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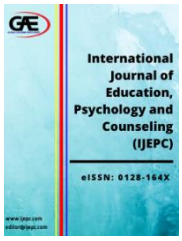

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INVESTIGATING ONLINE LEARNING PRESENCE THROUGH CONNECTIVISM

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Abstract:

The adoption of online learning has grown significantly, particularly in the post-pandemic era. Initially driven by necessity, its flexibility and scalability have contributed to widespread acceptance, especially in higher academic institutions. This quantitative study examines online presence in learning from the perspective of Connectivism. A 34-item Likert-scale survey assessing teaching, social, and cognitive presence was conducted among 166 undergraduate students at a public university in Malaysia. The findings highlight significant correlations between autonomy, connectedness, diversity, and openness in online learning. These results emphasise the need to balance instructional strategies and foster social connections to enhance engagement, satisfaction, and academic performance.

Keywords:

Online Learning, Connectivism, Teaching Presence, Social Presence, Cognitive Presence

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Introduction

Background of Study

The shift toward online learning has called for a deeper understanding of the driving factors influencing learners' engagement and satisfaction. The theory of Connectivism, introduced by Siemens (2005), provides a framework for understanding knowledge acquisition in digital environments. This theory highlights the principles of autonomy, connectedness, diversity, and openness, illustrating how learning occurs through networks rather than as an isolated cognitive process. It underscores the importance of interaction, collaboration, and real-time knowledge sharing in an increasingly connected world.

Complementing this perspective is the Community of Inquiry (CoI) model, developed by Garrison, Anderson, and Archer (2000) and further explored by Garrison and Arbaugh (2007). The CoI framework identifies teaching, social, and cognitive presence as key elements in promoting meaningful learning experiences. Teaching presence relates to instructional design and facilitation, while social presence involves interpersonal communication and collaboration. Cognitive presence, on the other hand, focuses on critical thinking and knowledge construction. Together, these elements shape the quality of online learning environments.

By integrating Connectivism and the CoI model, this study aims to explore how learners perceive online presence and engagement. Understanding the relationship of these theoretical models can provide insights into optimising online learning experiences to enhance learner autonomy, collaboration, and satisfaction.

Statement of Problem

Online learning has transformed education by offering unparalleled flexibility, accessibility, and opportunities for personalised learning. When implemented effectively, it supports engagement, collaboration, and global connectivity. The principles of autonomy, connectedness, diversity, and openness, as described by Connectivism (Siemens, 2005), underpin these benefits and provide a foundation for impactful online learning experiences.

One of the most significant strengths of online learning is autonomy, which empowers learners to take control of their education. This includes managing their pace, setting individual goals, and selecting resources that align with their needs. Research has shown that autonomy enhances motivation and academic performance, especially when learners effectively apply self-regulated learning strategies, such as time management and goal-setting (Jansen et al., 2020; Lazorak et al., 2021). Beyond autonomy, connectedness further enriches learning by fostering meaningful interactions. Virtual classrooms, discussion forums, and collaborative tools enable learners to share ideas, develop understanding, and create a sense of community within diverse learning environments (Saadatmand, 2017; Fakir et al., 2024).

In addition, the principle of diversity plays a critical role in broadening learners' perspectives. Online platforms frequently host international audiences, exposing learners to varied viewpoints, cultural contexts, and experiences. This diversity supports the development of critical thinking and intercultural competence, particularly in global or interdisciplinary programs (Jailani et al., 2023; Tahir et al., 2021). Alongside diversity, openness ensures equitable access to learning. Through free or low-cost resources, online learning reduces traditional barriers such as geographic location and financial constraints. Initiatives like

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Massive Open Online Courses (MOOCs) exemplify the potential of openness to make education widely accessible (Saadatmand, 2017; Tahir et al., 2021).

Despite these advantages, the practical application of online learning often falls short of these ideals. For instance, autonomy requires strong self-regulation skills that many learners lack. Jansen et al. (2020) highlight that while MOOCs offer significant flexibility, learners often struggle with time management, goal-setting, and maintaining motivation without structured support. Without interventions to scaffold these skills, learners can experience frustration, disengagement, or diminished performance (Hartnett, 2015; Ginting et al., 2020). Similarly, while connectedness is intended to promote collaboration, poor platform design or insufficient facilitation can lead to superficial interactions, leaving learners feeling isolated or unsupported (Worley, 2015; Saadatmand, 2017).

Although diversity enriches learning, it can overwhelm learners in environments with conflicting perspectives or an excessive amount of information. Without appropriate guidance, students may find it difficult to synthesize or apply new knowledge effectively (Tahir et al., 2021). Moreover, the principle of openness, while removing barriers, often inundates learners with a wide array of resources that vary in quality and relevance. This abundance can create challenges in evaluating and engaging meaningfully with content (Fakir et al., 2024; Panagiotopoulou & Manousou, 2020).

These challenges underscore a disconnect between the theoretical ideals of online learning and learners' practical experiences. While the principles of autonomy, connectedness, diversity, and openness underpin effective online learning, their implementation often presents challenges that affect learners' experiences. Addressing these challenges requires a deeper understanding of how learners perceive these principles in practice and the specific difficulties they encounter in online learning environments.

This study aims to explore learners' perceptions of these components and investigate how they interact to shape the overall learning experience. By addressing these gaps, this research seeks to contribute to the development of online education systems that align theoretical ideals with learners' practical needs, fostering more equitable and effective learning environments.

Objective of the Study and Research Questions

This study is done to explore the perception of learners on Connectivism in online learning. Specifically, this study is done to answer the following questions;

- How do learners perceive autonomy in online learning?
- How do learners perceive connectedness & diversity in online learning?
- How do learners perceive openness in online learning?
- Is there a relationship between all components in online learning?

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Literature Review

Theoretical Framework

Connectivism in Online Learning

Connectivism was founded by Siemens (2004, 2005, 2006, 2009) and Downes (2007). It is a learning theory that denounces and transcends the boundaries of Behaviorism, Cognitivism, and Constructivism (Duke, Harper & Johnston, 2013). These three were established before the incorporation of the technology within the sphere of academia; thus, Siemens (2004) mentions that the existing theories do not cater to the organizational knowledge and transference challenges of the information age. To address the matter, this relatively novel concept, Connectivism has emerged as a response to the increment of interconnectedness and complexity of the digital landscape (Alam, 2023).

The pedagogical framework, to put it simply, is a network that can be viewed as connections between entities or as a network-forming process (Siemens, 2004, 2005). Downes (2007), on the other hand, defines it as learning that is made up of the capability to construct and traverse a network of connections where knowledge is distributed. Knowledge in this context is defined as a recombination type of knowledge that has been developed in the past by people who live in this system, making it deeply interconnected with one another (Siemens, Rudolph & Tan, 2020). Apart from that, Alam (2023) views it as a theory of learning that emphasizes how significant technology and social networks can be in the process of learning.

In general, the definition of learning, according to Driscoll (2000), is where human performance or performance potential goes through a persisting change due to learners' experience as well as interaction with the world. Siemens (2004, 2005) elaborates that this particular model represents a tectonic shift where learning takes place outside an internal, individualistic endeavor. Learning here occurs externally through social networks, and learning will be linked based on how well it is presently linked. Siemens (2005) then clarifies that this is where the information learnt can smoothly flow from one domain to another once a network has been connected. Underlying the network creation, the information systems include the four aforementioned traits, which are autonomy, openness, diversity, and connectedness (Siemens, 2020; Tschofen & Mackness, 2012). Given that Connectivism emphasizes knowledge acquisition through digital networks, online presence becomes an essential element in fostering meaningful engagement and interaction within virtual learning environments.

Online Presence

The online presence of the learners can be acknowledged during the implementation of online learning. Garrison and Arbaugh (2007) define online learning as the extent to which learners and instructors engage in a virtual learning environment through cognitive, social, and teaching interactions. This definition is later expanded by Renda and Kuys (2015), who highlight that the model, devised by both George Siemens and Stephen Downes, fosters a much better integration, diversity, and distributed knowledge. This is because knowledge is now not only obtained via traditional means like lecturers or textbooks but is acquired through social media, online communities, and other technological platforms as well (Alam, 2023). Alam (2023) further states that new learning models, which are more collaborative and student-centered, have been employed in the model of Connectivism. For instance, watching virtual lectures, participating in group work and joining discussions are some of the activities done by the

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students in the flipped classroom model. The model lets them be in charge of their learning and collaborate with other students to enhance knowledge and understanding.

As a consequence, according to Renda and Kuys (2015), the emergence of Connectivism within the e-learning field and distributed learning networks are suitable in the technical fields. However, it still has not been accepted universally (Bell, 2011). According to Tschofen and Mackness (2012), personality theory and self-determination theory within the connectivist and MOOC landscapes have implicated people's expectations in open networks and online learning. Even so, online learning has revolutionised the realm of academia with the advancements of tailored learning, easy accessibility, and boundless flexibility offered throughout the system of network.

Past Studies

Past Studies on Connectivism in Online Learning

Connectivism has been widely applied in online learning environments to enhance educational outcomes. This theory, which emphasizes learning through digital networks and connections, has gained popularity due to its success across various educational contexts. It is particularly effective in today's digital world, where easy access to information and the ability to share knowledge have been shown to improve learning. Several studies have documented the positive outcomes of applying Connectivism in online course design.

Cleary (2020) conducted a study to explore peer engagement activities in two Technical and Professional Communication (TPC) programs at the University of Limerick. One of the programs was delivered entirely online, and the other was in a hybrid format. The study, spanning from 2014 to 2019, involved students from the Graduate Certificate and MA in Technical Communication and E-Learning programs. The first activity, the Academic Socialization Workshop, involved the development of a virtual learning environment (VLE) to facilitate communication among students. Meanwhile, the second activity, Peer Review, was designed to foster a Community of Inquiry (CoI). The students worked in peer groups to provide feedback on each other's research proposals, guided by the instructor. Qualitative feedback from students revealed that the workshop, which introduced Connectivism as both a theory and strategy, helped learners use networked technologies like VLE for communication and facilitated the formation of a CoI. Additionally, the workshop prepared students for online learning and future careers by promoting academic socialization, managing expectations, and building resilience—factors that could contribute to higher persistence rates. The study also found that the peer review activity played a crucial role in supporting cognitive learning while strengthening the learning community. Feedback on this activity was overwhelmingly positive, with students highlighting key benefits such as engagement, collaboration, connectedness, knowledge construction, and motivation. Based on these findings, Cleary (2020) emphasized the importance of monitoring the impact of pedagogical interventions at both the program and course levels. Therefore, gathering feedback on these interventions allows instructors to refine activities and establish a solid foundation for curriculum improvements. It also encourages learners to be involved in the curriculum design process.

Similarly, Don et al. (2022) explored the concept of connectedness in online learning, specifically within the framework of Connectivism, to understand how learners and educators can effectively interact with each other and with experts in a virtual environment. A survey

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was administered to 367 participants, using a questionnaire to gather data on online learning connectedness. The data, analyzed through SPSS, revealed the dynamics of connectivity between teachers, students, and peers during online sessions. The study found that online learning connectivity is shaped by three main interactions: between teachers, students, and peers. This highlights the importance of these relationships in the online learning environment. Based on these findings, Don recommended that educators adopt various pedagogical methods, including both synchronous and asynchronous sessions, alongside different ICT tools to improve connectivity and replicate the engagement typically seen in face-to-face learning settings.

Fakir et al. (2024) conducted a similar study, examining the relationship between core principles of Connectivism and learners' experiences in online group work, with a focus on how these principles can enhance collaborative learning. Using a quantitative approach, the study employed a survey with 23 items divided into three sections to gather data on learners' perceptions of online group work. A total of 166 responses were collected, allowing for an analysis of how principles such as diversity and openness, connectedness, and autonomy influenced learners' perceptions, as well as the interrelationships between these factors as outlined by the learning theory. The results indicated that learners' perceptions of online group work were significantly shaped by these principles, underscoring the importance of these elements in digital collaborative environments. Additionally, the study found a moderate to strong positive correlation between these variables, suggesting that applying Connectivism principles in online group work can improve learners' perceptions and enhance their engagement in collaborative learning.

In conclusion, the studies reviewed highlight the value of incorporating Connectivism's core principles into online courses to improve learner outcomes, promote active participation, and strengthen the learning community. They also highlight the importance of monitoring pedagogical interventions to continuously refine and improve the online learning experience.

Past Studies on Connectivism in Online Learning

Several studies have highlighted the importance of online presence in fostering active participation, interaction with multimedia content, and peer collaboration in digital learning environments. Haslina et al. (2023) explored learners' perceptions of online engagement, focusing on key elements of the Connectivism framework: connectedness, diversity, openness, and autonomy. Through a survey of 129 students at the Centre of Foundation Studies, UiTM Kampus Dengkil, the study found that learners viewed online engagement positively, with learner-to-instructor interactions being the most valued. A strong positive correlation between the four engagement elements indicated that these factors are interconnected and crucial for students' online motivation, academic success, and adaptability to future learning environments.

Sidik et al. (2021) investigated Connectivism in online engagement, focusing on learner-to-learner, learner-to-instructor, and learner-to-content interactions in an Open and Distance Learning (ODL) context. The study, which surveyed 116 respondents across various educational levels, revealed that students' interactions, behaviors, and motivations were significant factors in fostering engagement. However, unlike the findings of a previous study by Haslina et al. (2023), this study indicated that collaborative learning was not considered the most effective method for promoting peer understanding. While students appreciated instructor

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feedback, they felt that synchronous discussions and asynchronous assignments lacked immediate support and did not stimulate critical thinking.

To recapitulate, both studies emphasize the importance of instructor involvement and the role of engagement strategies in enhancing online learning. While Haslina et al. (2023) found strong support for collaborative learning and peer interactions, Sidik et al. (2021) highlighted the need for more effective methods to promote peer understanding and critical thinking. These findings suggest that for online learning to be truly effective, instructors must balance interaction types and ensure that all activities—whether collaborative or independent—are designed to provide immediate support and foster deeper cognitive engagement.

Conceptual Framework

Figure 1 shows the conceptual framework of the study. This study looks at the types of presence that learners are exposed to in online learning. Past findings revealed that learners perceived some factors that caused them to be less satisfied with online learning, while some factors are perceived as giving a positive online experience (Rahmat et al., 2021). In actuality, learners need different factors (ie, the type of presence) to make their learning successful. This study thus explores online presence through the concept of constructivism by Siemens (2005).

He states four main characteristics of Connectivism, and they are autonomy, connectedness, diversity, and openness. The four characteristics are scaffolded onto types of presence in online learning by Garrison & Arbaugh (2007) as presented in figure 1 below. Autonomy in learning is achieved through teaching presence. The teacher's autonomy is needed to lead the learners to focus their attention on what is important. Next, connectedness and diversity are achieved through social presence. Although learning is done online, learners still need to feel a social presence. Their presence can be felt through their interaction with their peers and even instructors. Finally, openness is achieved through cognitive presence. When learners have internalized the newly acquired knowledge, they can engage in discussions that encourage their critical thinking skills.

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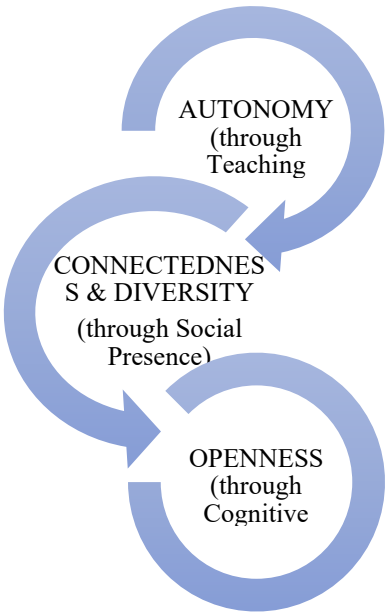

Figure 1: Conceptual Framework of the Study - Online Presence through Connectivism

Methodology

This quantitative study is done to explore motivation factors for learning among undergraduates. A purposive sample of 166 participants responded to the survey. The instrument used is a 5-point Likert-scale survey and is rooted from Siemens (2005) and Garrison & Arbaugh (2007) to reveal the variables in Table 1 below. The survey has four sections. Section A has items on the demographic profile. Section B has 13 items on teaching presence. Section C has 9 items on social presence. Section D has 12 items on cognitive presence.

Table 1: Distribution of Items in the Survey

Section	Component	Type of Presence	No. of Items	Cronbach Alpha
B	Autonomy	Teaching	13	.968
C	Connectedness & Diversity	Social	9	.922
D	Openness	Cognitive	12	.963
			34	.973

Table 1 also shows the reliability of the survey. The analysis shows a Cronbach alpha of .968 for Autonomy, .922 for Connectedness & Diversity, and .963 for Openness. The overall reliability for all 34 items is .973, thus revealing a good reliability of the instrument chosen/used. Further analysis using SPSS is done to present findings to answer the research questions for this study.

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Findings

Findings for Demographic Profile

Table 2: Percentage for Q1 - Gender

No	Item	Percentage
1	Male	33%
2	Female	67%

Table 2 presents the gender distribution of respondents. The majority of participants were female, at 67%, whereas male respondents were recorded at 33%. This trend aligns with the program's enrolment patterns, where female students are significantly higher as compared to male students.

Table 3: Percentage for Q2 - Age Group

No	Item	Percentage
1	18-20	49%
2	21-30	51%

As illustrated in Table 3, the respondents were almost evenly distributed between the two age groups. 51% of the participants fall within the 21-30 age group, while 49% are between 18 and 20 years old. Since the survey was distributed to Bachelor's students across different academic years, the participants ranged from ages 18 to 30. This relatively balanced distribution suggests a mix of younger and more mature undergraduate students, reflecting different stages of academic progression.

Table 4: Percentage for Q3 - English Course Enrolment

No	Item	Percentage
1	LCC 401	10%
2	LCC 402	82%
3	ELC 590	8%

Table 4 shows that most respondents are enrolled in LCC 402 (82%), followed by LCC 401 (10%) and ELC 590 (8%). This distribution indicates that the majority of participants were from LCC 402, likely due to higher enrolment numbers or a greater willingness to participate in the survey. The lower participation from LCC 401 and ELC 590 may be attributed to smaller class sizes or less interest in the study.

Table 5: Percentage for Q4 - Campus Distribution

No	Item	Percentage
1	Shah Alam	32%
2	Puncak Alam	4%
3	Puncak Perdana	17%
4	Sungai Buloh	47%

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Table 5 illustrates the distribution of respondents across different campuses. Sungai Buloh had the highest representation at 47%, followed by Shah Alam at 32% and Puncak Perdana at 17%. The Puncak Alam campus had the lowest representation at just 4%. This distribution may reflect the differences in student population sizes or the availability of relevant courses at each campus.

Findings for Autonomy

This section presents data to answer research question 1: How do learners perceive autonomy in online learning? In the context of this study, autonomy is measured by teaching presence, which is sub-categorized by (i) design & organization, (ii) facilitation, and (iii) direct instruction.

Table 6: Mean for (i) Design & Organization

Item	Mean	SD
TPQ 1 The instructor clearly communicated important course topics.	4.7	.55114
TPQ 2 The instructor clearly communicated important course goals.	4.8	.48218
TPQ 3 The instructor provided clear instructions on how to participate in course learning activities.	4.7	.57249
TPQ 4 The instructor clearly communicated important due dates/time frames for learning activities.	4.7	.48202

Table 6 highlights learners' perceptions of autonomy in online learning, as reflected in teaching presence. The instructor's ability to communicate course goals clearly scored the highest mean (4.8, SD = .48218), which demonstrates its importance in guiding learners to take ownership of their learning. Similarly, clear communication of course topics (4.7, SD = .55114), instructions for participation (4.7, SD = .57249), and due dates or time frames (4.7, SD = .48202) also contributed significantly to fostering autonomy. These results suggest that effective teaching presence, through well-structured design and organisation, plays a crucial role in empowering learners to navigate and succeed in online learning environments autonomously.

Table 7: Mean for (ii) Facilitation

Item	Mean	SD
TPQ 5 The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.	4.7	.47796
TPQ 6 The instructor was helpful in guiding the class toward understanding course topics in a way that helped me clarify my thinking.	4.8	.48538
TPQ 7 The instructor helped to keep course participants engaged and participating in productive dialogue.	4.7	.47902
TPQ 8 The instructor helped keep the course participants on task in a way that helped me to	4.7	.49151

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learn.		
TPQ 9 The instructor encouraged course participants to explore new concepts in this course.	4.7	.50268
TPQ 10 Instructor actions reinforced the development of a sense of community among course participants.	4.7	.53980

The findings in Table 7 focus on learners' perceptions of facilitation, a key component of teaching presence that supports autonomy in online learning. The instructor's guidance in helping students clarify their understanding of course topics received the highest mean score (4.8, SD = .48538), indicating its critical role in fostering effective learning. Other aspects of facilitation, such as encouraging exploration of new concepts, maintaining productive dialogue, and reinforcing a sense of community, all received high mean scores (4.7, SD = .50268, .47902, .53980). These results suggest that active facilitation by the instructor not only helps students stay engaged and focused but also promotes collaborative learning and a deeper understanding of course material.

Table 8: Mean for (iii) Direct Instruction

Item	Mean	SD
TPQ 11 The instructor helped to focus the discussion on relevant issues in a way that helped me to learn.	4.7	.54635
TPQ 12 The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.	4.6	.58695
TPQ 13 The instructor provided feedback in fashion.	4.7	.56427

Table 8 highlights learners' perceptions of direct instruction, an essential aspect of teaching presence that supports autonomy in online learning. The instructor's ability to focus the discussions on relevant issues and provide timely feedback both received high mean scores (4.7, SD = .54635), reflecting their importance in maintaining engagement and clarity during the learning process. Feedback that helped learners understand their strengths and weaknesses relative to the course's goals and objectives scored slightly lower (4.6, SD = .58695) but still indicated a positive perception. These findings emphasise that clear guidance and prompt, constructive feedback are critical components of effective direct instruction, contributing to learners' autonomy and overall satisfaction with online learning.

Findings for Connectedness & Diversity

This section presents data to answer research question 2: How do learners perceive connectedness and diversity in online learning? In the context of this study, this is measured by social presence, which is sub-categorized by (i) affective expression, (ii) open communication, and (iii) group cohesion.

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Table 9: Mean for (i) Affective Expression

Item	Mean	SD
SPQ 1 Getting to know other course participants gave me a sense of belonging in the course.	4.4	.74800
SPQ 2 I was able to form distinct impressions of some course participants.	4.3	.74367
SPQ 3 Online or web-based communication is an excellent medium for social interaction.	4.5	.63935

Table 9 highlights Affective Expression to understand what and how the participants are feeling a sense of connectedness and diversity during their Online Presence. For the first question in this section, only a 4.4 mean score (SD = .74800) is obtained as not many participants would like to get to know other course participants to feel a sense of belonging in the course. Furthermore, even fewer participants can form distinct impressions of some course participants, as the mean score is 4.3 (SD = .74367), which is the lowest. On the contrary, it is believed that online or web-based communication is an excellent medium for social interaction since the mean score is highest out of the three with 4.5 (SD = .63935). This result suggests a generally low affective expression among the participants.

Table 10: Mean for (ii) Open Communication

Item	Mean	SD
SPQ 4 I felt comfortable conversing through the online medium.	4.5	.68532
SPQ 5 I felt comfortable participating in the course discussions.	4.5	.71893
SPQ 6 I felt comfortable interacting with other course participants.	4.4	.73162

In terms of Open Communication in Table 10, the participants felt comfortable conversing through the online medium as well as participating in the course discussions with a similar mean score of 4.5 (SD = .68532, .71893) for the fourth and fifth questions. The sixth question, concerning the participants' comfort interacting with other course participants, however, received a slightly lower mean score of 4.4 (SD = .73162). Similar to the above, these findings indicate an even lower open communication level among the participants.

Table 11: Mean for (iii) Group Cohesion

Item	Mean	SD
SPQ 7 I felt comfortable disagreeing with other course participants while still maintaining trust.	4	.92643
SPQ 8 I felt that my point of view was acknowledged by other course participants.	4.3	.81204
SPQ 9 Online discussions help me to develop a sense of collaboration.	4.5	.72732

Table 11, on the other hand, explores Group Cohesion among the participants. With a very low mean score of 4 (SD = .92643) for the seventh question, the participants often felt /uncomfortable disagreeing with other course participants while still maintaining a sense of

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trust. In addition, there is a slight increase in the mean score of 4.3 (SD = .81204) where the participants felt their opinion was acknowledged by others. Lastly, there is an even greater increase of mean score, 4.5 (SD = .72732) to correspond to online discussions helping them to develop a sense of collaboration. The above illustrates a general expression of group cohesion among the participants.

Findings for Openness

This section presents data to answer research question 3: How do learners perceive openness in online learning? In the context of this study, this is measured by cognitive presence, which is sub-categorized by (i) triggering events, (ii) exploration, (iii) integration, and (iv) resolution.

Table 12: Mean for (i) Triggering Events

Item	Mean	SD
CPQ1 Problems posed increased my interest issues.	4.2	.83219
CPQ 2 Course activities piqued my curiosity	4.3	.75081
CPQ 3 I felt motivated to explore content-related questions.	4.4	.71697

Table 12 demonstrates the participants' perceptions of Triggering Events, a key component of cognitive presence used to measure how participants perceive openness in online learning. With the highest mean score of 4.4 (SD = .71697), it can be inferred that participants felt motivated to explore content-related questions, emphasizing the critical role of motivation in fostering deeper engagement and exploration within the course. Following closely behind, with mean scores of 4.3 (SD = .75081) and 4.2 (SD = .83219), respectively, participants also indicated that course activities significantly piqued their curiosity and that the problems posed in the course helped to increase their interest in course issues. These findings highlight how both the structure of the course and the challenges it presents can effectively stimulate learners' curiosity and encourage further exploration of the material.

Table 13: Mean for (ii) Exploration

Item	Mean	SD
CPQ 4 I utilized a variety of information sources to explore problems posed in this course.	4.4	.68497
CPQ 5 Brainstorming and finding relevant information helped me resolve content-related questions.	4.4	.70904
CPQ 6 Online discussions were valuable in helping me appreciate different perspectives.	4.4	.66632

Table 13, on the other hand, highlights the participants' perceptions regarding the Exploration phase of cognitive presence. The results show that the three items—'I utilized a variety of information sources to explore problems posed in this course,' 'Brainstorming and finding relevant information helped me resolve content-related questions,' and 'Online discussions were valuable in helping me appreciate different perspectives'—all share a mean score of 4.4 (SD = .68497, .70904, .66632). This indicates that participants consistently viewed these elements of the course as highly effective in supporting their exploration of the material. The equal mean scores also suggest that learners found each of these activities equally valuable in

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facilitating deeper engagement, critical thinking, and the integration of diverse perspectives, contributing significantly to their overall learning experience.

Table 14: Mean for (iii) Integration

Item	Mean	SD
CPQ 7 Combining new information helped me answer questions raised in course activities.	4.3	.70097
CPQ 8 Learning activities helped me explanations/solutions.	4.4	.68335
CPQ 9 Reflection on course content and discussions helped me understand fundamental concepts in this class.	4.3	.68787

The findings in Table 14 explore the participants' perceptions regarding Integration, another key component of cognitive presence. The results show that most participants believe that learning activities have significantly helped them construct explanations or solutions, with this item receiving the highest mean score of 4.4 (SD = .68335). This indicates a strong perception that the course facilitated critical thinking and the development of well-rounded solutions to course-related challenges. Additionally, combining new information to help answer questions raised in course activities and reflection on course content and discussions to help understand fundamental concepts in the class both share a similar mean score of 4.3 (SD = .70097, .68787). This suggests that participants also felt the course activities effectively supported the integration of new knowledge and encouraged reflective thinking, which helped deepen their understanding of key concepts. These findings highlight the role of integration in promoting a deeper, more cohesive learning experience, where students actively synthesize information and reflect on their learning.

Table 15: Mean for (iv) Resolution

Item	Mean	SD
CPQ 10 I can describe ways to test and apply the knowledge created in this course.	4.3	.73920
CPQ 11 has developed solutions to course problems that can be applied in practice.	4.3	.75840
CPQ 12 I can apply the knowledge created in this course to my work or other non-class related activities.	4.4	.73012

Table 15 showcases participants' perceptions regarding Resolution, the final subcategory in cognitive presence. The results indicate that many participants believe they were able to apply the knowledge gained in the course to their work or other non-class-related activities, with a high mean score of 4.4 (SD = .73012). This suggests that the course effectively equipped learners with practical, transferable skills and knowledge that they could use beyond the classroom. With slightly lower mean scores of 4.3 (SD = .73920, .75840), participants also reported that they could describe ways to test and apply the knowledge created in the course, as well as develop solutions to course problems that could be applied in real-world situations. These findings highlight the course's success in helping participants move from theoretical understanding to practical application, reinforcing the value of the learning experience in real-life contexts.

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Findings for the Relationship Between all Factors in Online Learning

This section presents data to answer research question 4: Is there a relationship between all components in online learning? To determine if there is a significant association in the mean scores between metacognitive, effort regulation, cognitive, social, and affective strategies, data is analysed using SPSS for correlations. Results are presented separately in the tables below.

Table 16: Correlation between Autonomy and Connectedness & Diversity

Correlations

		AUTONOMY_ Teaching	CONNECTED NESS_SOCIAL
AUTONOMY_Teaching	Pearson Correlation	1	.648**
	Sig. (2-tailed)		.000
	N	166	166
CONNECTEDNESS_SOCIAL	Pearson Correlation	.648**	1
	Sig. (2-tailed)	.000	
	N	166	166

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS

Table 16 shows there is an association between autonomy and connectedness. Correlation analysis shows that there is a highly significant association between autonomy and connectedness(r=.648**) and (p=.000). According to Jackson (2015), a coefficient is significant at the .05 level, and positive correlation is measured on a 0.1 to 1.0 scale. Weak positive correlation would be in the range of 0.1 to 0.3, moderate positive correlation from 0.3 to 0.5, and strong positive correlation from 0.5 to 1.0. This means that there is also a strong positive relationship between autonomy and connectedness.

Table 17: Correlation between Connectedness & Diversity and Openness

Correlations

		CONNECTED NESS_SOCIAL	OPENNESS_C OGNITIVE
CONNECTEDNESS_SOCIAL	Pearson Correlation	1	.815**
	Sig. (2-tailed)		.000
	N	166	166
OPENNESS_COGNITIVE	Pearson Correlation	.815**	1
	Sig. (2-tailed)	.000	
	N	166	166

**. Correlation is significant at the 0.01 level (2-tailed).

Source: SPSS

Table 17 shows there is an association between connectedness and openness. Correlation analysis shows that there is a highly significant association between connectedness and openness(r=.815**) and (p=.000). According to Jackson (2015), the coefficient is significant at the .05 level, and positive correlation is measured on a 0.1 to 1.0 scale. Weak positive

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correlation would be in the range of 0.1 to 0.3, moderate positive correlation from 0.3 to 0.5, and strong positive correlation from 0.5 to 1.0. This means that there is also a strong positive relationship between connectedness and openness.

Conclusion

Summary of Findings and Discussions

This study explored learners' perceptions of autonomy, connectedness, and openness in online learning, guided by the principles of Connectivism and the community of inquiry framework. The findings indicate that learners perceived autonomy positively, with teaching presence effectively facilitating organisation, guidance, and timely feedback. Connectedness and diversity, represented by social presence, were also well-received, highlighting the importance of peer interactions and group cohesion in fostering a sense of belonging. Lastly, learners valued openness, with cognitive presence encouraging critical thinking, exploration, and practical application of knowledge.

These results align with past studies, such as Garrison and Arbaugh (2007), which emphasised the critical role of teaching, social, and cognitive presence in enhancing online learning experiences. Additionally, the findings support Siemens' (2005) claim that Connectivism fosters effective knowledge acquisition through autonomy, connectedness, diversity, and openness.

Pedagogical Implications and Suggestions for Future Research

The study's findings emphasise the need for a balanced approach between autonomy and social engagement while taking into consideration the cognitive challenges. Effective teaching strategies should include clear communication, structured facilitation, and timely feedback to enhance teaching presence. Similarly, activities that promote collaboration and a sense of community can strengthen social presence, while tasks that encourage critical thinking and real-world application can improve cognitive presence.

Future research could explore how specific demographic variables, such as age or prior online learning experience, influence perceptions of autonomy, connectedness, and openness. Additionally, longitudinal studies could examine how these perceptions evolve or differ across various disciplines. Researchers may also investigate the integration of emerging technologies, such as artificial intelligence or virtual reality, in fostering the components of Connectivism in online learning environments. These efforts can further enrich the pedagogical approaches to online education and address learners' diverse needs more effectively.

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discussions, encouragement, or simply offering patience and understanding, their contributions have been deeply valued.

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