Examining Students' Self-Regulation Skills, Confidence to Learn Online, and Perception of Satisfaction and Usefulness of Online Classes in Three Suggested Online Learning Environments that Integrates ChatGPT

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Abstract

This study aims to investigate students' self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online classes in three online learning environments that integrate ChatGPT. The participants were 100 undergraduate students from Palestine Technical University Kadoorie registered in a problem-solving and decision-making course during the first semester of 2023–2024 academic year. These participants were at various stages of their bachelor's degree programs within the Faculty of Arts and Educational Sciences. A quasi-experimental design was used to compare three online learning environments that integrate ChatGPT (independent, peer, and group). A total of 100 undergraduate students were randomly assigned to these three groups. Three questionnaires were used for data collection. The results showed that the self-regulation levels were high among the participants in these three online ChatGPT groups. However, learning in peer and group environments were more effective in developing self-regulation skills than learning independently. This research also found that the participants in the peer and group learning environments had high levels of confidence to learn online compared to the participants in the independent group. The results also showed that the participants in the peer learning group had the highest scores in perception of satisfaction and usefulness of online classes compared to the participants in the independent and group learning environments. The findings of this study support the notion that integrating ChatGPT within peer groups can enhance students' perception of satisfaction and usefulness of online classes. Therefore, integrating ChatGPT in online peer group settings can bring about a transformative educational experience marked by customized interactions, adaptable content delivery, and enhanced engagement levels. Educators should explore ways to leverage ChatGPT to facilitate meaningful interactions and collaboration among students, thereby increasing their satisfaction and engagement with online learning materials and activities. The findings from this research offer potential for enriching online learning experiences through the use of AI technologies.

Keywords: online learning, ChatGPT, self-regulation skills, confidence to learn online, perception of satisfaction

Introduction

ChatGPT is a new interface that facilitates human-computer interaction in a user-friendly method. Created by OpenAI, ChatGPT is an artificial intelligence language model that uses the GPT architecture. It generates human-like responses to user inquiries and commands by integrating deep learning and machine learning algorithms to simulate natural conversations. Its efficacy in mimicking human responses and adapting to user input within certain constraints has been demonstrated (Terwiesch, 2023). In education, initial researchers suggest that ChatGPT holds promise for enriching knowledge acquisition and refining writing and problem-solving competencies (Chatterjee & Dethlefs, 2023; Terwiesch, 2023). Despite the extensive use of artificial intelligence (AI) and GPT in various industrial sectors (Ahuja, 2019; Veloso et al., 2021), Bozkurt (2024) argued for innovative AI-inclusive strategies, emphasizing the urgent need for academia to adapt and evolve in response to the transformative impact of generative AI across various information-processing domains. Nevertheless, research that integrates chatbots in classroom settings and online learning environments is still in the early stages (Hwang & Chang, 2021).

The global expansion of online education has been rapid, with a growing number of platforms supporting distance learning. However, several challenges persist in enhancing the learning experience of online students. For instance, research has revealed significant differences in the outcomes of online math courses at the community college level compared to traditional face-to-face classes. These differences include lower grades, decreased pass rates, and a higher probability of withdrawal among students in online courses (Francis, Wormington, & Hulleman, 2019). Faculty feedback has also emphasized the importance of students' self-regulation for success in online classes (Gaytan, 2015; Levy, 2007; Nistor & Neubauer, 2010). If students do not possess self-regulated learning (SRL) skills while engaging in online education, they might encounter challenges in fulfilling the assigned learning tasks within their online courses (Barnard et al., 2009). However, online students hardly engage in interaction activities or receive direct guidance and supervision from their instructors (Broadbent & Poon, 2015; Su & Wu, 2021), which might make them struggle to regulate their learning (Jansen et al., 2019). Furthermore, students who dropped out of online classes reported lower satisfaction levels and displayed lower engagement, particularly in the early stages of the course, compared to those who completed it. Students with better ability to self-regulate their online learning were found to have significantly higher levels of perceived effectiveness than those with less ability in this area (Charo, Maite, & Guillermo, 2020).

The perception of self-regulation skills, confidence to learn online, and satisfaction and usefulness of online classes are crucial factors in the success of online learning. Landrum (2020) found that students' confidence in their ability to learn online was the strongest predictor of satisfaction, emphasizing the importance of students' confidence in online learning. Another study by Dai, Li, & Jia (2022) revealed that self-regulated learning was positively associated with perceived academic control and online mathematics learning engagement, highlighting the significance of self-regulation in online learning success. Additionally, students' satisfaction with online learning is influenced by their perception of the usefulness of online courses, their confidence in learning online, and their level of familiarity with the course content. Moreover, the level of students' satisfaction with online learning tends to increase with their accumulated experience in online education (Landrum et al., 2020). These findings highlight the need to address self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online classes to improve the effectiveness of students learning in online environments.

One possible direction to improve online learning is integrating AI chatbots. For example, ChatGPT has the ability to help learners overcome language and geographical barriers. Integrating ChatGPT into the online learning platform enables learners to access knowledge and information from anywhere with an internet connection. This expands the diversity of learning opportunities and provides equal learning opportunities for everyone. While large language models like ChatGPT can provide valuable assistance in online learning, it is crucial to acknowledge the potential risk of unreliable responses stemming from limitations in their training data and algorithms (Saeidi et al., 2021). Therefore, one must be aware of ChatGPT's current limitations, particularly its potential for providing inaccurate responses, when incorporating it into educational settings.

The potential and challenges of integrating ChatGPT into online learning platforms need to be further researched. To our knowledge, there have been no studies addressing this issue. Therefore, this research focuses on examining the opportunities of integrating ChatGPT into online learning systems. This study investigates students' self-regulation skills, confidence in online learning, and perceptions of satisfaction and usefulness within three distinct learning environments employing ChatGPT. Using a quasi-experimental design, our objective is to comprehensively compare the integration of ChatGPT in independent, peer-assisted, and group-based online learning settings. The findings from this research offer potential for enriching online learning experiences through the use of AI technologies like ChatGPT. By interpreting the possible advantages and obstacles linked to these integrations, our results contribute to the continuous improvement of educational practices in digital environments.

Literature Review

ChatGPT to Support Online Learning Groups

The use of ChatGPT in higher education has generated interest for its ability to improve students' learning experiences. Through delivering personalized and prompt responses, ChatGPT can address students' needs, provide instant feedback, and help students understand complex concepts. This makes it a promising tool that supports active student engagement and cognitive progress by adapting to individual learning speeds and offering continuous assistance in knowledge acquisition (Dempere et al., 2023).

ChatGPT potential to support group interactions in an online learning context is significant. Firstly, ChatGPT can help facilitate group discussions and provide explanations on complex topics, serving as a virtual tutor for students seeking additional support or clarification (Javaid et al., 2023). Secondly, ChatGPT's continuous availability allows for on-demand support, enabling students to engage in group interactions and seek assistance at any time, which can be particularly beneficial for collaborative projects or study groups (de Winter, Dodou, & Stienen, 2023). Thirdly, the chatbot can personalize group interaction and support students with varying learning needs (Labadze, Grigolia, & Machaidze, 2023). Fourthly, ChatGPT can handle interactions with multiple users simultaneously, making it suitable for supporting group discussions and collaborative activities in online learning environments, even with large numbers of participants (Montenegro-Rueda et al., 2023). Finally, in the realm of online learning, ChatGPT can serve a supportive role by facilitating group interactions, guiding discussions, and providing insights into complex subjects. However, ethical considerations, such as finding a balance between automation and human interaction and ensuring transparency and accountability in its development and use, must be

carefully considered (Lo, 2023). Additionally, one must be aware of ChatGPT's current limitations, particularly its potential for providing inaccurate responses, when incorporating it into educational settings.

Self-regulation

Self-regulation skills refer to the ability to monitor one's thoughts, feelings, and behaviors, compare them against personal goals, and decide whether to adjust or maintain them. These skills are essential for managing emotions and maintaining focus on tasks (Boekaerts & Corno, 2005; Zimmerman, 2000). Students develop self-regulation by establishing goals, choosing and employing strategies, keeping track of their performance, and regularly reflecting on their learning outcomes over an extended period (Zimmerman, 2008). Online learning literature highlights the importance of self-regulated learning (SRL) for student success in digital educational environments. For example, students who receive self-regulation support, such as metacognitive questioning, outperform their peers in math procedural tasks, transfer tasks, and self-monitoring strategies (Artino, 2007). This literature also highlighted the role of interventions and tools like online virtual tutors in improving the performance of students with learning difficulties or unstable SRL skills (Pérez-Álvarez et al., 2018). Moreover, self-regulated learning in online environments includes various dimensions such as motivational, social, behavioral, and cognitive factors, all of which contribute to improved self-regulation and learning outcomes (Bylieva et al., 2021). If integrated properly, ChatGPT could have a positive impact on self-regulated learning. Some key aspects of this relation include cultivating metacognitive awareness by offering features that support self-regulation and promote metacognitive awareness (Bai, Liu, & Su, 2023). ChatGPT was found to be effective in promoting self-regulation progress and knowledge construction in a large mathematics blended class using a flipped learning approach (Li et al., 2023). Lee et al. (2024) found that integrating ChatGPT with a guidance mechanism in blended learning environment was effective in improving students' SRL, higher-order thinking skills (HOTS), and knowledge construction compared to traditional ChatGPT use.

Confidence to Learn Online

Confidence to learn online refers to the individuals' belief in their ability to effectively engage with and succeed in the process of online learning. It involves having the self-assurance and positive mindset necessary to navigate digital learning platforms, comprehend online course materials, and participate in virtual learning activities (Landrum, 2020). Confidence to learn online is related to self-efficacy, which is a student's belief in his ability to perform a specific task (Greener & Wakefield, 2015; Bandura, 1977). It serves as a foundational influence on human behavior and involves perceptual beliefs specific to users' activities, making it relevant for assessing particular situations or tasks (Bandura, 2010). In the context of online learning, self-efficacy relates to a student's confidence or capacity to learn using an online learning technology system (Cai et al., 2018). Individuals with enhanced self-efficacy levels experience reduced anxiety when using technology and demonstrate increased confidence in carrying out tasks related to technology (Downey & Kher, 2015). ChatGPT integration in face-to-face problem solving at university levels was found to have positive effects on self-efficacy for task resolution and enhanced the quality of deliberation and originality of solutions (Urban et al., 2023). Urban et al. (2023) found that the participants who received ChatGPT assistance perceived the task as easier requiring less mental effort. However, their study showed that the perceived usefulness of ChatGPT appeared to inform self-evaluation judgments, resulting in higher inaccuracy.

Perception of Satisfaction and Usefulness of Online Classes

Literature review indicates that students' perception of satisfaction and usefulness of online classes can be influenced by various factors like course design, quality of instructor, and students' expectations (Martin & Bolliger, 2022; Gopal, Singh, & Aggarwal, 2021). Technology integration can enhance students' satisfaction and usefulness of online classes through creating an engaging and collaborative learning environment and can improve the quality of the online learning system (Butt et al., 2021; Alqahtani et al., 2022). ChatGPT, as a language model, can potentially be used to enhance online learning experiences by providing personalized and interactive support to students, facilitating discussions, and answering queries.

Relationship Between Self-Regulation Skills, Confidence to Learn Online, and Perception of Satisfaction

The relationship between self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online classes is interconnected. Research indicates that students' confidence in their ability to learn online is a significant predictor of their satisfaction and perceived usefulness of online classes (Landrum, 2020). Additionally, self-regulation strategies, time-management skills, and past online learning experience play crucial roles in enhancing students' satisfaction and perceived usefulness of online classes (Artino, 2008). Therefore, students with strong self-regulation skills are likely to feel more confident in their ability to learn online, which in turn can positively influence their perception of satisfaction and usefulness of online classes. Inversely, students who lack confidence in their ability to learn online may struggle to regulate their learning effectively and may perceive online classes as less satisfactory or useful. Therefore, interventions aimed at improving self-regulation skills and fostering confidence in online learning can have positive implications for learners' overall satisfaction and success.

Group Size

Group size in online learning can significantly impact students' performance, motivation, cognitive load, and collaborative problem-solving quality (Afify, 2019; Zhan et al., 2022). The relation between group size and self-regulation in online learning is noteworthy. Group size can influence students' self-regulation, which is essential for successful online learning outcomes (Lin, Szu, & Lai, 2016). Smaller groups tend to enhance student self-regulation by creating a more personalized and interactive learning environment, reducing the negative aspects of online learning, such as social loitering and low levels of group structure, and promoting a sense of community and cohesion (Akcaoglu & Lee, 2016). Research shows that group awareness and self-regulation levels substantially affect student outcomes in online learning (Lin, Szu, & Lai, 2016). Thus, smaller group sizes can positively influence students' self-regulation skills and overall success in online learning environments. Furthermore, the relationship between group size and the perception of satisfaction and usefulness of online classes is significant in online learning. Studies indicate that students' satisfaction with online classes is influenced by factors like group size and composition in online discussions (Murdoch & Lin, 2023). Additionally, students' perceptions of satisfaction and usefulness in online classes can be affected by the level of engagement, collaboration, and support facilitated by different group sizes (Gopal, Singh, & Aggarwal, 2021). Therefore, group size plays an important role in shaping students' perceptions of satisfaction and usefulness in online classes, emphasizing the importance of considering group dynamics when designing online learning environments. Furthermore, research suggests that students' confidence in their ability to learn online significantly predicts their satisfaction and perceived usefulness of online classes (Landrum, 2020). Thus, a combination of confidence

in online learning and group size can impact students' self-regulation skills and overall success.

Some studies suggest that group sizes of four to five are best for small group learning, while others report that the ceiling on group size should be four (Correge & Michinov, 2021). Literature review present mixed findings of group size effects on self-regulation in online learning. For example, larger groups are associated with decreased performance of individual students and less diverse social interactions (Saqr, Nouri, & Jormanainen, 2019). The impact of group size on self-regulation may be influenced by factors such as the design of collaborative activities, the use of technology to support group interactions, and the facilitation of group processes by instructors. Additionally, the literature suggests that the quality of group interactions, the establishment of group norms, and the distribution of roles within the group can all play a role in shaping self-regulatory processes (Thürmer, Wieber, & Gollwitzer, 2020; Doebel & Munakata, 2017). The size of online groups can also have an impact on students' confidence in learning online. Research has shown that students may believe that online instruction could lead to decreased social presence and a lack of ability to self-regulate, which can affect their confidence in learning online (Garner, Kuborn, & Chisum, 2022). Additionally, a study on motivation in massive open online courses (MOOCs) found that the size of online groups can influence the participants' motivation to learn online (Barak, Watted, & Haick, 2016). Furthermore, the size of the group can influence students' perception of usefulness in online learning. Research has shown that varying group sizes can impact students' perception of social presence, personal identity, and group cohesiveness (Luo et al., 2023). It has been found that small group discussions can lead to a higher level of social presence, which can contribute to increased perceived usefulness in online learning (Akcaoglu & Lee, 2016). Therefore, the impact of group size on students' perception of usefulness in online learning is a complex and multifaceted issue that may depend on the specific learning context and activities.

Theoretical Framework

This research is guided by two theoretical frameworks: connectivism and the Community of Inquiry (CoI) model. George Siemens and Stephen Downes (2005) introduced connectivism as a contemporary learning theory (Herlo, 2017). This theory underscores the significance of technology in education and the interconnected nature of knowledge acquisition. The theory advocates for students to gather diverse ideas and knowledge from various sources, combining them effectively to create meaningful understanding. Several key principles characterize connectivism. Firstly, learning is a social process where students take control of their learning while teachers serve as facilitators. Secondly, learning occurs across a network where knowledge is derived from diverse opinions, viewpoints, and experiences, treating individuals and resources as "nodes." Thirdly, learning is a process of connecting and emphasizing the importance of building relationships with colleagues to access new skills and ideas. Finally, learning may reside in non-human devices, allowing learners to store information digitally (Harasim, 2017; Herlo, 2017; Sa'adi, 2016). Connectivism promotes group interaction, fostering diverse perspectives in decision-making, problem-solving, and information comprehension. It encourages learning through online communities, blogs, and public spaces, aligning with the changing educational landscape influenced by technology (Harasim, 2017).

The CoI model emphasizes the significance of interactions among teaching, social, and cognitive aspects in forming collaborative and positive learning communities. It

comprises three fundamental components: teaching presence, cognitive presence, and social presence. Teaching presence involves guiding cognitive and social processes to achieve personally meaningful learning outcomes. Cognitive presence gauges learners' ability to construct and validate meaning through reflection and discourse. Social presence entails participants connecting with the community, using purposeful communication in a trusting environment, and building interpersonal relationships by expressing their individual personalities. Widely employed in online education, the CoI model is adaptable to blended and in-person courses. It advocates for active engagement and shared meaning-making, promoting a profound and significant learning experience while fostering a positive, community-focused learning atmosphere (Garrison, Anderson, & Archer, 1999; Vaughan, 2013).

Despite the growing use of ChatGPT in educational settings to improve engagement and meaning-making, there is a need to understand its specific impact on undergraduate students' online learning experiences. The aim of the study is to investigate the impact of integrating ChatGPT within three suggested online learning environments (independent, peer, and group) on undergraduate students' self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online learning.

Problem Statement and Research Question

The previous literature review shows that while there is extensive literature on the potential of ChatGPT to support group interactions and enhance learning experiences, there is a lack of empirical evidence regarding its actual impact on self-regulation, confidence, and perception of satisfaction and usefulness in the context of online learning. Additionally, the existing research primarily focuses on the benefits and challenges of ChatGPT implementation, as well as the perspectives of key stakeholders in higher education, rather than on the direct impact on students' learning experiences and outcomes. Therefore, there is a need for empirical studies that specifically investigate the influence of ChatGPT integration within different online learning environments on students' self-regulation, confidence, and perception of satisfaction and usefulness, in order to provide a more comprehensive understanding of its effects on undergraduate students' online learning experiences. Therefore, the presented study aims to investigate the impact of integrating ChatGPT within three suggested online learning environments (independent, peer, and group) on undergraduate students' self-regulation skills, confidence to learn online, and perceptions of satisfaction and usefulness of online classes.

It seeks to answer the main question: what is the impact of integrating ChatGPT within independent, peer, and group online learning environments on undergraduate students' self-regulation skills, confidence to learn online, and perceptions of satisfaction and usefulness of online classes? How do these effects vary across the three suggested online learning environments? Three sub-research questions were derived from this main question:

Q1: Is there a significant difference in the self-regulation levels among the students who participated in the three online ChatGPT groups: individual learning, peer learning, and group learning?

Q2: Is there a significant difference in the confidence to learn online mong the students who participated in the three online ChatGPT groups: individual learning, peer learning, and group learning?

Q3: Is there a significant difference in the perception of satisfaction and usefulness of online classes levelsmong the students who participated in the three online ChatGPT groups: individual learning, peer learning, and group learning?

Methods

Research Design and Context

This study aimed to investigate the impact of integrating ChatGPT within three suggested online learning environments (independent, peer, and group) on undergraduate students' self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online courses. Pre-test and post-test experimental design was used to collect data from three experimental learning groups. These groups were: individual learning with ChatGPT, peer learning with ChatGPT, and group learning with ChatGPT. The participants were 100 undergraduate students from Palestine Technical University Kadoorie registered in a problem-solving and decision-making course during the first semester of the 2023–2024 academic year. These participants were at various stages of their bachelor's degree programs within the Faculty of Arts and Educational Sciences. Their specialties were Media Technology, Educational Technology, and Decoration and Interior Design. During this online course on the Moodle platform, the participants were required to integrate ChatGPT to analyze and discuss cases on online worksheets that present problem-solving and brainstorming activities.

A training session was given to the participants in the first week of the course to introduce ChatGPT and explain how it can be used to enhance problem-solving and decision-making. Table 1 presents the learning activities of the ChatGPT training.

Table 1

The Outline of the ChatGPT Training

Session	Activities
Introduction to Chatbots and ChatGPT:	• Explain what chatbots are and how they work. • Introduce ChatGPT and its capabilities, including text generation, language understanding, and context handling. • Discuss the potential benefits of integrating ChatGPT in problem solving and decision making.
Hands-On Experience:	• Provide students with access to ChatGPT in Moodle environment. • Let them experiment with the tool, ask questions, and observe how the chatbot responds. • Encourage them to identify potential use cases for problem solving and decision making.
Identify Use Cases in Problem Solving:	• Brainstorm with students to identify specific use cases where ChatGPT can enhance problem-solving. • Examples might include Creative Problem Solving (CPS) which involves breaking down a problem to understand it, generating ideas to solve the problem and evaluating those ideas to find the most effective solutions.

Promote Student Engagement:	• Explore strategies to engage students actively in interactions with ChatGPT. • Discuss how ChatGPT can be used as a tool to spark discussions, encourage creativity, and problem-solving.
Address ChatGPT Challenges and Limitations:	• Discuss the limitations of ChatGPT, such as generating incorrect or biased responses. • Teach students how to verify information provided by ChatGPT and supplement it with reliable sources. • Encourage critical thinking and evaluation when using AI-generated content.
Understand Responsible AI Usage:	• Address the ethical considerations of using AI and chatbots in the online setting. • Discuss the importance of responsible AI usage, data privacy, and avoiding biases in the training data. • Provide guidelines on using ChatGPT appropriately and avoiding harmful or inappropriate content during this course.

The participant students were randomly assigned in the three experimental groups. Table 2 presents the demographic information of the participants in each group.

Table 2

Demographic Information of the Participants

	Gender		**Level**			
Learning Group	Male	Female	First year	Second year	Third year	Fourth year
Individual	17	17	6	8	10	10
Peer	16	17	7	9	8	9
Group	16	17	9	7	9	8

Instruments

Three different questionaries were applied to assess students' self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online classes during the implementation phase of this study. Firstly, the Online Self-Regulated Learning Questionnaire (OSLQ) was adopted by the researcher to assess the participants' self-regulation skills (Barnard et al., 2009). This questionnaire consisted of 24-items in a 5-point Likert response format. Higher scores on this scale indicate better self-regulation in online learning by students. Secondly, to assess confidence to learn online, a questionnaire was developed based on the learning management system self-efficacy scale (Bradley, Browne, & Kelley, 2017), and self-efficacy for learning online scale (Zimmerman & Kulikowich, 2016). This questionnaire consisted of 10 items in a 5-point Likert response format. Finally, to assess students' perception of satisfaction and usefulness of online classes, the student

satisfaction survey developed by Strachota (2006) was adapted. The applied draft consisted of 10-items in a 5-point Likert scale format.

Validity and Reliability of the Instrument

To assess the validity of the instruments, the questionnaires were presented to eight experts with graduate degrees and vast experience in instructional design and online learning. The experts evaluated the questionaries' accuracy, clarity, and appropriateness. A final version of the scales was developed based on the experts' feedback. Cronbach's Alpha was used to determine the internal consistency reliability of the three scales. The results are accepted values of Cronbach's Alpha scores (Taber, 2008), as presented in Table 3.

Table 3

Cronbach's Alpha Scores

Scale	Self-Regulation Skills	Confidence to Learn Online	Perceptions of Satisfaction and Usefulness
Cronbach's Alpha	.95	.93	.84

Students' Results Prior to the Study

A one-way analysis of variance was conducted to assess whether a significant difference in confidence to learn online, self-regulation skills, and perception of satisfaction and usefulness of online courses exist between the three learning groups (independent, peer, and group) on the pre-test scores. The results are presented in Table 1.

Table 4

ANOVA Test Results Comparing the Three Experimental Groups Prior to the Study

		Sum of Squares	df	Mean Square	F	Sig.
Self-Regulation Skills	Between Groups	.015	2	.008	.037	.963
	Within Groups	19.865	97	.205		
	Total	19.880	99			
Perceptions of Satisfaction and Usefulness	Between Groups	.050	2	.025	.106	.900
	Within Groups	22.831	97	.235		
	Total	22.881	99			
Confidence to Learn Online	Between Groups	.084	2	.042	.248	.781
	Within Groups	16.467	97	.170		
	Total	16.552	99			

ANOVA results showed that there are no significant differences in students' self-regulation skills, confidence to learn online, and perception of satisfaction and usefulness of online classes before participating in this study, $F = .037$, $p > 0.05$ for self-regulation skills, were $F = .248$, $p > 0.05$ for confidence to learn online, and $F = .106$, $p > 0.05$ for perceptions of satisfaction and usefulness of online courses. The results reveal that the three online

ChatGPT groups (independent learning, peer learning, and group learning) were at the same level before participating in the study.

Results

Q1 Results

Is there a significant difference in the self-regulation levels among the students who participated in the three online ChatGPT groups: individual learning, peer learning, and group learning?

One-way analysis of variance was conducted to assess whether a significant difference in self-regulation scores exist between the three online ChatGPT groups (individual learning, peer learning, and group learning) after participating in online course. The results are presented in Table 5.

Table 5

ANOVA Results of Self-Regulation Skills by Learning Group After Participating in the Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.684	2	.342	5.823	.004
Within Groups	5.696	97	.059		
Total	6.380	99			

Table 6

Descriptive Results of the Self-Regulation by Learning Group After Participating in the Study

	N	Mean	Std. Deviation
Independent learning	34	3.545	.2659
Peer learning	33	3.733	.1717
Group learning	33	3.702	.2748
Total	100	3.659	.2538

Table 6 shows that a significant difference exists in the self-regulation scores between the three online ChatGPT groups. A LSD test was applied to figure out the direction of these differences.

Table 7

LSD Test Results

	Independent learning	Peer learning	Group learning
Independent learning	-	*	*
Peer learning	*	-	-
Group learning	*	-	-

Table 7 shows that the participants in the peer learning and group learning had high levels of self-regulation scores (3.733 and 3.702, respectively). Otherwise, the participants in the independent group had the lowest scores (3.545). However, the self-regulation levels were high among the participants in these three online ChatGPT groups.

Q2 Results

Is there a significant difference in the confidence to learn online levels among the students who participated in the three online ChatGPT groups: individual learning, peer learning, and group learning?

ANOVA test was conducted to assess whether significant differences in confidence to learn online scores exist between the three online ChatGPT groups (individual learning, peer learning, and group learning) after participating in the online course. The results are presented in Table 8.

Table 8
ANOVA Results of Confidence to Learn Online by Learning Group After Participating in the Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.553	2	2.277	18.155	.000
Within Groups	12.164	97	.125		
Total	16.718	99			

Table 9
Descriptive Results of the Confidence to Learn Online by Learning Group After Participating in the Study

	N	Mean	Std. Deviation
Independent learning	34	3.841	.5081
Peer learning	33	4.336	.2678
Group learning	33	4.227	.2050
Total	100	4.132	.4109

Table 8 shows that a significant difference in the confidence to learn online scores exists between the three online ChatGPT groups. A LSD test was applied to figure out the direction of these differences.

Table 10
LSD Test Results

	Independent learning	Peer learning	Group learning
Independent learning	-	*	*
Peer learning	*	-	-
Group learning	*	-	-

Table 10 shows that the participants in peer learning and group learning had very high levels of confidence to learn online scores (4.336 and 4.227, respectively). Otherwise, the participants in the independent learning group had the lowest score (3.841). However, the level was high in these three groups.

Q3 Results

Is there a significant difference in the perceptions of satisfaction and usefulness of online classes levels among the students who participated in the three online ChatGPT groups: individual learning, peer learning, and group learning?

ANOVA test was conducted to assess whether a significant difference exist in the perception of satisfaction and usefulness of online classes scores between the three online

ChatGPT groups (individual learning, peer learning, and group learning) after participating in the online course. The results are presented in Table 11.

Table 11

ANOVA Results of Satisfaction and Usefulness of Online Classes by Learning Group After Participating in the Study

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.359	2	1.679	11.496	.000
Within Groups	14.171	97	.146		
Total	17.530	99			

Table 12

Descriptive Results of Satisfaction and Usefulness of Online Classes by Learning Group after Participating in the Study

	N	Mean	Std. Deviation
Independent learning	34	3.785	.5070
Peer learning	33	4.230	.3996
Group learning	33	3.960	.1344
Total	100	3.990	.4208

Table 11 shows that a significant difference exists in the perceptions of satisfaction and usefulness of online classes scores between the three online ChatGPT groups. A LSD test was applied to figure out the direction of these differences.

Table 13

LSD Test Results

	Independent learning	Peer learning	Group learning
Independent learning	-	*	-
Peer learning	*	-	*
Group learning	-	*	-

Table 13 shows that the participants in the peer learning group had the highest scores of perceptions of satisfaction and usefulness of online classes (4.230). Otherwise, the participants in the independent learning and group learning had the lowest scores (3.785 and 3.960, respectively).

Discussion

This study aimed to investigate the impact of integrating ChatGPT within three suggested online learning environments (independent, peer, and group) on undergraduate students' self-regulation skills, confidence to learn online, and perceptions of satisfaction and usefulness of online classes. The participants were 100 undergraduate students from Palestine Technical University Kadoorie registered in a problem-solving and decision-making course during the first semester of 2023–2024 academic year. The results showed that the self-regulation levels were high among the participants in these three online ChatGPT groups. However, learning in peer or group was more effective in developing self-regulation skills

than learning independently. This research found that participants in peer and group learning environments were more confident in learning online compared to those in the independent learning environment. The results also showed that the participants in the peer learning group had the highest scores of perception of satisfaction and usefulness of online classes compared to the participants in the independent and group environments.

The findings of this research highlighted the importance of interactive learning experiences in online education and aligned with existing literature on online interaction and engagement. Interaction and engagement have emerged as pivotal factors influencing self-regulation, confidence, and satisfaction in online learning environments (Miao & Ma, 2022). Previous researchers had established a positive correlation between social presence, self-regulation, and online interaction with students' engagement in online courses (Landrum, 2020; Wu et al., 2023). Moreover, the theory of transactional distance emphasizes the significance of interaction in fostering effective online learning experiences (Moore, 1993; Benson & Samarawickrema, 2009). The integration of ChatGPT within the online course facilitated enhanced interaction among the participants, provided them access to a diverse range of information and resources, thereby fostering collaboration, problem-solving, and engagement. The use of a language model (LLM) such as ChatGPT in learning settings brings about a transformative educational experience marked by customized interactions, adaptable content delivery, and enhanced engagement levels. ChatGPT, when integrated properly into educational settings, tailors its responses to match individual learning styles, provides instantaneous feedback, and cultivates critical thinking skills through open-ended chats. Acting as a virtual tutor, study mate, and content creator in the online learning setting, ChatGPT improves the quality of the learning experience (Mai, Da, & Hanh, 2024). In contrast, the absence of AI-driven support, content creation, and feedback mechanisms could restrict the extent of engagement and personalization achievable during the learning journey. Hence, while interactive learning experiences without ChatGPT remain valuable, the distinctive capabilities of ChatGPT in enhancing personalization, engagement, and inclusivity distinguish it as a pivotal tool in revolutionizing educational learning experiences. Notably, interaction within peer groups leveraging ChatGPT appeared particularly effective, likely due to its facilitation of peer projects and collaborative activities.

While prior studies on group size's impact on learning tasks in online discussions have yielded mixed results (Corrégé & Michinov, 2021). This study observed that integrating ChatGPT within peer and group online environments enhanced self-regulation compared to independent learning settings. These results align with previous findings suggesting that collaborative group projects can bolster students' self-regulation skills, fostering independence in online learning environments (Khurshid, 2020).

The perception of satisfaction and usefulness of online classes was significantly higher in the online environment that integrates ChatGPT in peer learning environment compared to those integrating it in larger groups or independently. Large group sizes may impede effective communication and information exchange, potentially leading to reduced satisfaction and engagement (Saqr, Nouri, & Jormanainen, 2019). However, the impact of group size on learning outcomes and satisfaction may vary across disciplines (Zhan et al., 2022), highlighting the need for further research and contextual understanding.

Implications

The findings of the study suggest several implications for online education practitioners and educators aiming to enhance the effectiveness of online learning environments. Firstly, educators and course designers should consider integrating ChatGPT

into assignments within peer and group settings to foster collaborative learning experiences. The study highlights the effectiveness of ChatGPT in facilitating group projects, brainstorming sessions, and problem-solving activities, which can enhance student engagement and interaction. Secondly, institutions should focus on promoting self-regulated learning skills among students by encouraging collaborative group projects and activities. By leveraging technologies like ChatGPT, educators can provide students with the tools and resources necessary to develop and enhance their self-regulation skills, thereby fostering independence and autonomy in online learning environments. Thirdly, educators should pay attention to the dynamics of group size when designing collaborative learning activities. While smaller group sizes may facilitate effective communication and information exchange, larger groups may lead to less cohesive interactions and reduced satisfaction. Understanding the optimal group size for different disciplines and learning contexts can help educators design more effective collaborative learning experiences. Fourthly, integrating ChatGPT within peer groups can enhance students' perception of satisfaction and usefulness of online classes. Educators should explore ways to leverage ChatGPT to facilitate meaningful interactions and collaboration among students, thereby increasing their satisfaction and engagement with online learning materials and activities. Finally, given the evolving nature of online education and technology, continuous research and adaptation are essential. Educators and researchers should conduct further studies to explore the long-term effects of integrating ChatGPT in online learning environments and to identify best practices for optimizing its use to enhance student learning outcomes and satisfaction.

ChatGPT shows potential as a helpful tool for educators and a virtual mentor for students in online learning; however, it poses specific challenges. These challenges include generating incorrect or false information and being able to bypass plagiarism detection. It is crucial to address these issues promptly by revising assessment methods and institutional policies in educational institutions. For example, Trust (2023) proposed several strategies aimed at mitigating the adverse effects of ChatGPT on academic integrity. These strategies include, firstly, encouraging activities and assignments that emphasize genuine understanding and application of knowledge, rather than relying solely on automated responses from ChatGPT. Secondly, fostering an environment where students are encouraged to question, analyze, and evaluate information provided by ChatGPT, rather than passively accepting it as definitive. Finally, designing assignments that require creativity, originality, and personal input from students, thereby reducing reliance on ChatGPT-generated content and enhancing the value of human thought and effort in academic work. Therefore, providing training for instructors and educating students on effectively managing the impact of ChatGPT in the educational landscape is equally vital.

Declarations

Ethical Approval

Approval to conduct this study was received from the Human Subjects Committee at Palestine Technical University Kadoorie. All research activities were reviewed and approved by the Human Subjects Committee. The researcher also followed the Code of Ethics by the American Educational Research Association.

Informed Consent of Participation

Informed consent of participation was obtained from each participant.

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