A Case Study Investigating the Utilization of ChatGPT in Online Discussions

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Abstract

This study explored the impact of integrating ChatGPT into asynchronous online discussions. The analysis encompassed students' log data from Canvas and their perspectives on using ChatGPT. Results revealed a significant enhancement in overall discussion participation when ChatGPT is encouraged, emphasizing its potential as a catalyst for constructive conversations and the development of generic skills. Students also acknowledge ChatGPT's positive influence on critical thinking and knowledge exploration. In summary, integrating ChatGPT not only enhances participation and engagement but also fosters a sense of community, promotes online interaction, and cultivates essential skills. This study concluded by discussing issues associated with using ChatGPT for online discussions and highlighting implications for its appropriate integration into online discussion boards.

Keywords: ChatGPT, artificial intelligence (AI), online discussions, online learning, critical thinking

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Introduction

The widespread use of technology and the availability of online learning in higher education have created numerous opportunities for learners, providing them with greater access, flexibility, and convenience at a reduced cost (Buelow et al., 2018). According to the National Center for Education Statistics (2020), in the fall of 2019, 33% of postbaccalaureate students in the U.S. enrolled exclusively in distance courses. Online learning comes in two primary forms: asynchronous and synchronous. Asynchronous online learning involves the delivery of course content and instruction without real-time communication between students and the instructor, whereas synchronous learning takes place in real-time. Asynchronous online learning is often

considered the preferred method for online learners (Radford et al., 2015) due to several advantages. First, this format allows for 24/7 access to learning materials from any location with an internet connection. Second, learners have the flexibility to manage their learning at their own pace, as they can allocate time based on their personal schedules (Hrastinski, 2008). Lastly, learners can engage in more structured discussions and express well-organized thoughts on asynchronous platforms like discussion boards (Hrastinski, 2008).

Among various online teaching strategies, instructors employ online discussion boards to facilitate interactions for content learning and reflective inquiries (Ruiz et al., 2006). This aspect of asynchronous learning alleviates the pressure on learners who may not be ready to share their responses, thereby promoting deeper learning and encouraging valuable contributions to their peers' learning experiences (Brierton et al., 2016). Additionally, participating in discussions is often beneficial for learning in online courses as it facilitates the exchange of ideas and thoughts (Lindeman, 1926). Moreover, online discussions contribute to enhanced interactions and foster cognitive presence by challenging and improving learners' understanding (Galikyan & Admiraal, 2019).

However, a prevalent issue in asynchronous online discussions is limited student contribution (LSC) (Hewitt, 2005), where students either fail to contribute to the discussion board or procrastinate in responding to their peers' posts. Previous studies have suggested various approaches to address the issue of LSC, such as implementing active learning activities like case studies and integrating different technology tools, including memes. For instance, in a recent study conducted by Lin (2024), a student-developed case study activity was introduced in asynchronous online discussions that required students to interact with each other through developing their own cases and analyzing their peers' cases. The analysis of students' feedback revealed that the activity had a positive impact on their learning experiences. The case study activity stimulated critical thinking regarding the discussion topic and provided valuable resources for online learners. Furthermore, the case study activity fostered a high level of interaction among students within the discussion board. Similarly, the use of online memes as a facilitator was found to significantly enhance learner engagement in asynchronous online discussion boards (Lin & Sun, 2023). This discussion activity provided individuals with a means to express their emotions and feelings, offering a valuable outlet for learners when faced with new learning experiences. Additionally, it fostered a sense of community, promoting social support and mutual assistance in the pursuit of new knowledge.

As technology continues to rapidly advance, particularly with the emergence and progress of artificial intelligence (AI), various applications have been developed to benefit online learners. One notable example is the recent development of ChatGPT, an advanced chatbot that uses state-of-the-art AI and natural language processing (NLP) technologies. Recent studies have highlighted the advantages of leveraging this tool in online learning. Qadir (2022) and Zhai (2022) suggested that ChatGPT has the potential to enhance students' independent learning practices by assisting in the creation of personalized learning plans. Similarly, Lin (2023) concluded that ChatGPT can support online learners in setting learning goals, accessing available resources, designing customized learning plans, monitoring progress, and reflecting on learning experiences. Gregory et al. (in press) required education students to use ChatGPT to generate classroom assessments and found that they appreciated using ChatGPT as a tool as it provided a strong starting point for curriculum design, which ultimately deepened their level of critical

thinking and analysis. With the increasing use of ChatGPT and other large language models as a tool in online learning, the purpose of the present study is to explore the use of ChatGPT for asynchronous online discussions, and to inform guidelines for effectively applying ChatGPT in asynchronous online discussion boards. The research questions for this study include:

- How does the use of ChatGPT for asynchronous online discussions affect students' overall discussion participation?
- How does the use of ChatGPT contribute to the development of asynchronous online discussions?

Literature Review

Limited Student Contribution (LSC)

LSC is defined as a situation where students make few or no postings, exhibit surface-level critical thinking, or engage in low-level knowledge construction (Hew et al., 2010). LSC in online discussions can have a significant impact on the effectiveness and dynamics of the learning environment, potentially hindering the achievement of desired learning outcomes and impeding the collaborative nature of the online learning experience. Specifically, when students contribute minimally or infrequently, the interactions among learners become sparse, resulting in a lack of diverse perspectives, critical thinking, and the exchange of ideas (Guzdial, 1997; Hewitt, 2005). Effective online discussions rely on active student participation and engagement. Contributions from multiple students foster a sense of community, promote peer interaction and collaboration, and facilitate the exploration of different viewpoints and perspectives (Lin, 2024; Lin & Sun, 2024). However, when student contributions are limited, the richness of the learning experience may suffer. Discussions may lack depth and meaningfulness, becoming shallow exchanges of information rather than opportunities for in-depth analysis and synthesis (Khine et al., 2003; Fung, 2004). Moreover, LSC can hinder the development of important skills, such as critical thinking, communication, and argumentation. When students contribute minimally, they miss out on valuable opportunities to refine their reasoning, challenge their assumptions, and expand their understanding through interactions with their peers (Cheung & Hew, 2005; Khine et al., 2003).

Researchers have identified several factors that contribute to LSC, including not perceiving the need for online discussions, uncertainty about what to contribute, lack of critical thinking skills, and being content with providing superficial answers. Regarding specifics, there are various reasons behind students' limited participation in online discussion forums. First, if students are already attending face-to-face courses or lack interest in the discussion topics, they may not see the necessity to engage in online discussions (Zhao & McDougall, 2005). Additionally, the absence of clear expectations or incentives, such as grades, can also contribute to LSC (Dennen, 2005). Furthermore, students' uncertainty about what to contribute acts as a barrier to their active participation (Fung, 2004; Khan, 2005). Similar to how a blank document can be daunting for a writer, students may experience a "writer's block" (Hew et al., 2007, p. 575) when it comes to determining what to write in the discussion forum. Moreover, the use of discussion prompts or questions that elicit a single, factual answer can exacerbate the issue of students struggling to identify what to contribute. Once one student has provided the correct response, there may be no perceived need for further contribution from other students (Dennen,

2005). Lastly, students' contributions to online discussions often demonstrate surface-level critical thinking, characterized by unsupported conclusions or judgments, incomplete solutions or explanations, and mere agreement with others without further exploration (Khine et al., 2003). Additionally, students may focus primarily on answering questions rather than engaging in deeper knowledge construction. Cheung and Hew (2005) discovered that students mainly expressed their opinions in response to their peers' queries, aligning with Gunawardena et al.'s (1997) Phase I level of knowledge construction, which emphasizes information sharing and results in basic question-and-answer sessions with limited involvement in higher-level knowledge construction phases. Therefore, it is important to engage students in online discussions effectively, thus enhancing their learning experiences, fostering deeper critical thinking, and promoting meaningful engagement in knowledge construction within the online learning environment.

Developing Effective Online Discussions

To promote active engagement in discussion activities, instructors should establish a clear purpose and set expectations (DeNovelles et al., 2014; Han & Hill, 2006). Creating general guidelines that encourage collaboration and the sharing of diverse perspectives can motivate students to collaboratively construct knowledge on the discussion board (DeNoyelles et al., 2014). Generating more responses and meaningful interactions can be achieved by posing thought-provoking questions that simulate traditional classroom dialogues (Levine, 2007). The use of open-ended questions and the requirement for learners to respond to one another also enhance student involvement (Carwile, 2007). Encouraging learners to conduct independent research and respond to comments and questions from their peers further fosters active participation and interactions (Carwile, 2007). Lastly, incorporating graded discussions can act as a catalyst for encouraging learners to actively participate in conversations. An et al. (2009) emphasized that without the requirement for peer interaction in online environments, voluntary interactions among learners are infrequent.

Meanwhile, several recommendations have been proposed to address the issue of LSC in online discussions. First, instructors should provide clear explanations regarding the purpose of the online discussion to ensure that students understand its significance and actively participate (Cheung & Hew, 2005). Without a clear understanding of the purpose, students may lose interest and engagement. Therefore, explicitly stating the instructor's expectations plays a crucial role in increasing student participation in online discussions (Jung et al., 2002). To address students' uncertainty about what to contribute, two guidelines have been suggested. One approach is to provide online scaffolds, such as clarification or elaboration questions, counterarguments, and context- or perspective-oriented questions (Choi et al., 2005). These scaffolds encourage students to think critically and consider different aspects of the problems beyond the initial questions provided. By acting as a starting point, these scaffolds facilitate students in generating their own questions and actively contributing to the discussion boards. Furthermore, to combat surface-level critical thinking and promote higher-level knowledge construction, it is essential to enhance students' critical thinking skills (Hew et al., 2005). For instance, incorporating the Socratic questioning model, which includes questions of clarification, assumptions, reasons, and evidence, into teaching can help students demonstrate higher levels of critical thinking (Yang et al., 2005). By fostering deeper analysis and evaluation, these strategies encourage students to engage more critically and constructively in online discussions.

Using ChatGPT for online learning

Previous studies indicated that using technology would facilitate effective online discussions, further optimizing students' learning experience (Kumi-Yeboah et al., 2020; Liu & Yu, 2023). Particularly, technology has the potential to facilitate active learning and encourage learner participation in discussion activities (Stephenson, 2018). One example of such technology is ChatGPT, an AI-powered chatbot that uses a large language model with over 175 billion parameters to process and respond to natural language input (Floridi & Chiriatti, 2020). This word-driven dialogue system is capable of assisting in cross-domain problem-solving and generating content to address user inquiries (Luan et al., 2024a). Since its release in November 2022, over one million users signed up for ChatGPT within a week (Haque et al., 2022). Chatbot use has sparked a debate among educators regarding its impact on the teaching profession and student learning outcomes. While some scholars, such as Qadir (2022) and Zhai (2022), believe that ChatGPT has the potential to promote independent learning practices by facilitating customized learning plans, others, like Kung et al. (2023) and Cotton et al. (2023), raise concerns about the obsolescence of traditional online exams and the automation of the teaching profession. Despite differing perspectives, ChatGPT, as a newly developed chatbot, offers several enticing features for learners. It provides immediate feedback and guidance, supports personalized learning experiences, and assists in complex problem-solving. Moreover, ChatGPT's availability 24/7 makes it accessible to learners in asynchronous online learning contexts. Learners can ask ChatGPT questions related to their learning goals and receive prompt feedback and suggestions, and it can track learners' progress and offer recommendations for further learning opportunities.

Finding and accessing resources is a crucial component of self-directed learning in asynchronous online learning contexts, as learners are expected to actively seek out opportunities and materials to support their own learning. However, some learners may encounter difficulties in locating available resources, particularly interactive and multimedia materials. To overcome this challenge, ChatGPT could play a valuable role by providing external and pertinent resources based on learners' personalized learning plans, complementing the materials provided by their instructors (Lin, 2023; Lin et al., 2024; Luan et al., 2024b). If learners could share their personalized learning plan with ChatGPT, this tool could offer recommendations such as online articles, videos, and multimedia resources that align with their specific learning objectives. Additionally, ChatGPT could suggest relevant books, journals, publications, blogs, and social media groups related to team-based learning, thereby fostering peer learning and facilitating the exchange of ideas. By using ChatGPT in this way, learners would have access to a wide range of resources that support their learning goals and enhance their overall learning experience.

In terms of using ChatGPT for online discussions, Lin and Schmidt (2023) noted that ChatGPT could serve as a catalyst for discussions. Specifically, instructors can present students with case-study-like examples of conversations between individuals and ChatGPT on specific topics, such as climate change or healthcare reform. Students could then discuss and critically evaluate the validity and accuracy of ChatGPT's responses. This process can foster the development of critical thinking skills and initiate a dialogue about the course material. By questioning the responses generated by ChatGPT, students learn to assess the reliability and credibility of different information sources. They also become adept at identifying biases and assumptions and acquire strategies for verifying and validating information. Through this interactive process, students can deepen their understanding of the topic and engage in

constructive discussions that consider diverse viewpoints and perspectives. Using ChatGPT in online discussions provides an opportunity for students to actively engage with the technology and apply critical thinking to evaluate its outputs. By analyzing and discussing the responses generated by ChatGPT, students develop their ability to think critically, evaluate information, and engage in meaningful discussions. This approach not only enhances their understanding of the subject matter but also cultivates important skills that can be applied beyond the online learning environment.

However, there is a lack of empirical research examining the use of ChatGPT for asynchronous online discussions. To address this gap, this case study aims to investigate how ChatGPT influences students' online discussion experience and their expectations regarding the design of the discussion activity, which involves student use of ChatGPT in asynchronous online discussions. Furthermore, this research will contribute to the limited literature base on generative AI tools in online learning environments by exploring the impact of ChatGPT on students' online learning, such as the development of critical thinking skills, along with the facilitation of meaningful discussions. Ultimately, it is the intent that this empirical study will provide valuable insights and practical recommendations for instructors and course designers seeking to effectively integrate ChatGPT into their online teaching practices.

Method

Through a mixed-method design, this study examined students' behavioral log data from Canvas—the learning management system (LMS), their feedback from surveys exploring critical thinking skills and the discussion activity experience, as well as their feedback from five open-ended questions regarding the use of ChatGPT in online discussion boards. The log data was used to objectively track students' engagement levels. The quantitative data from surveys enabled exploration of the statistical significance of any observed differences in critical thinking skills. Activity experience data provided insights into students' overall discussion participation. Lastly, the qualitative data from open-ended questions investigated ChatGPT's contribution to the development of asynchronous online discussions by further analyzing students' experiences with using ChatGPT for online discussions, capturing insights and perspectives that may not be evident through quantitative measures alone (Creswell & Creswell, 2017). This mixed-method approach enabled pursuit of a comprehensive understanding of the impact of using ChatGPT for asynchronous online discussions.

Activity Design

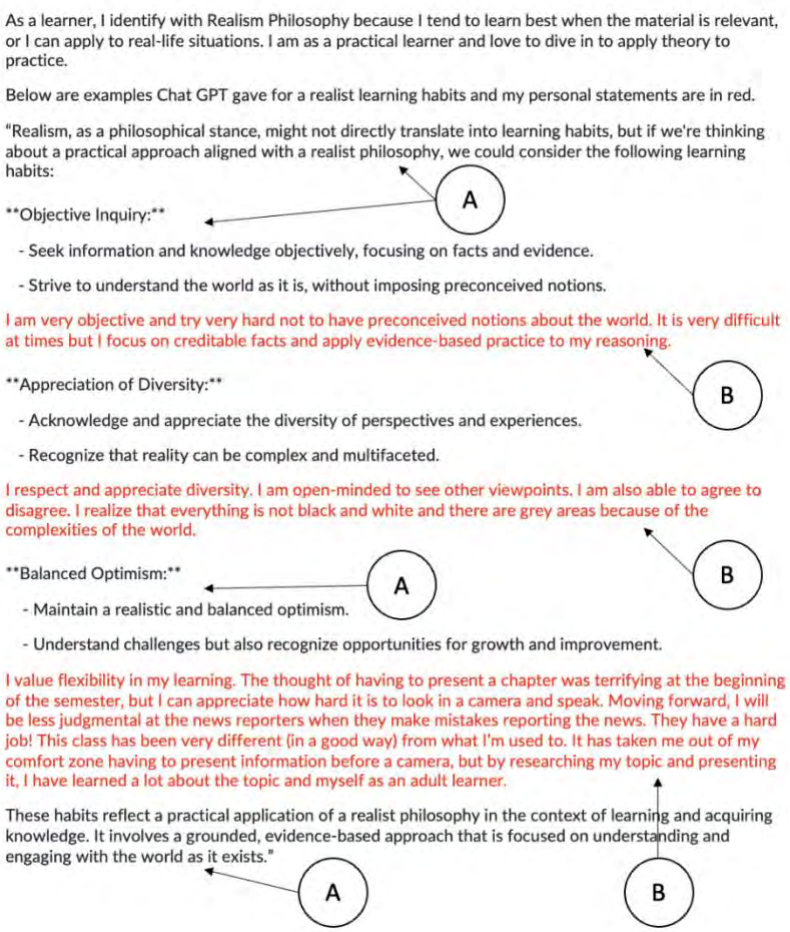
In two sections of the same graduate-level online course in the fall semester of 2023, ChatGPT was integrated into the graded discussion activities, each with specific deadlines and requirements for thread posting and responding. This fully asynchronous online course provided a comprehensive introduction to the historical and philosophical underpinnings of adult and community education, along with an exploration of the field's nature and breadth. The instructor provided step-by-step instructions for using ChatGPT for online discussions, as follows:

1. The instructor shared guidelines and rules (see Appendix A) related to how to use ChatGPT, highlighting examples of prompts to generate discussion posts and responses to others' threads.

2. Following the guidelines and rules, students used ChatGPT to participate in the discussion boards. While posting and responding to threads using ChatGPT, students were required to critique and reflect on the information generated by this AI-driven tool and must not simply copy and paste the information (see Figure 1).
3. Students were requested to send their conversations with ChatGPT to the instructor for each discussion activity.

Figure 1

Example of a Student's Reflection With AI-generated Information



Note. A: Information generated by ChatGPT

B: Student's reflection towards AI-generated information

Experiential learning theory

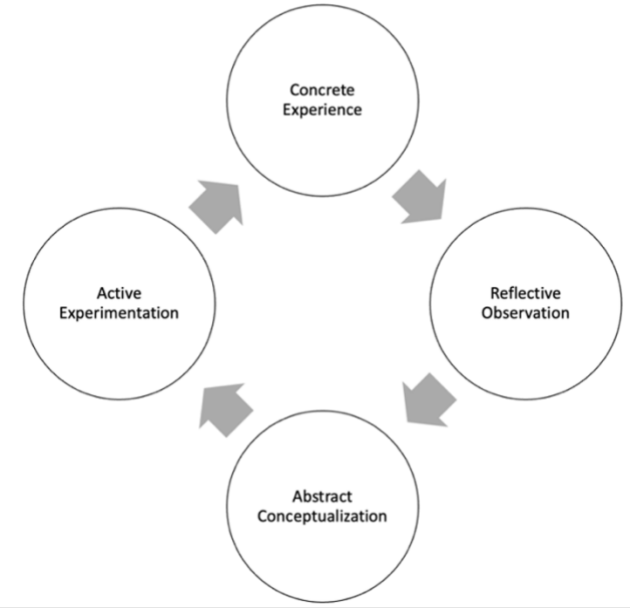
The present study used Kolb's Experiential Learning Theory (ELT, 1984) to design the discussion activity. Experiential learning theory was defined as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of

grasping and transforming experience" (Kolb 1984, p. 41). In other words, the ELT denotes an approach to curriculum development and modification that focuses on firsthand experiences. It aims to provide a concrete understanding of how to teach specific courses, with the ultimate objective of improving student learning through experiential methods.

The ELT involves a four-step learning process (see Figure 2), which includes (1) concrete experience, (2) reflective observation, (3) abstract conceptualization, and (4) active experimentation. Specifically, in the concrete experience stage, learners engage personally with everyday situations, relying on feelings, open-mindedness, and adaptability. In reflective observation, learners comprehend situations from various perspectives, emphasizing objectivity and thoughtful judgment without necessarily taking action. In the abstract conceptualization stage, learners use ideas, logical approaches, and theories, emphasizing systematic planning to solve practical issues. Finally, in active experimentation, learners actively apply their knowledge, experimenting with real-life situations and adopting a practical approach rather than merely observing. Effective learning usually takes place as learners navigate through this four-stage cycle, moving from concrete experience to observing and reflecting on it (e.g., Abdulwahed & Nagy, 2009; Konak et al., 2014).

Figure 2

Example of a Student's Reflection With AI-generated Information



Based on the ELT, in the Concrete Experience phase, students reflected on the discussion topics through the lens of their learning and everyday experiences. This initial step encouraged a personal connection to the subject matter, fostering open-mindedness and adaptability. Next, during the Reflective Observation stage, students used ChatGPT by experimenting with various prompts to seek relevant information related to the discussion topics. This step aligns with

Kolb's notion of observing and reflecting on experiences, emphasizing a thoughtful examination without immediate action. Moving on to the Abstract Conceptualization phase, students critically evaluated the information generated by ChatGPT. They integrated this AI-generated knowledge with their own thoughts to formulate a comprehensive and reflective discussion thread. This stage focuses on using logical approaches and theories to systematically plan and address issues. Finally, in the Active Experimentation stage, students interacted with their peers by reading and commenting on others' threads. This interaction involves a synthesis of information from both human and AI sources, encouraging students to apply their combined knowledge to critically contribute insights.

Data Collection

Participants (n = 27) were recruited from two sections of a 15-week course taught by the same instructor in the fall semester of 2023. Log data on students' overall discussion board participation were collected from the LMS for ten weeks, the period during which ChatGPT was allowed and encouraged for use. Additionally, anonymous questionnaire responses were gathered on the first day of the course and at the end of the semester to explore students' perceptions of using ChatGPT for online discussions. Through the collection and analysis of learner feedback, we aimed to explore strategies and effective practices for instructors integrating ChatGPT into online learning environments.

A total of 21 students completed both pre- and post-surveys (response rate was 77.8%). According to the self-introductions in the LMS, students had diverse backgrounds, including K–12 education, adult and higher education, workforce training and development, and medical education. All students were identified as adult learners with full-time jobs and/or family responsibilities. This study was approved by the Institutional Review Board (IRB).

Instruments

The critical thinking abilities of students were assessed using the Critical Thinking Scale, which was adapted from the Motivated Strategies for Learning Questionnaire (MSLQ) developed by Pintrich et al. (1991). The Critical Thinking Scale consisted of five items that evaluated the degree to which students employed their existing knowledge to address novel situations, solve problems, make decisions, and engage in critical evaluation aligned with rigorous standards of excellence. To better align with the objectives of this study, the researchers made certain modifications to the wording of the items. Sample questions include "*I often find myself questioning things I hear or read in the discussion board to decide if I find them convincing*," and "*I treat the posts generated by ChatGPT as a starting point and try to develop my own ideas about it in the discussion board*." Students completed this 5-point Likert scale survey on the first day of the course and at the end of the course. Cronbach's alpha for Critical Thinking was 0.879.

Students completed two additional instruments toward the end of the course. First, the Course Experience Questionnaire (CEQ), developed by Wilson et al. (2006), examined students' experiences using ChatGPT for online discussions. The CEQ consisted of 23 items rated on a 5-point Likert scale, ranging from "1 Definitely disagree" to "5 Definitely agree." In line with the objectives of this study, certain words in the questionnaire were revised by the researchers to

ensure the relevance and alignment of the items with the research purpose. Five factors were examined, including Good Teaching (GT) with six items (e.g., *The instructor of this course motivated me to do my best work while using ChatGPT for online discussions*), Clear Goals and Standards (CG) with three items (e.g., *It's always easy to know the standard of the activity expected*), Generic Skills (GS) with six items (e.g., *As a result of engagement in this activity, I feel more confident about tackling unfamiliar problems*), Appropriate Assessment (AA) with three items (e.g., *To do well to complete this activity, all you really need is a good memory*), and Appropriate Workload (AW) with two items (e.g., *We are generally given enough time to understand the things we have to learn while completing this activity*). Cronbach's alpha for these variables are 0.676 (CG), 0.831 (GS), 0.737 (GT), 0.788 (AW), and 0.763 (AA).

Lastly, we used Brookfield's Critical Incident Questionnaire (CIQ), which involved the incorporation of five open-ended questions. The CIQ serves as a valuable tool for instructors to gain a deeper understanding of the classroom experience from the students' perspective. Widely employed in adult and higher education, it provides an alternative approach for learners to express their observations regarding what is effective and what is not functioning optimally (Brookfield, 2015). In our study, we made adaptations to these open-ended questions to align them with the specific requirements of the course activity. This modification aimed to encourage participants to share comprehensive information, provide feedback, and contribute their ideas in their own authentic voices, specifically focusing on the use of ChatGPT for online discussions. Sample questions included "*At what moment in the discussion board did you feel most engaged with what was happening?*" and "*At what moment in the discussion board were you most distanced from what was happening?*"

Data Analysis

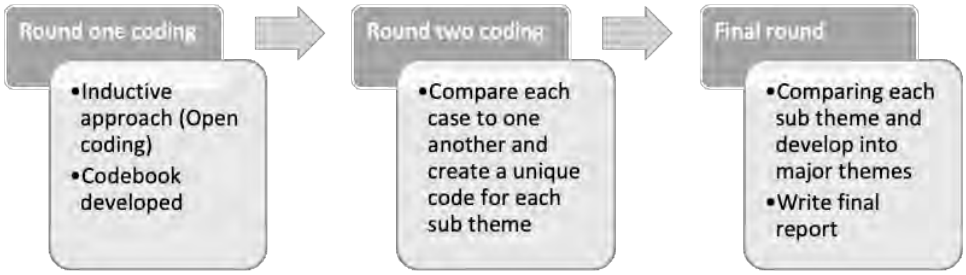
The quantitative data analysis involved the use of IBM® SPSS Statistics software. First, log data from the LMS was analyzed through a one-way ANOVA to examine whether students' discussion board participation and overall course participation varied for the same course taught by the same instructor in fall 2023 when ChatGPT was encouraged, compared to spring 2023 and fall 2022 where ChatGPT was not allowed. Furthermore, among students in fall 2023, an independent sample t-test was used to explore their overall course participation log data between those who used ChatGPT and those who did not. Next, a paired t-test was employed to explore learners' critical thinking skills derived from the pre- and post-test surveys. Following that, descriptive statistics were calculated to examine the CEQ results, investigating their perspectives regarding the use of ChatGPT for online discussions.

To complement the quantitative data results, a multiple-case study approach was employed to qualitatively analyze learners' responses to open-ended questionnaires. The case study method was particularly valuable in addressing the "how" and "why" aspects of class engagement, focusing on contemporary events while allowing minimal control over the data by the researchers (Yin, 2014). Each participant was treated as an individual case in this study, all belonging to two sections of the same course, taught by the same instructor who designed and facilitated the discussion activity. Thematic analysis, following Braun and Clarke's (2006) guidelines, was applied to examine the feedback provided by class members. This approach facilitated the presentation of learners' authentic voices. The initial coding phase relied on each participant's responses, leading to the creation of a codebook. In the second round of analysis, an

inductive open-coding approach was used, with the authors comparing notes to identify major themes. Finally, the themes were refined in the final round, ensuring the production of robust and compelling results for the study (Thornberg & Charmaz, 2014; Yin, 2014). Figure 3 illustrates the rationale and progression of the case design and data analysis process.

Figure 3

Multiple-case Study Coding Steps



Results

How does the use of ChatGPT for asynchronous online discussions affect students' overall discussion participation?

First, we compared students' overall weekly discussion board participation, which was accumulated through the count of times they contributed to the discussion board pages, among fall 2023 ($N_{student} = 27$), spring 2023 ($N_{student} = 11$), and fall 2022 ($N_{student} = 21$) using one-way ANOVA. The LMS log data results indicate that no significant difference was found in students' discussion participation between spring 2023 and fall 2022 when ChatGPT was not allowed ($p = 0.286$). However, there were significantly higher counts of times contributed to the discussion board when ChatGPT was involved in fall 2023, with an average of 70.1 counts of times in the discussion board ($M_{fall2023} = 70.1$, $SD = 10.44$), compared to the discussion board where ChatGPT was not involved in spring 2023, with an average of 43 counts of times ($M_{spring2023} = 43$, $SD = 3.8$), and in fall 2022, with an average of 46.6 counts of times ($M_{fall2022} = 46.6$, $SD = 9$), with a large effect size ($F_{(2, 41)} = 31.82$, $p < .001$, $\eta^2 = 0.63$), as presented in Table 1. When comparing students' overall course participation, one-way ANOVA results demonstrated no significant difference among students from these three semesters ($p = 0.43$).

Table 1

Comparison of Discussion Forum Participation Across Semesters

	Fall 2023		Spring 2023		Fall 2022				
	M	SD	M	SD	M	SD	$F_{(2,41)}$	*p*-value	Partial η^2
Average counts of times	70.1	10.44	43	3.8	46.6	9.0	31.82	<.001	0.63

When specifically examining fall 2023, during which ChatGPT was encouraged in the discussion board, over half of the class (55.6%) used this tool in at least two discussion activities,

ranging from 2 to 10 participated discussion activities using ChatGPT (M = 5.6) across the ten weekly activities. Students who used ChatGPT for discussions had higher overall course participation (M = 82.78, SD = 14.48) compared to those who did not use ChatGPT (M = 71, SD = 18.84). However, no significant difference was found between these two groups (p = 0.14).

How does the use of ChatGPT contribute to the development of asynchronous online discussions?

Next, we examined how ChatGPT contributes to the development of asynchronous online discussions by examining students' overall perspectives on using ChatGPT for online discussions in fall 2023. Descriptive analysis (see Table 2) shows that students had a positive experience with this activity. Specifically, students believed that this activity has clear goals and rules to follow for completing assignments. They also reported that using ChatGPT for online discussions may develop generic skills and abilities, which may include problem-solving, analytic skills, confidence in tackling unfamiliar situations, the ability to plan work, and written communication skills. Additionally, students agreed that the instructor offered a high level of teaching quality in guiding them using ChatGPT. Finally, students expressed that this activity has a fair workload to complete, and the instructor provided an appropriate assessment to evaluate their use of ChatGPT for online discussions.

Table 2

Descriptive Analysis of Course Experience Questionnaire (CEQ)

	M	SD
Clear goals	4.05	0.64
Generic skills	4.09	0.60
Good teaching	4.33	0.49
Appropriate workload	3.92	0.71
Appropriate assessment	3.70	0.88

In terms of critical thinking, students demonstrated a high level of critical thinking both before (M = 3.77, SD = 0.77) and after (M = 3.80, SD = 0.42) using ChatGPT for online discussions. No significant differences were found according to the paired t-test (p = .45). It is probable that the online discussion board itself is an activity that motivates students to apply their existing knowledge to address novel situations, solve problems, make decisions, and engage in critical evaluation aligned with rigorous standards of excellence (Lin et al., 2023), even without involving ChatGPT.

Finally, thematic analysis was conducted to analyze the students' responses to open-ended questions, and three themes were generated: (1) ChatGPT makes discussions engaging, (2) ChatGPT motivates effective learning, and (3) challenges of using ChatGPT.

Theme one: ChatGPT makes discussions engaging

Students believed that using ChatGPT made the online discussion engaging. First, they reported that reading what ChatGPT produced was engaging, as one learner stated, "I felt the

most engaged when reading the answers that ChatGPT came up with." Meanwhile, they expressed that to "critique the information generated by ChatGPT is engaging." This tool furthermore encourages interaction among peers because "Using the ChatGPT was helpful, because it was very engaging to see others' responses from ChatGPT which made me want to participate in the forum even more." Finally, ChatGPT could help expand on responses and ideas because "With some topics covered in class, ChatGPT came up with some ideas I should have thought about or remembered as part of that topic." Moreover, this tool could create engaging communications, as one student noted,

> I think the ChatGPT was a very helpful tool. I did not use it consistently but I did when I felt challenged or simply wanted the extra support in a particular topic. I think it also helped us communicate with one another to better expand on responses and ideas provided within our discussions.

Theme two: ChatGPT motivates effective learning

ChatGPT could help clarify challenging discussion topics, and "it [ChatGPT] was effective when there was a difficult topic or theory being discussed in class." Specifically, a majority of students mentioned that ChatGPT can be used as a starting point especially with challenging topic. Indeed, participants stated, "It [ChatGPT] did assist me in starting the conversation," and "ChatGPT is another tool that can be used to start and create conversations." Moreover, this tool "was very helpful in answering questions and understanding the topics," and would help students "stay relevant in the conversation when my thoughts and understandings of the concepts were not at the level of my peers' comprehension or experience." Furthermore, gaining a better understanding of the topic with the help of ChatGPT, learners may feel confident with their discussion posts, as one noted,

> I felt most engaged when I fully understood the questions, how to answer and it was applicable to my life. I think the ChatGPT also assisted in providing me feedback to ideas and concepts I had not considered which helped me feel even more confident in my responses.

Additionally, ChatGPT could aid learners in finding information across various resources, as one learner noted, "I'm glad to have the tool on hand! It has been very helpful in finding answers and provides a lot of details where I may have to search many different sites on the internet in its place." They were also "impressed about the amount of information that ChatGPT would provide." Lastly, ChatGPT could motivate brainstorming, as one student reported,

> I was shocked that we were allowed to use ChatGPT for the discussion boards because I thought that it would be frowned upon. But I am glad we were introduced to it here. It helped my brainstorming processes and allowed me to see more perspectives towards a topic.

Likewise, another student expressed,

> I found it most helpful during brainstorming process of task. I would have an idea that I want to go with, and then I would use ChatGPT to provide additional information. It allowed my process to go much more smoothly.

In short, students believed that "referring to ChatGPT responses enriched our answers." Yet, they also suggested, "Only when we were challenged to use it more as a starting point and encouraged to interact with the feedback, did it become more engaging and truly enriching to the learning process."

Lastly, ChatGPT could motivate their critical thinking, as one learner mentioned, "After getting ideas from ChatGPT, it helps me to critically think about discussion points I wanted to cover." For instance, ChatGPT could provide new perspectives toward a topic, as one participant expressed, "I feel the ChatGPT helped fill the gap in times when I felt most vulnerable or lacking in knowledge of content." Students also believed that "critique information generated by ChatGPT motivates deep understanding." Moreover, ChatGPT would empower learning when combining learners' own interpretations with AI-generated information, as one participant stated, "I enjoyed using ChatGPT as a learning tool and I believe with our own interpretations and ideas added it is an effective learning tool." However, it is significant to reflect on ChatGPT's answers instead of simply copying and pasting, as one participant highlighted, "Interacted with it [ChatGPT] could expand my understanding of the topic."

Theme three: Challenges of using ChatGPT

However, several challenges were raised by students, including issues with the length and similarity of responses generated by ChatGPT, as well as concerns about the adequacy of AI-generated content. First, they complained that "when others chose to use ChatGPT in every discussion post, I felt those were the longest to reply back to as a lot of the information was AI generated," thereby "disconnected may occur when classmates' ChatGPT responses seemed to be very long and all very similar." As a result, one student "opted to not use ChatGPT in my discussion boards, and I felt more engaged when I did not rely on it for every discussion post." Meanwhile, students reported that not every learner were able to reflect and critique in-depth on the information generated by ChatGPT, as one noted, "Not everyone elaborates more on what they found in ChatGPT." Furthermore, some believed that "what the AI generates isn't in-depth enough," and "ChatGPT was great, but it didn't challenge us to think about a topic as hard." Therefore, they "still had to dig deep to understand some of the information." To address these issues, some students suggested, "It [ChatGPT] is a new tool and should continue to be explored especially in how to input details to achieve better results." Additionally, having examples from peers showing how to interact with ChatGPT would be helpful, as one participant noted,

> There was a point where the professor praised a student for how the student had not just copied and pasted their ChatGPT response, but rather interacted with it in order to advance our understanding. It eventually led to my own interactive engagement.

Discussion

Results indicate that when ChatGPT was encouraged in the discussion board, students' overall discussion participation significantly increased compared to semesters when ChatGPT was not allowed. Specifically, in fall 2023, students contributed nearly twice as many times to the discussion board compared to spring 2023 and fall 2022, respectively. This finding supports earlier conclusions that ChatGPT could act as a catalyst for online discussions (Lin & Schmidt, 2023). Concurrently, the results show that students' overall course participation, including tasks such as written assignment and final project completion, quiz-taking, video watching, across the three semesters remains consistent. Furthermore, students who used ChatGPT exhibited similar overall course participation compared to those who did not use this tool. With findings that highlight improvements in students' discussion board engagement, the consistent overall course participation findings somewhat indirectly suggest that ChatGPT may play a role in enhancing students' online discussion participation.

Furthermore, the findings reveal that students overwhelmingly had a positive experience with the integration of ChatGPT into online discussions. Specifically, they recognized the potential of ChatGPT to cultivate generic skills, such as problem-solving, analytic abilities, confidence in addressing novel situations, planning skills, and improved written communication (Wilson et al., 2006). Moreover, they expressed appreciation for the instructor's high-quality teaching in guiding them through the use of ChatGPT. Finally, students found the workload to be fair and valued the instructor's provision of appropriate assessments to evaluate their use of ChatGPT in online discussions. Specifically, students believed that ChatGPT could make online discussions engaging, especially when reading and critiquing what ChatGPT generated. ChatGPT is also considered a useful tool for motivating interactions by expanding on responses and thoughts, thereby leading to engaging communications. Moreover, ChatGPT may facilitate effective learning through various means. For instance, it could help students clarify challenging discussion topics and initiate conversations, as noted by previous scholars who highlighted ChatGPT's effectiveness in complex problem-solving (Qadir, 2022; Zhai, 2022). Furthermore, ChatGPT provides learners with a variety of resources to facilitate their learning. In an age of information explosion, sometimes it is challenging for learners to locate available and useful resources. However, ChatGPT, capable of engaging in conversational interactions and addressing follow-up questions, seamlessly provides an extensive array of relevant and additional resources to support learners in enhancing their overall learning experience (Lin, 2023)

Additionally, sometimes students have no clue about what to contribute to the discussion, and such uncertainty acts as a barrier to their active participation (Fung, 2004; Khan, 2005). While using ChatGPT as a discussion starter, the different perspectives ChatGPT provides would encourage students to brainstorm and enable them to think of the topic from different perspectives, further motivating students' critical thinking. In other words, ChatGPT could enlighten students with new ideas. ChatGPT proved beneficial in bridging knowledge gaps, ensuring relevance in conversations even when participants may have lacked a comprehensive understanding of the content or found themselves at a different level of comprehension or experience compared to their peers. Lastly, ChatGPT could enhance students' learning experience when they contemplate how to integrate their own interpretations with the AI-generated content. These results confirm the earlier claim that students could enhance their understanding of a subject and engage in constructive discussions that consider various

viewpoints and perspectives by questioning and reflecting on the responses generated by ChatGPT (Lin & Schmidt, 2023).

However beneficial at times, students encountered several challenges when ChatGPT was incorporated into the online discussions. For instance, they perceived a disconnection when confronted with lengthy and redundant responses generated by ChatGPT. Another issue pertained to the insufficient elaboration of AI-generated content, with some learners merely copying and pasting answers to the discussion board without deeper contemplation of the topic. Additionally, the information produced by ChatGPT was occasionally deemed superficial, prompting students to explore deeper to enhance their understanding. Interestingly, the need to explore issues more deeply due to the surface-level nature of AI-generated content could be seen as a mechanism that fosters students' critical thinking when they use ChatGPT for discussions, thus leading to deeper knowledge construction. Yet, this study does not provide statistical evidence specifically indicating an increase in critical thinking skills after a semester of using ChatGPT as a tool in discussion activities. It is assumed that the online discussion board already functions as an activity encouraging students to apply their existing knowledge in addressing unfamiliar situations, solving problems, making decisions, and engaging in critical evaluation, adhering to high standards of excellence, even without the direct involvement of ChatGPT. Further research is required to explore this aspect.

Overall, as mentioned by Lin and Schmidt (2023), incorporating ChatGPT into online discussions enables students to actively engage with the technology and apply critical thinking. By analyzing and discussing AI-generated responses, students can develop their critical thinking skills and judiciously evaluate information, which amplify engagement in meaningful participation in discussions. The use of ChatGPT in online discussions not only establishes effective discussions through active student participation and engagement but also nurtures a sense of community, promotes online interaction, and incorporates diverse viewpoints and perspectives (Lin, 2023; Lin & Schmidt, 2023). In essence, the potential of ChatGPT to increase students' discussion participation aids in reducing the LSC, thereby fostering deep and meaningful conversations. This, in turn, contributes to the development of skills such as critical thinking, communication, and argumentation (Fung, 2004; Khine et al., 2003).

To better integrate ChatGPT into online discussion, this study presents several strategies. First, when designing the activity, it is important for the instructor to align the goals and rules of the ChatGPT-involved discussions clearly, ensuring a well-defined structure for completing assignments. This clarity will contribute to students' understanding and engagement. Moreover, instructors should provide examples demonstrating how to effectively interact with ChatGPT in online discussions. They should also offer examples of prompts for students to refer to when using ChatGPT for specific discussion topics, aiming to stimulate more results-oriented conversations. Furthermore, instructors should provide clear guidance on the effective use of ChatGPT and lucid instructions that help students contribute insightful discussion posts in order to foster critical thinking and meaningful interactions. Additionally, concerning the workload, instructors should strive to maintain a fair balance in the tasks associated with ChatGPT-involved discussions, ensuring that the workload is reasonable and conducive to a positive learning experience. Lastly, instructors should continue to refine and implement appropriate assessments that accurately evaluate students' use of ChatGPT for online discussions. This process reinforces the effectiveness of this educational tool and helps prevent students from

simply copying and pasting AI-generated content without in-depth elaboration. In other words, instructors could share examples to encourage students' deep analysis and critical engagement with AI-generated responses, thus guiding students to go beyond surface-level interaction and truly integrate ChatGPT's output with their own critical thinking and learning objectives.

Conclusions

In sum, this study highlights the multifaceted impact of integrating ChatGPT into online discussions. The findings indicate a significant enhancement in students' overall discussion participation when ChatGPT was encouraged, demonstrating its potential as a catalyst for constructive conversations. Students expressed a positive experience, recognizing ChatGPT's contribution to facilitating engaging communications in asynchronous online discussions. Despite encountering challenges such as perceived disconnection and superficial responses, students acknowledged ChatGPT's role in motivating critical thinking and knowledge exploration. In short, incorporating ChatGPT into online discussions not only enhances student participation and engagement but also cultivates a sense of community, promotes online interaction, and contributes to the development of essential skills for a comprehensive and enriched learning experience.

Regarding limitations, first, the sample size of the study (N = 21) is small to conduct pre- and post-tests focusing on students' critical thinking and overall discussion activity experience. Therefore, future studies should recruit more participants to either support or challenge the present findings. Second, due to the limited class size of graduate-level courses, it is suggested to conduct the activity in a larger program especially in undergraduate courses. Moreover, due to the diversity among student groups, the analysis of log data across various semesters could potentially affect the examination of students' overall course and/or discussion participation. Therefore, future studies should investigate the effectiveness of ChatGPT on student participation by randomly assigning them to experimental groups within the same semester. Furthermore, students' characteristics, such as their AI literacy, readiness for AI tools, educational background, and technical proficiency, may influence their using ChatGPT in discussion participation. Thus, future studies should consider including these factors to deepen the analysis of how students engage with ChatGPT in asynchronous online discussions.

Further, since students were not required to solely use ChatGPT for information searches, it is possible that other tools, including search engines, books, and other AI tools, were used during their learning. Therefore, future activity designs should control for these variables. Lastly, because Canvas does not categorize overall course participation log data into specific course assignments and tasks for individual students, it is challenging to determine whether students using ChatGPT significantly contribute more to online discussions compared to those who do not. Therefore, future research should devise a method to examine individual students' discussion board participation, specifically comparing this type of participation among students who use ChatGPT to those who do not. Further research could also explore the reasons why some students choose not to use ChatGPT, thus providing a comprehensive examination of issues related to the integration of ChatGPT in online discussion and beyond.

Conflict of Interest

All authors declare that they have no conflicts of interest.

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Appendix A

Grand Rule for Using ChatGPT for Online Discussions

- Maintain Respectful and Professional Communication:
  - Treat all participants, including ChatGPT, with respect and professionalism.
  - Use language that is courteous, inclusive, and free from derogatory or offensive remarks.
- Stay Focused on the Discussion Topic:
  - Generate discussion posts and responses that directly relate to the topic under discussion.
  - Avoid unrelated tangents or digressions that may derail the conversation.
- Ensure Authentic Engagement:
  - Provide thoughtful and genuine contributions to the discussion, reflecting your own perspectives and insights.
  - Use ChatGPT as a tool to enhance your ideas and expression, rather than relying solely on its responses.
- Properly Attribute Contributions:
  - Clearly indicate whether a particular statement or viewpoint is generated by ChatGPT or is your own input.

    - Acknowledge and give credit to other reliable sources used in your statements.
- Regularly Review and Edit ChatGPT Output:
    - Carefully review the output generated by ChatGPT for accuracy, clarity, and relevance to the discussion.
    - Edit or refine the generated content as necessary to ensure coherence and alignment with the topic.
- Seek Clarification and Ask Questions:
    - If uncertain about ChatGPT's response or the meaning behind it, seek clarification from the instructor.
    - Pose thoughtful questions to stimulate further discussion and encourage deeper engagement.
- Submit Conversations with ChatGPT:
    - Submit your conversations with ChatGPT to the instructor for each discussion activity.
    - This allows for analysis and feedback on your utilization of ChatGPT and aids in assessing your critical thinking skills.

Below are specific rules when using this tool on the discussion board:

- If copying an exact text generated by such tools, put the text in quotation marks; cite ChatGPT that generated the text and include the prompt used to generate the text in the reference section of your thread.

Example:

Original text generated by ChatGPT: “Online learning provides flexibility and accessibility to a diverse range of learners, accommodating various schedules and geographical locations.”

John’s post in the discussion thread: “I agree with the point made by ChatGPT that ‘Online learning provides flexibility and accessibility to a diverse range of learners, accommodating various schedules and geographical locations.’ This aligns with my own experiences as an online learner. However, I would like to explore further how online learning can address specific challenges faced by students with different learning styles.”

Generated text citation: ChatGPT. (2023). “Online learning provides flexibility and accessibility to a diverse range of learners, accommodating various schedules and geographical locations.” [Prompt: Discuss the advantages of online learning.]

- If paraphrasing a text generated by such tools, do not put the text in quotation marks but cite the tool which generated the original text; and include the prompt used to generate the original text in the reference section of your thread.

Example:

Original text generated by ChatGPT: “The impact of technology on education has revolutionized the way we learn, allowing for personalized and adaptive learning experiences tailored to individual needs.”

John’s post in the discussion board: According to the insights provided by ChatGPT, technology has brought about a transformative shift in education, enabling customized and adaptive learning opportunities that cater to the unique requirements of each learner.

Paraphrased text citation: ChatGPT. (2023). The impact of technology on education has revolutionized the way we learn, allowing for personalized and adaptive learning experiences tailored to individual needs. [Prompt: Discuss the role of technology in education.]

- If you use the tool to edit/modify your own original text, you do not need to cite it.