available digital content. This content includes webpages, research articles, books, social media posts, and chatter (Javaid et al., 2023; Lai et al., 2023). As a result, ChatGPT demonstrates a notable capacity for creative text generation across a diverse range of academic disciplines (Deng & Lin, 2023). These disciplines include medicine and public health education (Khan et al., 2023), language learning (Liu & Ma, 2023) and economics and finance (Dowling & Lucey, 2023). However, it is reported that ChatGPT has lower performance in mathematical abilities than that of an average student (Frieder et al., 2023) and unsatisfactory performance in sports science and psychology (Szabo, 2023).

Specifically, in the context of education, ChatGPT can provide answers to questions related to teaching and learning, which often aligns with important research themes in the literature. Furthermore, it also possesses the ability to generate science units based on the 5Es model (Engage, Explore, Explain, Elaborate, and Evaluate), although some of the generated content may appear somewhat generic and could benefit from further improvement. Generally, ChatGPT proves to be a valuable resource for teachers and preservice teachers when they are creating science units, rubrics, and quizzes (Cooper, 2023). However, it is crucial to learn how to use this tool effectively in order to fully harness its potential, particularly for inexperienced or novice users (Atlas, 2023). This aligns with current trends in educational technology research that emphasize the need for strategic AI integration in teaching.

Consequently, this study aims to address the mentioned challenges by investigating the effective use of ChatGPT in educational context. ChatGPT was chosen due to its widespread usage (Labadze et al., 2023), its accessibility to anyone, which is related to promoting equity (Chiu et al., 2023), and its good performance in education (Cooper, 2023). The findings of this study have potential to inform educators on practical ways to incorporate ChatGPT into their teaching strategies, emphasizing the importance of contextual clarity and strategic interaction. Thus, educators can better understand how to harness ChatGPT's potential for enhancing instruction and learning

experiences. An exploratory case study was conducted to investigate the aspects that influencing the effective utilization of ChatGPT conversations in educational settings.

Usage of ChatGPT in Education

While still in its early stages of development, ChatGPT has already found extensive applications in various aspects of education (United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2023). These applications highlight the potential for integrating ChatGPT in education to revolutionize education by providing personalized and interactive learning experiences (Javaid et al., 2023). ChatGPT enables the analysis of students' language patterns, feedback, and performance to create customized learning plans with tailored content, activities, and assessments for each student (Fuchs, 2023). This provides educators to utilize ChatGPT to foster exploration, motivation, and critical thinking. ChatGPT's personalized feedback and customized instruction capabilities ultimately lead to improved student outcomes (Carr, 2023). When students receive content that directly relates to their interests and matches their abilities, they are more likely to actively engage with the material and gain a deeper understanding (Fuchs, 2023).

ChatGPT can provide thorough assistance and information on a variety of subjects, curriculum standards, and pedagogical knowledge, including effective strategies for teaching and educational theories (Cooper, 2023; Lo, 2023). Additionally, it offers knowledge on the development of children and adolescents, which can aid inexperienced teachers in comprehending students with a range of disabilities as well as varied learning needs and styles (Rakap, 2023). Moreover, ChatGPT emphasizes the value of establishing inclusive learning environments by supporting diversity and cultural sensitivity (Rawas, 2023; Strzelecki, 2023). ChatGPT offers teachers knowledge and strategies for utilizing digital tools, software, and efficient practices in order to help them integrate educational technology (Mondal et al., 2023; Trust et al., 2023). It can also foster Technological Pedagogical Content Knowledge-related knowledge and abilities for teachers (Çelik et al., 2023). Incorporating ChatGPT into teaching practices can result in enhanced educational experiences, along with increased teacher competence and professionalism, especially when utilized responsibly and sensibly by teachers (Luo et al., 2023). Additionally, it can be a valuable tool for developing thoughtful lesson plans, a fundamental aspect of the teaching profession (Kasneci et al., 2023). Critical to effective teaching and learning, lesson planning ensures the teacher's effective communication, efficient time management, student engagement, and accurate assessment and evaluation. In this context, ChatGPT can assist teachers in developing various elements of lesson plans, including defining learning objectives, planning specific learning activities and tasks, establishing a realistic timeline, and incorporating assessment components (van den Berg & du Plessis, 2023).

Despite the notable benefits, employing ChatGPT in education presents a set of challenges. As pointed out by Zhang et al. (2023), one major challenge is the anxiety teachers feel when dealing with new technology. According to Tallvid (2016), this anxiety is often related to their comfort zone and unwillingness to integrate new materials and instructional techniques. Teachers frequently have limited knowledge and skills necessary to use AI. Furthermore, the media's negative view of AI implies that it may replace human roles. Such factors further contribute teachers' anxiety (Luckin et al., 2016). Taken together, it becomes a struggle for teachers to use AI in their future classroom practice. Luckin et al. (2016) point out that effective AI integration in education requires certain skills from teachers. These skills include a clear understanding of how AI systems facilitate learning, proficiency in research and data analysis, and the ability to collaborate effectively in new team-based environments. In the specific case of ChatGPT, Kohnke et al. (2023) provide a comprehensive overview of the precise digital competencies necessary to harness the capabilities of ChatGPT to their full potential. These skills encompass technological expertise, alignment with pedagogical compatibility, and a heightened sense of societal awareness. Additionally, the research conducted by Zhang et al. (2023) underscores that preservice teachers are more inclined to adopt AI-driven educational technology when it is user-friendly and straightforward to navigate. This improved usability bolsters their perception of the technology's utility, ultimately alleviating any apprehension they may have as they gain familiarity with AI through training and practical exposure.

Education must provide the necessary pedagogical knowledge and practical skills for incorporating AI into learning environments, as this is an essential requirement for the AI-driven future (Tate et al., 2023). However, according to Zhang et al. (2023), the most influential factors affecting teachers' intentions to use AI technology are perceived usefulness and perceived ease of use. Furthermore, teachers often experience anxiety when using AI and may lack knowledge of responsible and sensible practices. To contribute to overcoming these challenges, the objective of this study is to systematically investigate the effective utilization of ChatGPT conversations within an educational context. Specifically, this study focuses on the following research question: What aspects influence the effective use of ChatGPT conversations in educational settings?

METHOD

An exploratory case study design was employed. An exploratory case study is a qualitative approach used to explore a phenomenon within its real-life context, particularly when the boundaries between the phenomenon

and context are not clearly evident. This approach is particularly valuable for investigating a situation in depth, especially when there is limited prior knowledge or understanding (Yin, 2018). This qualitative method was selected due to ChatGPT is being a relatively new and exceptional chatbot that has rapidly gained prominence in education. The case focused on ChatGPT conversations conducted for educational purposes. The conversations were conducted exclusively between the researcher and ChatGPT, focusing only on educational content.

In this study, I actively engaged in generating data through conversations with ChatGPT. Additionally, as preservice teacher educator, I have been familiar with the application of ChatGPT since January 2022.

Data Sources

Three data sources were utilized: a lesson plan designed with ChatGPT assistance, conversations with ChatGPT, and researcher notes. The first data source was the lesson plan in a science education course intended for preservice science teachers. After completing the lesson plan, I asked ChatGPT follow-up questions about the content that had been generated, such as “Based on this whole conversation, in your opinion, what are the effective prompts I have given you for creating the materials?” and “Could you provide examples of prompts related to providing clear context from our entire conversation during the creation of the materials?” The second source of data consisted of the conversations with ChatGPT on effective prompts. These included responses to questions such as “What are the essential characteristics of prompts for effectively interacting with ChatGPT?” and “What kinds of prompts should be avoided when using ChatGPT?” These responses were also tested in separate conversations with ChatGPT for education. These responses were included in the second data source. The third data source comprised researcher notes, where I documented each step of the process and recorded critical situations along the way.

Data Analysis

An inductive analysis was employed to examine data obtained from three different sources in order to identify effective prompts for presenting to ChatGPT in the context of education. Inductive analysis primarily involves uncovering meaning within data by conducting detailed examinations of raw data. This process enables the development of concepts, themes, or a model through interpretations provided by an evaluator or researcher (Thomas, 2006; Strauss & Corbin, 2015). Thomas’s (2006) process of inductive coding was followed. It includes of five steps: (i) preparing raw data files, (ii) closely reading the text, (iii) creating codes, sub-themes, and themes, (iv) conducting coding with uncoded text, and (v) continuously revising and refining the theme system.

In the first step, the data were transferred from three data sources to an online text file. Then data cleaning was conducted for any content that was not relevant to the research context. In the second step, the raw data was read in detail to become familiar with its content. During the third step, codes, sub-themes, and themes were generated using actual phrases and/or meanings from specific text segments in order to determine effective prompts for ChatGPT. During the fourth step, to ensure the consistency and credibility of the coding process, a second researcher independently coded a selected portion of the data. The codes and themes were then compared and discussed to confirm that the coding framework was coherent and accurately represented the data. During this stage, discussions were held to reach a consensus, and the uncoded text was carefully reviewed to ensure there were no coding errors. In the final step, the sub-themes and themes were reviewed through the codes to ensure that their meanings were meaningful and reasonable. Appropriate evidence was then selected to clearly convey the characteristics of the themes and sub-themes from the three data sources.

In the presentation of findings, the following acronyms were employed: DS-1 for the lesson plan, which was designed with assistance from ChatGPT and included ChatGPT’s responses to effective prompts about conservation; DS-2 for ChatGPT’s responses to effective prompts and the corresponding test results; and DS-3 for the researcher notes.

Several methods were implemented to ensure the trustworthiness of the study. First and foremost, in the effort to identify effective prompts for ChatGPT in the realm of education, three different data sources were utilized to triangulate the data. Obtaining multiple perspectives and validating the results were achieved through data source triangulation, which involved gathering data from different sources. This approach led to a more comprehensive understanding of the phenomenon under study and enhanced the overall trustworthiness of the research (Carter et al., 2014; Patton, 2015). Furthermore, rich and thick descriptions were employed, which are crucial for ensuring the trustworthiness of findings (Guba & Lincoln, 1982). These descriptions correspond to data that is sufficiently detailed and complete, maximizing the ability to extract meaning from the data (Onwuegbuzie & Leech, 2006). To further ensure the trustworthiness of the findings, clarification of potential biases was addressed (Creswell, 2012). The most valuable tool in achieving bias clarification in the current research was utilizing Thomas’s (2006) process of inductive coding during data analysis. This process guided the interpretation of meanings derived from the data sources through themes, sub-themes, and codes, as well as the presentation of supporting evidence and the development of consensus. The planning, implementation, data analysis, and reporting phases of the study

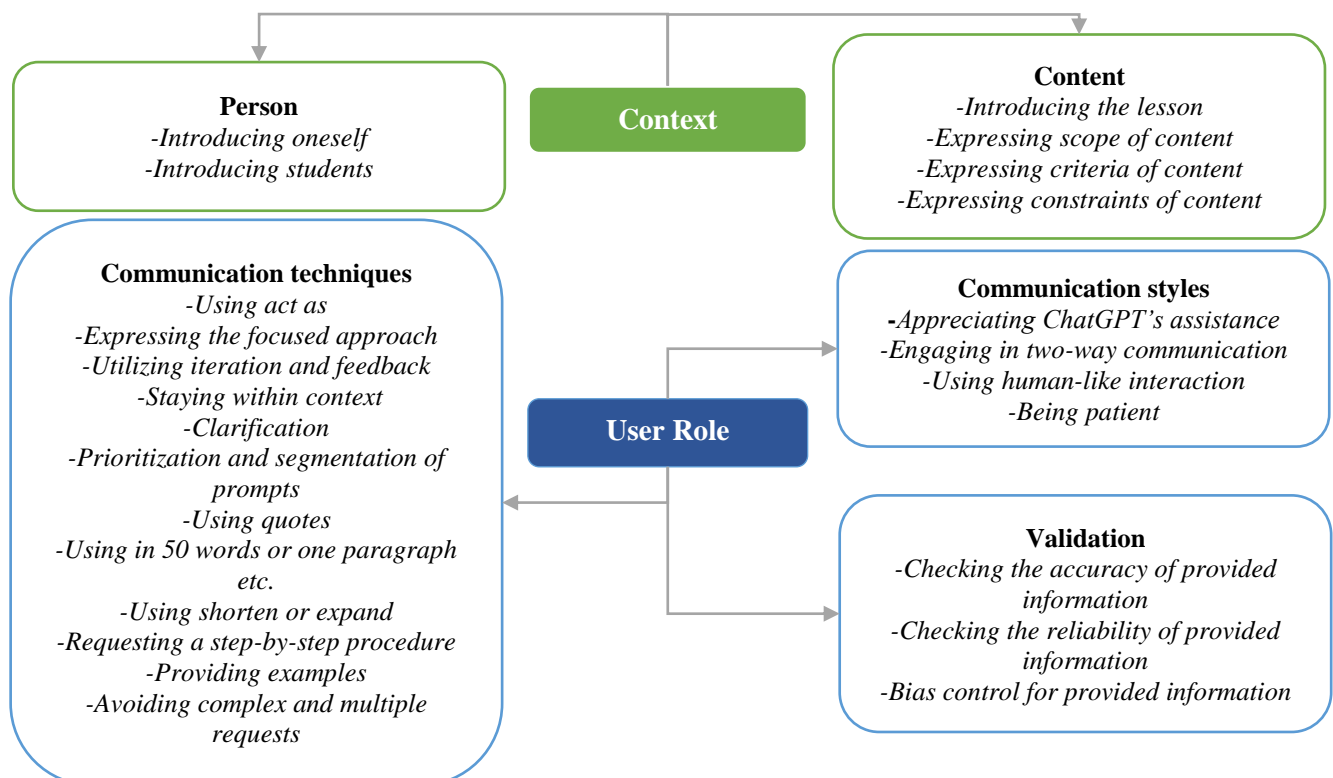
were reviewed and assessed by an external researcher with expertise in qualitative research methods and technology integration in education. This method, known as peer debriefing (Creswell, 2012), contributed to ensuring the trustworthiness of the study.

FINDINGS

In alignment with the research objective, the results were divided into two subsections. First, the figure summarizes the main findings of the research, including the themes, sub-themes, and codes in a hierarchical manner. It allows for a holistic view of the findings. Following this, in the presentation, the sources of the emerging codes within the findings were emphasized, and detailed evidence was provided. This enabled a deeper understanding of the results. Taking the research objective into account, the findings were organized under the heading “Effective Use of ChatGPT.”

Effective Use of ChatGPT

After performing the inductive analysis, two main themes have emerged: context and user role. The sub-themes and the codes related to these themes are illustrated in Figure 1.



Sub-themes are indicated in bold, and codes are highlighted in italics.

Figure 1. The sub-themes and the codes related to the themes of context and user role.

Figure 1 demonstrates context and user role themes with related sub-themes and codes. The first theme was named Context because it included emerging codes and sub-themes that aimed to provide ChatGPT with a clear understanding of the task's context. Meanwhile, the codes and sub-themes of the User Role theme highlighted the guidance role of the ChatGPT user. Below, a thorough overview is provided of the sources behind the emerging codes. This not only identifies these sources but also presents detailed evidence, offering a valuable resource for understanding the context and development of the emerging codes.

Context

Through the analysis, it emerged that one key element of effective ChatGPT usage was the need to define both the persona and the content when establishing context in education. As part of the lesson planning process, an essential step was the introduction of the user. One of the prompts used in this step was: “*I am a researcher and instructor in the science education department at a university in Turkey. My research interests include science education, physics education, using technology in education, preservice and in-service science teacher education (DS-1).*” With this type of introduction, ChatGPT provided valuable content to convey the instructor's perspective, values, background, and teaching style (DS-3).

In order to test the impact on the target audience, the following prompts were sequentially directed to ChatGPT: “*Could you please develop a 5E activity focused on lunar eclipses for middle school students?*” and “*Could you please develop a 5E activity focused on lunar eclipses for high school students?*” ChatGPT responded to these two questions with a similar activity flow but different content. For instance, during the engagement step, ChatGPT employed thought-provoking questions. Middle school students were asked questions like “*How does a lunar eclipse differ from a solar eclipse?*” while high school students received questions such as “*How can we predict when lunar eclipses will occur?* (DS-2).” The difference that emerged between these two examples, depending on the students' developmental levels, clearly highlighted ChatGPT's responsiveness to its target audience.

When developing the lesson plan, it was essential to specify what information was provided to ChatGPT as input and what it did not include. The lesson was introduced in detail with the following prompt: “*Measurement tools and their characteristics used in education; tools based on traditional approaches: Written exams, short-answer exams, true-false type tests, multiple-choice tests, matching tests, ... The main challenge is that some students take a course related to evaluation and assessment before taking this course, and some do not. ... I want my students to be aware that they will be teachers soon, and I want them to experience creating and using classroom assessments* (DS-1).” Furthermore, the constraints of the content were included in the following prompt: “*The lesson will be 40 minutes long. ... It will be delivered face-to-face* (DS-1).” Clearly defining the scope, criteria, and constraints of the content greatly contributed to obtaining the desired responses from ChatGPT.

User Role

The analysis revealed a prominent theme related to the user role, emphasizing the importance of validating information and using clear communication strategies to ensure effective interaction with ChatGPT. This underscored the significance of adapting to specific roles when utilizing ChatGPT. The first role among these was validation. Frequent accuracy checks were conducted on the information provided by ChatGPT. For instance, during the course plan development, supplementary materials were requested from ChatGPT by asking, “*Can you provide supplementary material for activity 2, such as a video or reading material like an article?*” However, the external links provided by ChatGPT were either broken or led to unrelated web sites (DS-1; DS-3). Checking the accuracy of such information was relatively straightforward. However, ChatGPT also pointed out that it has the potential to provide different, inaccurate information: “*The accuracy of the information provided by ChatGPT depends on the data it was trained on, which goes up until September 2021. It does not have access to real-time information or events that have occurred after that date. Therefore, any information or advice it provides may be outdated or incomplete, especially for rapidly changing fields or current events* (DS-2)” As an example of accuracy checking, we posed the question to ChatGPT: “*What is STEM integration?*” It responded by stating, “*STEM integration, often referred to as Science, Technology, Engineering, and Mathematics integration, is an educational approach that aims to blend the teaching and learning of these four disciplines in a cohesive and interconnected manner. The goal is to provide students with a holistic understanding of how these disciplines are interconnected and how they can be applied to real-world problem-solving.* (DS-2)” In its response without definitive conclusions, ChatGPT highlighted terms such as educational approach, cohesive and interconnected manner, holistic understanding, interconnected, and real-world context, which were in line with the categorization of increasing levels of STEM integration as described by Vasquez et al. (2013) and English (2016). Additionally, as ChatGPT has mentioned, “*ChatGPT can present biased information due to biases in its training data. It may display biases related to stereotypes, politics, culture, gender, or controversial subjects.* (DS-2)” Therefore, it is essential for the user to practice bias control. For example, the initial question was, “*What is the aim of education for sustainable development?*” ChatGPT answered this question by stating, “*Education for Sustainable Development (ESD) aims to empower individuals with the knowledge and skills needed to create a more sustainable and equitable future, addressing environmental conservation, social justice, and economic stability.*” In this response, a human-centric perspective was observed. To clarify this point, ChatGPT was asked, “*Is it human-centric?*” The response was, “*... it's important to note that ESD also recognizes the interconnectedness of humans with the environment and the importance of maintaining a balance that supports all living organisms and ecosystems on Earth* (DS-2).”

Through the analysis, the second user role involved employing specific communication techniques for ChatGPT. When effective prompts were requested, ChatGPT responded, “*By mentioning that you want the AI to act as the instructor, you provide a framework for the AI to create content that aligns with the instructional approach of the course. This can lead to more relevant and contextually appropriate suggestions* (DS-2).” Tests were conducted to evaluate the effectiveness of prompts in the context of education through learning approaches such as inquiry-based learning and problem-based learning. The learning outcome “*Observes how acids and bases affect different substances* (Ministry of Education [MoNE], 2017).” was selected and ChatGPT was requested to develop lesson plans for middle school students based on inquiry-based learning and problem-based learning approaches related to this learning outcome. The objectives included in ChatGPT's response in the inquiry-based learning activity plan were as follows: “*Understand the properties of acids and bases, predict and observe the effects of acids and bases on various substances, and develop critical thinking and inquiry skills* (DS-2).” In the problem-based learning activity plan, the objectives were to “*investigate the effects of acids and bases on various substances,*

collaboratively solve a real-world problem related to acidity and alkalinity, and develop critical thinking and problem-solving skills (DS-2).” The variation of activity objectives based on the learning approach underscored the significance of emphasizing approach in achieving distinct outcomes when using ChatGPT. In a similar vein, prompts like *“act like an instructor/teacher ...” (DS-1)* had an influence on ChatGPT’s response for the course plan.

Another important technique was keeping ChatGPT in the context. As ChatGPT responded, this is achieved by *“Keeping the conversation focused on the relevant topic or context is important for clarity (DS-2).”* Especially when designing a lesson plan, ChatGPT often struggled to maintain context in responses generated for prompts that included complex and multiple tasks (DS-3). To address this challenge, ChatGPT suggested making the prompts *“... clear and concise, avoiding ambiguity or overly complex language, and clearly stating your question or request (DS-2).”* For instance, in the process of creating a lesson plan, the following prompt was provided to ChatGPT to guide revision *“I would like you to incorporate the following: Could you please include information on the benefits and challenges associated with traditional assessments? Focus on how different question types help assess various types of knowledge and explore the connection between learning theories and the assessment methods we employ. Please make these revisions while assuming the role of the course instructor.”* After this prompt was used, the lesson plan generated by ChatGPT did not incorporate all of the intended revisions. Furthermore, changes were made to content that was not meant to be altered. ChatGPT recommended, *“Prioritize and break down prompts if needed: Dividing complex tasks into manageable steps can improve the effectiveness of guidance (DS-2).”* Based on this recommendation, I segmented complex prompts according to instructional priorities and used multiple prompts during the lesson planning process. The revision of this prompt proved to be effective in achieving the desired result (DS-3). Furthermore, within the same prompts, the use of quotation marks helped ChatGPT maintain focus and remain within the context. I noticed that employing quotes to emphasize particular criteria or words aided ChatGPT in generating responses centered around the emphasized word (DS-3).

To ensure that ChatGPT maintains context and produces content of the desired quality, I followed the guidelines provided by ChatGPT, listed as *“requesting a step-by-step procedure, providing examples, and asking for pros and cons (DS-2).”* When I requested the development of an activity from ChatGPT, requesting a step-by-step procedure was quite helpful. For instance, I requested ChatGPT to create an engineering design activity for middle school students using the prompt: *“Create an engineering design activity for middle school students to present by making a basic telescope model as the learning outcome, using a step-by-step procedure (DS-2).”* ChatGPT developed a detailed activity plan with nine steps: *“introduction (10 minutes), gathering materials (5 minutes), building the main tube (10 minutes), creating the focusing tube (10 minutes), making the eyepiece (15 minutes), making the objective lens (15 minutes), assembling the telescope (10 minutes), testing and decorating (5 minutes), and presentation (5 minutes per group) (DS-2).”* I requested that the activity be organized according to the engineering design process with this prompt: *“Revise this step using the engineering design process. For example, start by identifying the needs and constraints, then proceed to research the problem or develop possible solutions (TeachEngineering, n.d.) (DS-2).”* ChatGPT revised the activity and provided a detailed activity plan under the six steps: *“identify needs and constraints (15 minutes), research the problem and gather information (15 minutes), brainstorm and develop possible solutions (20 minutes), design and build the telescope (40 minutes), test and iterate (20 minutes), and evaluate and present (20 minutes)”*. ChatGPT listed six advantages (such as structured problem solving, critical thinking, and real-world relevance) and disadvantages (such as resource limitations, teacher expertise, and assessment challenges) and then provided the following explanation: *“In summary, while the engineering design process offers numerous benefits in terms of structured problem-solving, hands-on learning, and skill development, it also comes with challenges related to time, complexity, resources, and teacher expertise. With careful planning and adaptation to the specific needs of the classroom, these challenges can be mitigated, allowing students to gain valuable engineering and scientific insights through engaging activities like building a telescope model (DS-2).”* This explanation included important tips and suggestions for the effective implementation of the activity in a real classroom setting. To achieve the desired outcomes, iteration proved to be a crucial technique. For instance, when creating the course plan for classroom assessment for pre-service science teachers, ChatGPT generated seven different versions with my guidance (DS-3). An example of these revisions was the prompt I provided to ChatGPT: *“Please remove “grading” from the revised lesson plan and add “information about the benefits and challenges of traditional assessments” (DS-1).”* Additionally, there were some techniques to improve communication with ChatGPT. For example, I also tested the effects of constraints of the content in various conversations. I included constraints, such as *“in 50 words,” “in one paragraph,”* and *“in three sentences,”* for the questions posed to ChatGPT. I directed the following prompts to ChatGPT sequentially: *“Can spatial thinking enhance the learning of astronomy?”* and *“Can spatial thinking enhance the learning of astronomy in 100 words? (DS-2)”*. The response to the initial question was an extensive 388-word explanation. In contrast, the response to the constrained question condensed the same information into a brief 45-word summary: *“Spatial thinking is essential in astronomy education. It helps students understand celestial object positions, motions, and relationships in 3D space, enabling comprehension of complex topics like planetary orbits, star formation, and galaxy structures (DS-2).”* Following this step, I revisited the initial question, and during the conservation phase,

I provided ChatGPT with prompts to either “shorten” or “expand” the responses. I observed that with these prompts, I could effectively modify the scope of responses obtained from ChatGPT within the same conversation context (DS-2; DS-3).

Communication styles played an essential role when interacting with ChatGPT. I noticed that, much like humans, ChatGPT responded differently based on our communication approach (DS-3). ChatGPT also suggested the following: “*Thank ChatGPT for its guidance and acknowledge its contribution in helping you shape the course plan.*” Additionally, certain words I used during the conversations with ChatGPT, such as “*that is the point*” and “*great*,” helped ChatGPT maintain context and provide relevant responses. ChatGPT highlighted that one of the characteristics of effective prompts is the requirement for user politeness: “*Use polite language and tone in your prompts. Being respectful and courteous can lead to more cooperative and helpful responses* (DS-2).” I conducted a test by using two different prompts within the two different chats: “*Tell me about the motivation in science education.*” and “*Could you please provide me with information about the motivation in science education?*” In ChatGPT's responses to these prompts, I observed that the content included discussions on intrinsic motivation, extrinsic motivation, cultural and gender considerations, and STEM education. Importantly, the core ideas and classifications within these responses were quite similar. As a result, the observation indicated that whether I used polite language and tone or presented a direct prompt, it did not significantly alter the content's meaning or substance (DS-2; DS-3). However, when I asked for an effective way to use ChatGPT it provided “*To make the conversation more natural, engage in a back-and-forth dialogue with the model, asking clarifying questions, expressing appreciation, and so on* (DS-2).” This was also evident during the lesson plan development conversation. During this discussion, I asked questions such as “*Is there any information you need before we start?*” (DS-1).” It was during these interactions that ChatGPT posed specific questions, inquiring about what was necessary to shape the context and content, such as “*Are there any assessment methods or tools you prefer to use during the course to evaluate students' understanding of the material?*” and “*Do you have access to any specific resources or technology that could be integrated into the course?*”

By responding to these questions, maintaining two-way communication in subsequent conversations, and acknowledging that ChatGPT's responses weren't always perfect, I patiently provided feedback and revisions (DS-3), and this allowed me to successfully reach the desired course plan.

CONCLUSION AND DISCUSSION

The aim of this study was to explore the effective utilization of ChatGPT in an educational context. As a cornerstone of the findings, the interplay between context and user roles notably influenced ChatGPT's efficiency. This implies that the context must remain dynamic, constantly adapting to the user's needs. Effective usage of ChatGPT hinges on two key aspects: creating a context and employing the right strategies and techniques to elicit effective responses. To achieve this, users should adopt a more assertive and directive role, transforming the learning environment into a collaborative space where ChatGPT becomes a partner in the educational process.

In this research, it was found that in order to facilitate the establishment of this collaborative space, it is essential to first create the context and then maintain that context. In line with these findings, Atlas (2023) and Kasneci (2023) showed that ChatGPT operates in a context-based manner and effectively follows the context within the same chat. Considering the context helps ChatGPT contribute to the decision-making process for an individual's learning needs and preferences (Atlas, 2023; Fuchs, 2023). Furthermore, the findings indicated that user-provided prompts are crucial, and that the applied strategies and techniques yielded effective outcomes. Similar to these findings, Atlas (2023) also suggested using prompts for concise responses, such as “*summarize.*” Moreover, another significant role for the user was identified, which is to validate the outcomes produced by ChatGPT. This validation, as characterized by Luo et al. (2023) as responsible and sensible, plays a crucial role in harnessing ChatGPT's potential effectively. The study findings showed that using some strategies and techniques and providing context to more relevant and useful responses from ChatGPT. Even though the literature asserted that ChatGPT can support teachers in various ways (Mondal et al., 2023; Trust et al., 2023), it also warned us about the teachers' challenges of using ChatGPT. The main challenge is teachers' lack of knowledge and skills in using ChatGPT, and this leads to the second challenge, which is the anxiety of using ChatGPT (Luckin et al., 2016; Zhang et al., 2023). To address these challenges effectively, one important step is to emphasize and prioritize the integration of ChatGPT into the field of education (Erduran & Levrini, 2024).

The findings of this study have several implications. Even though ChatGPT is a valuable tool to improve subject matter knowledge, pedagogical knowledge, and teaching practice skills, as previously stated, due to a lack of knowledge and skills, teachers often experience anxiety when they use ChatGPT. These challenges can be addressed through appropriate training and guidance for teachers. Another advantage is that ChatGPT has the capability of adapting to diverse learning styles and paces by providing customized explanations, various resources, and feedback. Such capabilities can help close knowledge gaps, support self-directed learning, and

strengthen the learner's engagement with educational content. These outcomes may also meet teachers' individual needs by offering adaptable support within instructional contexts.

Additionally, the explanation on the context and user role offers a valuable reference for university educators and instructional designers who wish to utilize ChatGPT effectively. These consist of strategies for preserving context, crafting productive prompts, and validating the outcomes produced by ChatGPT. All of these aspects are pivotal for ensuring the responsible and efficient use of ChatGPT. I acknowledge certain limitations in this study, one of which is that the findings of this study were drawn exclusively from ChatGPT conversations within the education field. The analysis focused on documents generated during the design of a single course for preservice science teachers, which may limit the applicability of the findings to other subject areas that require different instructional strategies, content knowledge, or prompt design considerations. Additionally, this study was conducted at a specific point in time, and the evolving nature of generative AI tools may influence the transferability of the results to future contexts. The study also centered on a single generative AI tool—ChatGPT—without comparisons to other large language models, which may vary in output quality and educational utility. Considering these limitations and research findings, future research can explore how ChatGPT might be applied in different disciplines, such as engineering, economics, or environmental science. Despite these limitations, the study offers an important early exploration into the integration of generative AI in teacher education and provides a foundation for future work across diverse educational settings and disciplines.

AI becomes increasingly integrated into our daily lives in many fields. Education is one of the most prominent fields affected by this change. In order to benefit from the opportunities offered by this change, teachers, who hold a pivotal role in shaping education, must acquire the necessary knowledge and skills to effectively integrate novel technologies (Zhang et al., 2023). In conclusion, the present study highlights the effective use of ChatGPT in improving education. ChatGPT is still in the exploratory stage due to its novelty. While using ChatGPT may pose certain challenges, it is important not to dismiss its potential solely based on these challenges. To harness its full potential educators should develop targeted strategies that address both the opportunities and the barriers to its integration. These strategies should include comprehensive training programs that enhance teachers' technological literacy, ensuring they are equipped not only to use ChatGPT but to critically assess its impact on learning outcomes.

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