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Re-engineering the Pedagogical Design of Virtual Classrooms in Higher Education using the Community of Inquiry Framework: Benefits, Challenges, and Lessons Learned

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Abstract. The demand for online learning is increasing yearly in higher education and training industries worldwide. To sustain this demand, online course design and delivery quality became a critical topic for research and investigation. This study aimed to reimagine the pedagogical planning and design for virtual classrooms in a higher education institution based on the Community of Inquiry (CoI) framework. To achieve this goal, the researcher adopted the type 2 developmental research methods to reimagine the pedagogical planning and design for a virtual classroom considering the interconnectedness of the CoI dimensions: Cognitive Presence, Teaching Presence, and Social Presence. In addition, a closed and open-ended questionnaire was developed based on the CoI framework and employed to gather instructors' views on the benefits and challenges of utilizing a virtual classroom designed based on the CoI dimensions. The results showed that instructors had a favourable view of the benefits of virtual classrooms for delivering course content. They also reported several challenges that need to be addressed for using virtual classrooms. Study findings highlight the importance of offering customized training to instructors by higher education institutions on the best practices of virtual classrooms. In addition, findings showed the crucial role of pedagogical frameworks such as CoI for the effective design of learning activities tailored to teaching via virtual classrooms.

Keywords: Community of Inquiry, higher education; pedagogical planning and design; Virtual classroom

1. Introduction

Over the past decade, technological advances have led to a surge in remote or online education (Abraham, 2014). This learning mode is widely considered a useful tool that offers flexibility, quality education, and reduced long-term costs. Despite its benefits, there is limited understanding of how instructors adjust to online teaching and the support they receive from their institutions in academic, administrative, technical, and social aspects.

Online education refers to delivering content through online channels, enabling students to learn independently using digital resources. Instructors provide teaching modules that enhance learning and interactivity in synchronous or asynchronous environments (Hodges et al., 2020; Singh & Thurman, 2019). Some scholars use online distance learning or remote teaching to describe online education (Bozkurt & Sharma, 2020; Hodges et al., 2020). Additionally, technology-mediated learning, internet-based education, web-based learning, and virtual learning are frequently employed in academic literature (Mishra et al., 2021).

However, in the rapidly evolving landscape of online education, the pedagogical design of virtual classrooms in higher education institutions is of top importance. However, a lack of pedagogical design skills among instructors hinders the effective implementation of online learning platforms, reducing learner motivation and engagement and ultimately failing to achieve desired learning outcomes (Meylani et al., 2015). To address this issue, there is a need for research that explores how online virtual classrooms can be re-engineered and developed based on best practices of pedagogical frameworks to enhance the quality of online teaching and learning experiences.

This pedagogical design involves systematically planning educational activities and content to achieve learning objectives and promote proximal growth among learners. A well-designed virtual classroom can enhance and lead to effective teaching and learning practices.

Re-engineering the pedagogical design of online virtual classrooms is a key factor and actor in ensuring effective pedagogical planning and implementation of online courses in online platforms. Mayes and de Freitas (2004) indicated that the ideal eLearning model gives considerable attention to online learners' engagement, gives rapid feedback, encourages reflection through dialogue with instructors and peers, aligns assessment, and supports creating a community of learners through discussion and other planned activities. The Community of Inquiry (CoI) was selected in this research since it emphasizes the social, pedagogical, and cognitive presences.

The virtual classroom in this research refers to a platform where students can participate and interact with their instructor and classmates through different communication tools. This type of virtual classroom provides synchronous communication options, offering flexible and immersive learning experiences. In

such a classroom, students and instructors engage in real-time, live sessions and have access to pre-recorded or live materials and do pre-planned activities. This approach to virtual education aims to provide the benefits of both live interaction and flexible learning. Therefore, this approach emphasizes the importance of social and technological presence to enhance the online learning experience.

Numerous studies have shown that technology adoption and integration into education largely depend on its perceived benefits. The Technology Acceptance Model (TAM) posits that the more benefits technology offers, the higher its perceived value and the likelihood of adoption (Cobo-Rendon et al., 2021; Kaewsaiha & Chanchalor, 2021; Granic & Marangunic, 2019; Mousa et al., 2020; Scherer et al. 2019; Tarhini et al., 2017). Therefore, it is essential to identify and communicate the benefits of technology to educators and learners to increase their motivation and engagement with technology.

Previous studies such as Martin et al., (2019) and Otter et al. (2013) indicated that an investigation of the benefits and challenges of Virtual Classrooms users face is necessary to gain a deeper understanding of the preparation of instructors for online courses. In addition, the outcomes of this investigation may provide valuable insights and practical recommendations for higher education institutions seeking to enhance their online teaching and learning environments using the CoI framework, ultimately leading to improved learner engagement, motivation, and achievement of desired learning outcomes. Learner engagement in this context refers to the interaction and communication with the course instructor, peers, and presented content. It exhibits active learning and participation by learners during the class.

2. Research Problem

The Corona Virus Disease 2019 (COVID-19) pandemic has led to a significant increase in the use of online virtual classrooms in higher education institutions worldwide. However, instructors lack pedagogical planning and design skills, affecting teaching and learning quality in virtual classrooms (Kibaru, 2018). The lack of pedagogical design may result in less motivation and engagement of learners with instructors in virtual classroom sessions, leading to not achieving the learning outcomes. Therefore, there is a need to reimagine the pedagogical design of online virtual classrooms in higher education institutions since the adoption of online learning is there and will continue to expand across higher education programs and disciplines.

According to Ally (2004), and Boud and Prosser (2002), the ideal pedagogical practice in eLearning contexts is structured around five key processes: 1) Engaging learners, 2) Acknowledging the learning context, 3) Challenging learners, 4) Providing practice, and 5) Giving time and opportunity to reflect. The skill of planning and designing interactive activities to deliver effective online education was among the big six training needs for instructors in the United Arab Emirates (Abdelaziz et al., 2023).

The CoI framework may have a structure to achieve the above five processes. Therefore, the current research seeks to discover the potential of utilizing the CoI framework to reimage the pedagogical planning and designing of online virtual

classrooms in a higher education context. Recent research has explored the effectiveness of the CoI framework in online courses (Aslan & Turgut, 2021; Bektashi, 2018; Fiock, 2020; Brown & Eaton, 2020; Junus et al., 2022; Richardson et al., 2014; Tolu, 2013). However, they emphasize the utilization of the CoI framework in asynchronous learning settings, not for virtual classrooms. Therefore, there is a need for further research to explore how the CoI framework can be applied to reimagine the pedagogical planning and designing of online virtual classrooms in higher education institutions. Since the online delivery method was adopted across higher education institutions worldwide, the problem could occur in other contexts regardless of the geographical location. Hence, the need to re-engineer the VC worldwide has the same importance with the same global impact of the problem.

3. Research Significance

This study seeks to investigate and propose effective strategies for reimagining the pedagogical planning and designing of online virtual classrooms within a higher education context. By utilizing the CoI framework as a guiding and structured framework to support and promote cognitive, social, and teaching practices, the research aims to support instructors in creating engaging and interactive virtual classrooms. The CoI framework emphasizes the importance of three interrelated dimensions: social presence, cognitive presence, and teaching presence, which collectively contribute to meaningful teaching and learning experiences. Virtual classrooms have become increasingly prevalent in various educational settings, yet the approach has not been thoroughly investigated, especially in the Middle East region.

4. Research Objectives

The main purpose of this research was to explore how online virtual classrooms in higher education institutions can be designed and delivered based on the CoI framework. Thus, the study aimed to:

1. Explore how the CoI framework can be applied to reimagine the pedagogical planning and designing of online virtual classrooms in higher education institutions.
2. Examine the benefits and challenges of utilizing the CoI framework to deliver online virtual classrooms in higher education institutions.

5. Research Questions

The research questions:

1. How can the CoI framework be applied to reimagine the pedagogical planning and designing of online virtual classrooms in higher education institutions?
2. What are the benefits of utilizing the CoI framework to deliver online virtual classrooms in higher education institutions?
3. What are the challenges of utilizing the CoI framework to deliver online virtual classrooms in higher education institutions?

6. Literature Review

6.1. Online and Virtual Classroom Benefits

Previous research has extensively examined the benefits of incorporating online learning into higher education (Raspopovic et al., 2017). For instance, a survey conducted by Learning House, Inc. and Aslanian Market Research in 2016 found that 86% of 1,500 online graduate students believed that the value of their online degree was equal to or exceeded the cost (Songkram, 2015; Aparicio et al., 2016). Furthermore, the Brandon-Hall Group (2018) reported that online courses take considerably less time to teach than traditional face-to-face instruction. Additionally, online learning has been shown to offer several other benefits, such as increased interaction between students and faculty, greater flexibility, the convenience of learning anytime and anywhere, the potential to reduce anxiety, and the ability to record video lectures for flipped learning (Singh & Hurley, 2017). Other studies have identified several advantages of online education, including virtual classrooms, user-friendliness, effective time management, easy-to-manage course resources, and the ability to generate reports (Al-Handhali et al., 2020; Bolliger & Wasilik, 2009; Lloyd et al., 2012).

Other well-known and documented benefits of online learning include flexible degrees, different eContent, and platforms for collaboration learning, deep skilling through reusable learning objects, promoting lifelong learning competencies, and gamification to enhance learning during online learning. Virtual classrooms provide numerous advantages that improve learning accessibility, flexibility, and safety, especially during health emergencies like the COVID-19 pandemic. They provide a safe learning environment and enable remote attendance from any location, removing geographical restrictions. The opportunity to balance studies with other obligations, interactive technologies that encourage participation, and self-paced learning that promotes comprehension and retention are some of the main benefits. Virtual classrooms (VCs) provide instructors benefits like enhanced digital literacy, pedagogical abilities, and professional development possibilities (Dung, 2020; Ladia et al., 2023; Vargas-Murillo et al., 2023). Similarly, learners can go back to materials including recordings and discussion at their own pace and time.

6.2. Online and Virtual Classroom Challenges

While technology has numerous benefits for education, several obstacles still prevent its widespread adoption (Almekhlafi & Almeqdadi, 2010; Goundar, 2015; Neiterman & Zaza, 2019; Pazilah et al., 2019). One primary concern against online education is the perception that it lacks quality. Virtual classrooms can present certain challenges for instructors, such as eye strain from prolonged screen time, trouble with social interaction, technical issues, and digital inequality that can impair instruction quality and student performance (Arkorful & Abaidoo, 2015; Hiranrithikorn, 2019; Dung, 2020; Ladia et al., 2023; Vargas-Murillo et al., 2023).

While many educational institutions have equipped their educators with technology, factors such as time and staff development support can hinder or facilitate its adoption (Ismail et al., 2010; Kafyulilo et al., 2015). Technology can also create opportunities for cheating and plagiarism (Boudjadar, 2015). For example, Pazilah et al., (2019) suggest that technology may limit students' critical

thinking abilities by providing easy access to answers, which may hamper their creativity.

Furthermore, research suggests that interaction is essential for students to have positive learning experiences and become satisfied with their courses (Strandberg & Campbell, 2014; Singh & Hurley, 2017). However, critics of online education argue that one of the primary drawbacks of remote online education is the loss of face-to-face interaction among instructors and students (Cho & Kim, 2013; Kang & Im, 2013; Strandberg & Campbell, 2014). Many instructors consider the loss of physical co-presence among students to be one of the significant challenges of online learning (Fish & Gill, 2009; Fox et al., 2020; Korkmaz et al., 2021; & Zare-ee, 2011; Dung, 2020; Ladia et al., 2023; Vargas-Murillo et al., 2023).

6.3. Instructors' Technology Readiness

Vang et al., (2020) investigated the factors instructors perceived as essential for success in online teaching. They found that network reliability, creation of online assignments, grade management, time management, and technical competencies were highly regarded. Similarly, Aytac (2021) identified network problems and software and hardware issues as widespread concerns among instructors. Instructors hesitated to embrace virtual teaching because they lacked basic technological proficiency.

Many studies have emphasized professional development as a necessary aspect of enhancing virtual learning environments (Kibaru, 2018; Maatuk et al., 2021). AbuZayyad-Nuseibeh (2017) conducted an exploratory study that aimed to investigate the perceptions of instructors toward the process of transitioning from face-to-face to online instruction. The authors stated that instructors sought additional technical and instructional design training and requested that this aspect be a prerequisite to teaching online.

The literature review has established the benefits and challenges of virtual classrooms as a teaching mode. This study extends the examination by focusing on the benefits and challenges of virtual classrooms from university instructors' perspectives in light of the CoI framework utilization.

6.4. CoI Framework

Garrison, Anderson, and Archer introduced the CoI framework in 2000 for online higher education, highlighting its role in fostering a quality e-learning environment through integrating social, cognitive, and teaching presence (Garrison, 2007). The CoI framework is an instructional design model for eLearning focusing on exploring, constructing meaning, and validating understanding. It comprises three interdependent dimensions: social presence, cognitive presence, and teaching presence. Social presence refers to students feeling connected and engaged with their instructors and peers in an online learning environment. Teaching presence refers to how the course instructor shows up and manages the class. Cognitive presence refers to the degree to which learners can construct and validate meaning through dialogue in a critical community of inquiry (Garrison et al., 2010).

This research used the CoI framework to create compelling virtual classrooms. CoI is an approach that facilitates interaction and collaboration among learners and researchers, encouraging the sharing of ideas, discussions, and solution

development. It promotes a supportive environment for group work, critical thinking, and creativity, allowing learners to benefit from each other's knowledge and skills for classroom projects. The framework also supports engaging in meaningful dialogue and gaining deeper insights into learning topics, helping online learners understand the learning process and build strong relationships in their field. It may also facilitate creating meaningful learning experiences and projects.

6.5. Online Teaching Presence

Teaching presence is a critical component of the CoI framework for delivering effective and engaging online courses. It involves the deliberate design, facilitation, and direction of cognitive and social processes to promote personally meaningful learning. Anderson et al. (2001) suggested several techniques can be implemented to enhance online teaching presence, including:

1. Creating an introductory video of the course instructor for students.
2. Holding online office hours for student questions and concerns.
3. Responding to student problems and questions in a timely and helpful manner.
4. Providing clear and actionable feedback to students.
5. Communicating expectations for synchronous and asynchronous communication with the instructor.
6. Explaining how assignments contribute to achieving learning objectives.
7. Using formative assessments such as polls, quizzes, discussion posts, reflective writing assignments, and class participation to provide ample feedback opportunities.
8. Using discussion prompts to encourage student engagement.
9. Acknowledging and reinforcing student contributions to the class.
10. Creating a highlights reel of the week's activities and insightful contributions by students at the end of the week.

By implementing these techniques, instructors can create a more engaging and supportive online learning environment that promotes student success. It worth mentioning that this study was conducted during the implementation of both blended and online learning delivery methods at the United Arab Emirates University.

6.6. Cognitive Presence

To foster cognitive presence, theoretical statements are presented to students via the "Opinionator," a free virtual world tool that animates a Likert-like questionnaire scale. This allows students to position themselves, ask questions about the theoretical point, and exchange ideas as they explain their decisions to one another. Students demonstrate their positions by placing their avatars on the Opinionator. They may change their positions during the discussion due to their peers' arguments. In addition, they have reported that the engagement and presence of this experience are superior to having a similar discussion in a traditional, text-based learning management system (McKerlich et al., 2011).

When all these elements are present, learning and development are driven. Learners who engage in deep inquiry processing during academic tasks demonstrate high cognitive and metacognitive Engagement (Harlow et al., 2011).

6.7. Online Social Presence

Social presence refers to the degree to which an online student's true self is projected and perceived in a virtual course (McKerlich et al., 2011; Rourke et al., 2001). In social presence, students act as role models for each other, presenting their positions in virtual worlds. To foster online social presence, Abdelaziz (2012) suggested several activities, such as group discussions, online debates, simulations, creating peer games, maintaining a diary, and engaging in role-playing. These activities encourage learners to interact and share their ideas, leading to a greater sense of community and the development of strong interpersonal skills.

As the demand for online learning and distance education continues to grow, the CoI framework has become a popular instructional design approach, particularly during and post the COVID-19 pandemic. To explore online learning for sub-degree students, Lau, Tang, Chau, Vyas, Sandoval-Hernandez, and Wong (2021) employed aCoIapproach. They surveyed 287 sub-degree students from business and engineering disciplines and conducted a confirmatory factor analysis (CFA) on the data. The study found that the network speed for online education plays a significant role in determining students' perceived cognitive presence, social presence, and teaching presence. Overall, these findings shed light on the importance of network speed in online education and emphasize the need to ensure that technological infrastructure is robust enough to support effective learning. It is worth mentioning here that the study did not include Participants disciplines among the investigated variables

7. Research Methodology

This study aims to re-engineer the pedagogical planning and designing of online virtual classrooms based on the CoI framework. The study was conducted at UAE University, which has a well-established technology infrastructure that supports eLearning.

7.1. Research Approach

To re-engineer the pedagogical planning and designing of online virtual classrooms to achieve the purpose of this research, the researcher adopted and implemented the procedures, stages, and steps of the second type of developmental research. Type 2 developmental research is a generalized approach focusing on design, development, and evaluation processes. It aims to produce knowledge resulting in new or enhanced design or development models Richey, Klein, and Nelson's developmental research (2004). According to Richey and Klein (2005), the three main stages of this type of research are systematic design, development, and evaluation. The following addresses each stage and the steps that are implemented:

First: Systematic design of the online virtual classroom (OVC) based on the CoI framework

This phase describes the general requirements and structure of the OVC-CoI and includes the following steps: (1) Review educational research and literature related to the CoI framework, (2) Review the pedagogical principles of virtual learning through online classrooms, and (3) Map the CoI stages with pedagogical

principles of virtual learning to reimagine the pedagogical planning and designing of OVC.

The most important result of the systematic design stage is identifying how the OVC is systematically structured to address the elements of social, cognitive, and teaching presences. Based on the theoretical and empirical review and background of the CoI approach, nature, and the purposes of this research, the researcher designed the virtual classroom to address the three dimensions of the CoI (see Figure 1).

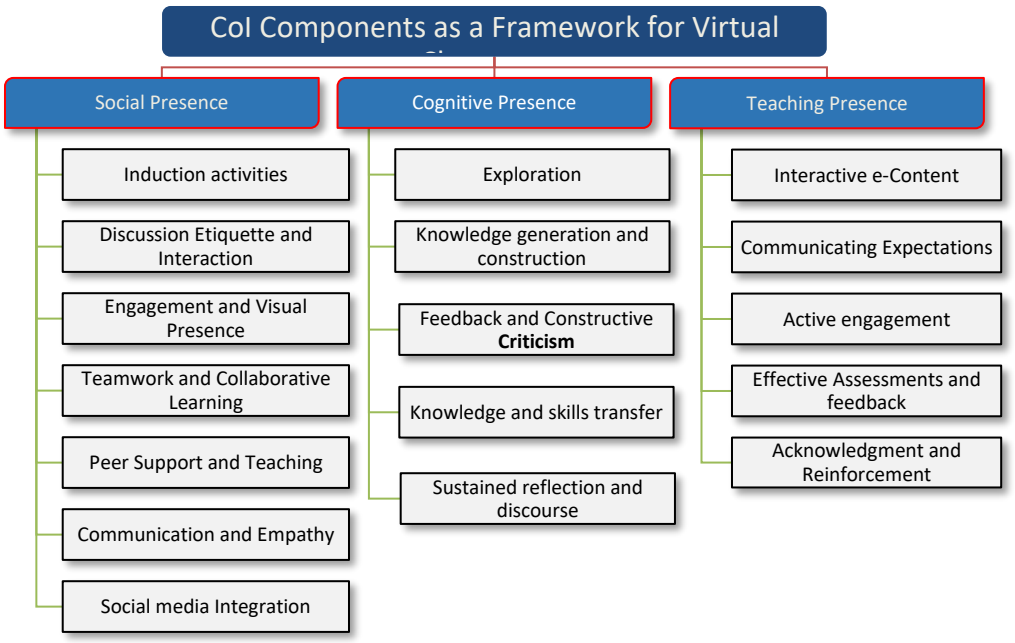

Figure 1. The suggested pedagogical design and structure of virtual classrooms based on the CoI framework

Second, the Systematic Development of the online virtual classroom (OVC) based on the CoI framework

This stage aims to develop online virtual learning activities that support online learners' and instructors' social, cognitive, and teaching presence. The systematic development stage was implemented according to the following steps:

- Provide a definition and description of each of the CoI dimensions when it is utilized for OVC,
- Develop a set of interactive activities relevant to each of the CoI dimensions,
- Select the appropriate technology that supports implementing each of the interactive activities, and
- Review the above process through a small jury of instructors specialized in educational technology and online learning.

The following figures demonstrate the pedagogical development of a virtual classroom and the pedagogical considerations and aspects implemented, in addition to screenshots (Figures 2, 3, and 4) from one of the courses showing prototypes of the three CoI domains.

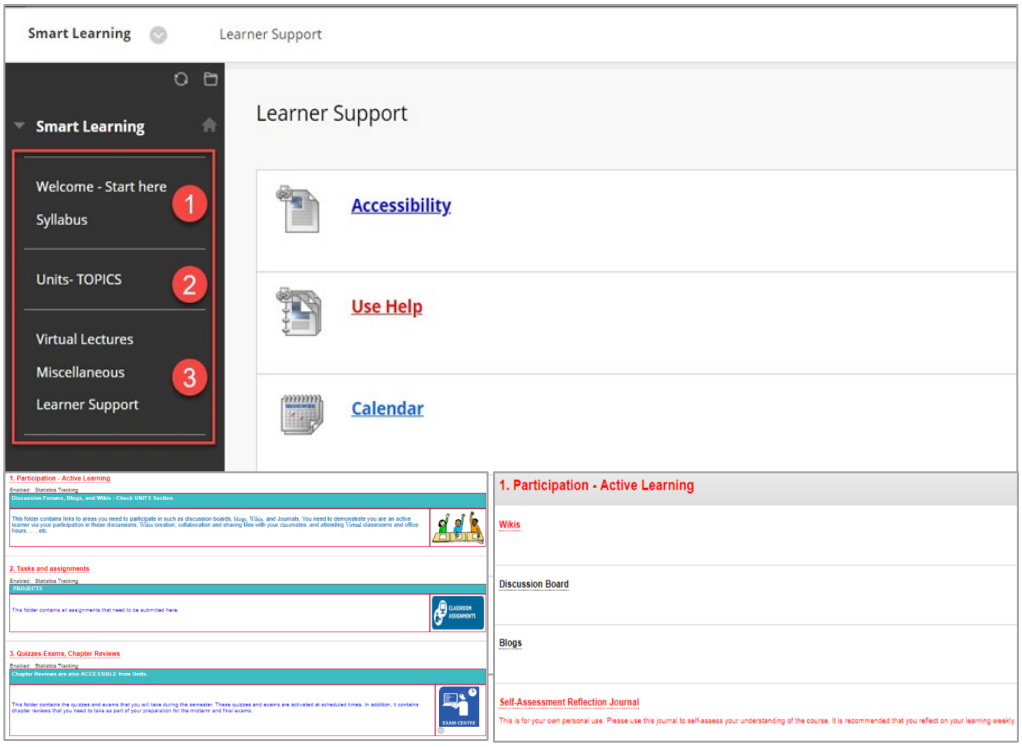

Figure 2. An example of social presence design in the study

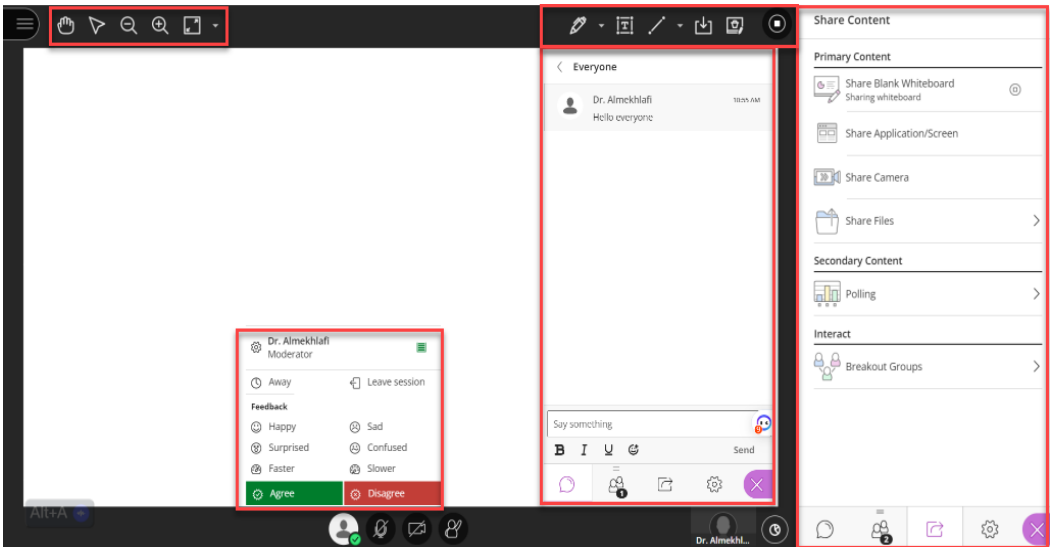

Figure 3. An example of cognitive presence design is in the study

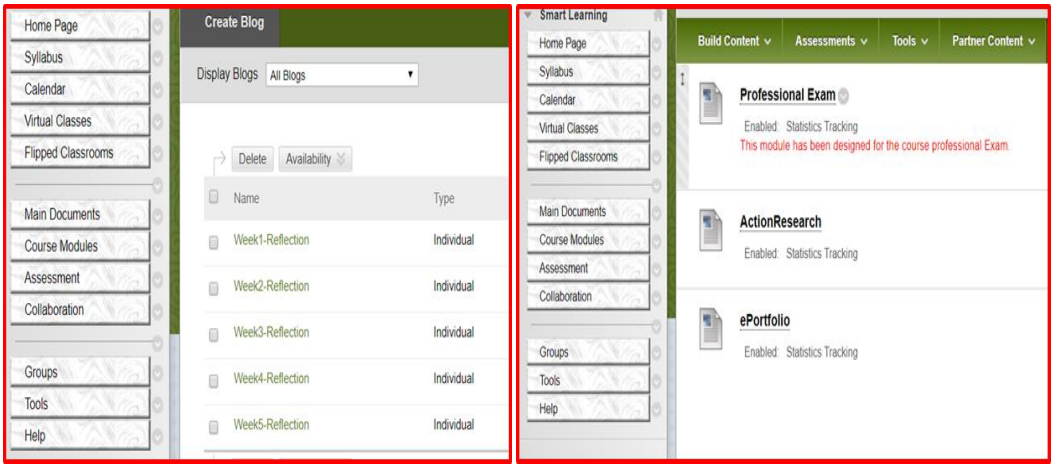

Figure 4. An example of teaching presence design in the study

Third, Evaluation of the Proposed Framework of OVC-CoI (Validity)

This phase aims to verify the validity of the proposed framework by identifying its applicability to improve online synchronous learning quality and the benefits and challenges of utilizing the proposed framework of OVC-CoI from faculty and instructors' perspectives. This phase was implemented according to the following steps: (1) Conduct an orientation session for instructors selected from the higher education institution, (2) Ask the participant to apply this model to their courses' synchronous activities and assessment tasks, (3) Collect prototyping feedback about the implementation of the OVC-CoI framework from instructors, (4) Share the research instruments with the participants. and (5) Analyze and summarize the results of adopting and implementing the proposed framework.

7.2. Participants

The participants were 85 instructors from all colleges of the United Arab Emirates University.

Table 1: Participants' Distribution by College

	Frequency	**%**
Arts and Humanities	11	12.9
Education	28	32.9
Engineering	3	3.5
Medical and Health Sciences	15	17.6
Law, Politic, and Sociology	9	10.6
Business, Economics, and Finance	4	4.7
Natural & Life Science	11	12.9
Other	4	4.7

Approximately two-thirds (63.5%) were male, while the rest were females. All instructors had experience teaching graduate and undergraduate students (30.6% teaching Bachelor's Degrees, 7.1% teaching Master's Degrees, 41.2% teaching Ph.D., and 21.2% teaching varied levels). All participants had good experience with teaching online and using virtual classrooms effectively. Approximately 94% of participants had two or more years of experience using virtual classrooms (5.9%

= one year; 30.6% = two years; 30.6% = three years; 41.2% = four years, and 16.5 = five years). Notably, all participants experienced teaching online courses. Approximately 70% experienced teaching three or more online courses.

Due to the nature of the study and the importance of instructors having technology competencies to use the virtual classrooms to teach students effectively, background data were collected focusing on instructors' technical skills. Table 2 shows the readiness of instructors to implement virtual classrooms efficiently from their perspectives.

As seen from the table, instructors were ready to utilize the virtual classrooms for teaching in an online smart learning environment as they had the competencies and skills needed for such type of instruction.

Table 2: Instructors' Technology Competencies and Experiences

Item	B	I	A	E
Using learning management systems	2.6	36.8	55.3	5.3
Using system software (e.g., Windows, Androids, and iOS)	2.7	31.5	60.3	5.5
Using application software (Office application)	4.5	25.4	62.7	7.5
Using email	1.8	14.0	61.4	22.8
Using hardware (microphones, cameras)	1.4	29.0	52.2	17.4
Using hardware (scanners, printers)	1.4	20.3	63.8	14.5
Using web technologies to exchange information with others	8.4	20.8	59.7	11.1
Using web technologies to exchange files with others	5.6	29.6	54.9	9.9
Collaborating with others in virtual classrooms.	8.3	31.9	52.8	6.9
Using other Internet tools (blogs, social networking, and forums).	17.6	39.2	37.8	5.4

Note: B = Beginner; I = Intermediate; A = Advanced; E = Expert

7.3. Data Collection and Analysis

7.3.1. Questionnaire

The study used a questionnaire developed by the researchers. The questionnaire consisted of three main sections: (1) section 1 focused on collecting demographic data about instructors' characteristics and their technology experience and skills for using virtual classrooms, and (2) a section focusing on 5-Point Likert scale closed-ended items about the instructors' perceptions of the benefits and challenges of virtual classrooms, and (3) two open-ended items asking participants to write the benefits and the challenges they faced when implementing virtual classrooms as a delivery method. The questionnaire was available online in both English and Arabic to avoid language interference with the meaning.

A panel of experts in education, educational technology, online learning, and teaching reviewed the questionnaire. The questionnaire validation focused on several aspects including content validity, face validity, cultural biases, in addition to language issues. As a result of this validation, a few changes were made based on the referees' feedback, including the number of items and sections

and rephrasing certain items. The questionnaire utilized a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree).

The questionnaire was piloted on an online technology course that has multiple sections. Cronbach's alpha was.92, indicating that the questionnaire was highly reliable.

7.3.2. Data Analysis

Descriptive statistics, including means, standard deviation, and percentages, describe the quantitative collected data. In addition, qualitative coding of themes was conducted based on the responses to open-ended questions, following an inductive process (Corbin & Strauss, 1990; Saldana, 2015). The following stages were followed: open coding, axial coding and selective coding to ground the major patterns and themes addressing concern, benefits or challenges perceived by the participants to deliver and assess the virtual classrooms in the selected higher institution.

8. Results and Discussion

8.1. Research question 1

To answer question number 1, " How can the CoI framework be applied to reimagine the pedagogical planning and designing of online virtual classrooms in higher education institutions? The suggested pedagogical planning and designing principles of virtual classrooms based on the CoI dimensions demonstrate the practical application of its components to the design of online virtual classrooms. Applying CoI to the plan and design of virtual classrooms involves assessing the three key components: social presence, cognitive presence, and teaching presence. The following is the answer to the first question.

8.1.1. Social Presence

Social presence in the virtual classroom is important for building a sense of community of learning among learners. This dimension focuses on establishing interpersonal connections and engagement. Pedagogical aspects that enhance social presence include Induction Activities, Discussion Etiquette and Interaction, Engagement and Visual Presence, Teamwork and Collaborative Learning, Peer Support and Teaching, Communication and Empathy, and Social Media Integration (see Table 3). By implementing these aspects, instructors create an environment where learners feel connected and supported, enhancing their learning experience.

Table 3: The Social Presence Pedagogical Design of Online Virtual Classrooms

CoI Element	Application to Virtual Classroom
Induction activities	● Develop Ice-breaking activities ● Encourage learners to share their short CVs reflecting their personal experiences and interests. ● Encourage learners to share their personal and professional expectations from the course.
Discussion Etiquette and Interaction	● Establishing guidelines and rules for courteous, constructive discussions ● Actively acknowledging and appreciating others' contributions ● Participating in conversations and listening attentively ● Reacting to students' sentiments and emotions

	● Expressing a variety of feelings, both good and bad
Engagement and Visual Presence	● Encouraging active engagement from all students while providing examples of proper online conduct ● Starting conversations and discussions to promote engagement ● Participating actively in group projects, games, and activities
Teamwork and Collaborative Learning	● Involving students in group activities, discussions, and projects ● Giving teams the chance to collaborate asynchronously ● Encouraging collaborative efforts and group problem-solving ● Working together to solve problems and find solutions to issues collectively ● Adopt group project assignments ● Adopt and implement activities that promote interpersonal collaboration.
Peer Support and Teaching	● Encouraging peer tutoring among students ● Creating peer games and engaging in role-playing ● Offering support, encouragement, and constructive criticism that fosters growth ● Providing aid and support to students who are struggling ● Assign peer learning tasks (a task for two)
Communication and Empathy	● Using a friendly and open tone of voice when communicating ● Making an effort to create a relaxed atmosphere by using informal language ● Expressing a variety of feelings, both good and bad ● Reacting to students' emotions and sentiments ● Creating a supportive environment where students can express their emotions
Social Media Integration	● Capitalize on social media communication tools to promote active participation and interaction. ● Create private groups on social media platforms such as Facebook and LinkedIn to enhance learning ● Encourage students to connect with their peers using well-known social media platforms ● Use social media for formative assessment and peer review whenever applicable

8.1.2. Cognitive Presence

Cognitive presence focuses on stimulating critical thinking and meaningful learning experiences. Pedagogical aspects of cognitive presence include Exploration, Knowledge Generation and Construction, Feedback and Constructive Criticism, Knowledge and Skills Transfer, and Sustained reflection and Discourse. Thus, encouraging critical thinking through discussions and problem-solving activities promoting knowledge construction by engaging learners in reflection-in-action exercises helps increase the cognitive presence during virtual classrooms. Furthermore, timely feedback on assignments and assessments guides and empowers learners' cognitive development, critical thinking, and academic and professional growth (see Table 4).

Table 4: The Cognitive Presence Pedagogical Design of Online Virtual Classrooms

CoI Element	Application to Virtual Classroom
Exploration	● Involving students in ongoing debates and idea-sharing sessions ● Using live polls or surveys to compile feedback and insights quickly ● Conducting collective research and critique analysis ● Motivating students to participate in asynchronous discussion forums ● Offering a resource library for independent study ● Leading activities that encourage dialogue and investigation ● Asking provocative questions at the start of each class or module
Knowledge generation and construction	● Allocate and use virtual learning space for interactive content such as H5P activity. ● Implement a creative problem-solving approach. ● Reflecting on Using virtual learning tools such as a wiki to encourage collaborative knowledge generation.
Feedback and Constructive Criticism	● Actively recognizing and thanking others for their contributions ● Offering constructive criticism and positive feedback ● Responding to inquiries and criticism from instructors and fellow learners
Knowledge and skills transfer	● Give real-world examples that would help transfer knowledge and skills. ● Integrate assessment tasks that promote students' cognitive understanding. ● Use continuous assessment strategies to help learners transfer their knowledge and skills to other situations.
Sustained reflection and discourse	● Allocate a learning space for learners to reflect on and about their learning weekly. ● Use virtual learning tools that encourage self-reflection, such as blogs and feedback. ● Allocate a section in each assignment for reflection-in-action purposes.

8.1.3. Teaching Presence

The instructor's teaching presence facilitates and guides the learning process. It involves setting the course structure, establishing clear learning objectives, and providing support. Pedagogical aspects of teaching presence include Interactive e-content, Communicating Expectations, Active engagement, Effective Assessments and feedback, and Acknowledgment and Reinforcement (see Table 5).

An effective design with clear learning outcomes, assessment, expectations, and interactive content supported by interactive assessment, effective reinforcement, and feedback will lead to a teaching presence. Instructors who excel in teaching presence create a well-structured and supportive virtual classroom that fosters active learning and helps learners achieve their educational goals.

Table 5: The Teaching Presence Pedagogical Design of Online Virtual Classrooms

CoI Element	Application to Virtual Classroom
Interactive e-Content	● Communicate regularly with students by using virtual synchronous office hours. ● Integrate interactive quizzes and polls within the topics ● Integrate virtual labs into teaching ● Integrate virtual reality, augmented reality, and simulations in teaching ● Use interactive storytelling to help students understand the content ● Implement e-content generation tools to support learning ● Integrate interactive multimedia to enhance understanding ● Incorporate gamification to increase students' motivation for learning
Communicating Expectations	● Communicate the course syllabus to students ● Communicate course goals, outcomes, and calendars ● Provide detailed guidelines and rubrics for every assessment task, including assignments and projects ● Create discussion forums and blogs to answer students' questions about assignments and projects ● Provide well-done assignments or project examples from previous semesters to help students understand what is expected from them ● Communicate weekly with students to remind them of expectations, highlighting assignment deadlines and readings ● Communicate technology requirements needed for the course ● Communicate expectations for email turnaround response and feedback to students
Active engagement	● Encourage learners to get immersed and participate positively ● Provide and guide learners to adopt productive dialogue for deep learning ● Use interactive quizzes and polls ● Use gamification to increase students' engagement with content
Effective Assessments and feedback	● Provide immediate and simultaneous feedback for students' performance ● Encourage self and peer-assessment ● Create online tests and quizzes for formative and summative assessment ● Integrate authentic project-based assessment ● Encourage virtual collaborative projects among students ● Provide comments on the group's overall performance and each member's contributions to teamwork ● Assess student participation in online discussion forums and blogs and provide constructive feedback
Acknowledgment and Reinforcement	● Use digital badges to award students ● Use personalized feedback to acknowledge achievement ● Highlight outstanding students' work by reinforcing it ● Encourage peer recognition among students ● Use technology tools such as icons and emoticons to applaud students virtually ● Consistently use positive reinforcement to encourage students' engagement ● Acknowledge collaboration and group work

8.2 Research question 2

To answer question number 2, What are the benefits of utilizing the CoI framework to deliver online virtual classrooms in higher education institutions"? Two primary data sources were used: (1) the closed items in the questionnaire and (2) an open-ended question asking participants to list the benefits of the virtual classroom for teaching and learning related to CoI. The correlation between students' responses to the closed items and the open-ended items is clear. Answers from closed items such as the three highest ranked mean scores for the closed-ended items on the benefits of CoI-based VC to teaching and instructors, " enhances my digital skills (4.1)", "is more convenient for teaching (4.0); and "is more convenient for learning (4.0)" conform positively with open-ended responses reported by participants such as VCs "support digital skills", "flexible for learning and learners", and "provide effective learning environments" for teaching and instructors. Designing the OVC based on CoI saves time, increases the achievement and motivation of students, decreases anxiety among students, and improves instructor-student interaction.

As shown in Table 6, the benefits are categorized into (1) the benefits of CoI-based VC to teaching and instructors and (2) the benefits of CoI-based VC to learning and learners. The means and percentages show highly positive perceptions of the benefits of the CoI-based virtual classroom for teaching and learning.

Table 6: Instructors' Perspectives on the Benefits of Using a Virtual Classroom

Item			%				
	M	SD	NA	SD	D	A	SA
Benefits of CoI-based VC to teaching and instructors							
is beneficial to teaching	3.8	1.2	7.1	12.9	0.0	57.6	22.4
enhances the ability to teach	3.2	1.3	12.9	25.9	4.7	43.5	12.9
enhances my digital skills	4.1	0.9	4.7	2.4	1.2	57.6	34.1
supports instructors in giving timely and high-quality feedback	3.2	1.3	14.1	23.5	3.5	45.9	12.9
supports the instructor in designing a response assessment that portrays student learning	3.1	1.3	14.1	29.4	4.7	41.2	10.6
is more convenient for teaching	4.0	1.0	4.7	3.5	15.3	44.7	31.8
saves the ' 'instructor's time	3.8	1.2	9.4	3.5	9.4	50.6	27.1
helps instructors prepare better for the lectures	3.5	1.2	10.6	10.6	12.9	47.1	18.8
I intend to continue using virtual classrooms	3.3	1.5	14.1	17.6	3.5	42.4	22.4
Benefits of CoI-based VC to learning and learners							
enhances collaboration, communication, discussion, and interaction among students in the course	3.1	1.3	20.0	10.6	20.0	41.2	8.2
is accessible to everyone from anywhere	3.9	1.1	5.9	7.1	2.4	57.6	27.1
is more convenient for learning	4.0	1.0	4.7	3.5	15.3	44.7	31.8
introduces students to authentic learning skills	3.8	1.2	9.4	5.9	8.2	51.8	24.7
decreases anxiety among students	3.2	1.3	14.1	16.5	21.2	31.8	16.5

***Note**. NA= Does not Apply/I do not know; SD = Strongly Disagree; D = Disagree; A = Agree; SA = Strongly Agree*

Instructors' percentages of agree and strongly agree combined ranged between 51.8 and 94.1 for most items in the two categories. This indicates that instructors perceive several benefits of virtual classrooms for themselves and learners. Positive perceptions correspond with Vang et al., (2020) and Schifter's (2002) research findings.

Except for one item, the Standard Deviation (SD) values of all factors in both categories were higher than 1. This result indicates the consistent self-perception of instructors regarding the benefits of utilizing virtual classrooms in teaching. These findings align with Lloyd et al., (2012).

Similarly, the results demonstrate that 63.5% of instructors agree that introducing students and educators to education technology is one of the significant benefits of using virtual classrooms for teaching and learning. In addition, 50.6%–57.6% agree that virtual classrooms can save time, introduce students to learning skills that will be useful after graduation, enhance digital skills, and provide access to all students from any place. Additionally, 21.2% to 47.1% of instructors agree that virtual classrooms for teaching and learning increase the achievement and motivation of students.

These results agree with studies that reported numerous benefits of virtual learning, such as improved instructor-student interaction (Mills et al., 2009; Singh & Hurley, 2017), flexibility, and convenience (learning can occur anywhere and anytime), potential reduction of anxiety and capability to record classes for flipped learning (Singh & Hurley, 2017). Among the other benefits of virtual education, Al-Handhali et al., (2020) emphasized user-friendliness, effective time management, ease of managing courses and resources, and the ability to generate reports.

These results agree with those of Mandernach et al. (2013) and Abdelaziz (2012), who demonstrated that when instructors become familiar with virtual learning, they exhibit a more positive attitude toward it. Moreover, instructors teaching online were gratified when institutions provided mentoring, training, support, and recognition of their success (Wingo et al., 2017). This is the case with the instructors in this study. They were fully supported technically to deliver teaching using virtual classrooms.

To conclude, virtual classrooms' benefits include decreasing anxiety among students, providing an effective environment for discussion, supporting students in learning lessons relevant to their lives and interests, enhancing collaboration and communication, increasing convenience, providing immediate test and exam results, and introducing students and educators to education technology.

8.2.1 Open-ended Qualitative answers

Investigating the open-ended answers to the same question, it is clear that participants reported several benefits of the virtual classrooms. The answers were clustered in themes, as shown in Table 7. When the responses were categorized, the themes yielded three main themes: benefits to learning and learners, teaching and instructors, and technology-related benefits. These benefits support all three domains of the CoI framework.

Table 7: Instructors' open-ended responses: Key themes of the virtual classrooms' benefits

Benefits to teaching and instructors
● Provides an effective learning environment ● Facilitates cooperation with different educational groups, ● Provides a teaching platform to track students' performance
Benefits to learning and learners
● Flexible ● Encourage learners' voice ● An instrument for dynamic thinking and practice
Technology-related benefits:
● Support digital skills ● Support forms of technology integration ● A tool to support learning analytics

8.2.2 Social presence

The virtual classroom can encourage learners to participate actively in the learning process. They can use chat or messaging features to ask questions without fear of being judged by their peers. In addition, learners can ask questions freely without feeling embarrassed. In addition, the virtual classroom allows instructors to provide feedback to students promptly. Furthermore, it enables instructors to engage students in active learning environments using quizzes, polls, and breakout rooms.

Last, a significant benefit for instructors is the ability to control the discussion and the time, allowing them to manage the class flow effectively and ensuring all students have a chance to participate. The ease of breakout groups supports this without worrying about physical space and arrangement.

8.2.3 Cognitive presence

The virtual classroom could help shy students participate in live sessions by speaking or writing freely, allowing students who may be hesitant to participate in face-to-face classes to feel more comfortable contributing their thoughts and ideas. Another reported benefit for instructors is using advanced technology, such as virtual and augmented reality and simulations, to create engaging and interactive lessons.

8.2.4 Teaching presence

Participants reported numerous benefits of a virtual classroom for teaching and instructors. It provides an environment where instructors can support their students with more resources to study at their own pace, time, and pleasure and share multimedia materials, such as videos, podcasts, and articles, for students to access and review outside of class. Similarly, flexibility is another benefit where learners can review the material at their own pace and revisit lectures they find difficult or confusing. It is worth mentioning here that the reported benefits of the virtual classroom conform to participants' self-perception as indicated by questionnaire items.

8.3 Research question 3

To answer question 3, "What are the challenges of utilizing the CoI framework to deliver online virtual classrooms in higher education institutions?". Two primary data sources were used to answer this question: (1) a questionnaire with closed items and (2) an open-ended question asking participants to list the challenges of the virtual classroom for teaching and learning. Table 8 presents the means, SD, and percentages of the self-perceptions of instructors regarding the challenges of virtual classrooms for teaching and learning. The researchers identified a few challenges, such as difficulty in supporting students with special needs, technical problems, and isolation among students.

Examining these challenges, researchers concluded that several solutions could minimize these challenges to the minimum, such as fostering a sense of community among students, using breakout rooms and support, encouraging participation, setting clear expectations, and using incentives whenever possible. These results echo those of several studies such as Pazilah et al., (2019); Ismail et al., (2010); and Kafyulilo et al., (2015).

Table 8: Self-perception of instructors on the challenges of virtual classrooms for teaching and learning

Item	Mean	SD	%				
			NA	SD	D	A	SA
Interaction between teachers and students							
Students feel the extra load is required.	3.18	1.36	15.3	21.2	11.8	34.1	17.6
Difficulty in supporting students with special needs or disabilities	3.74	1.19	5.9	15.3	5.9	44.7	28.2
Negatively influence the time management of students through technical problems	3.84	1.26	9.4	9.4	3.5	43.5	34.1
Reduce personal interaction between teacher and students	3.74	1.31	10.6	11.8	2.4	43.5	31.8
Increase isolation among students.	4.06	1.06	4.7	7.1	3.5	47.1	37.6

8.3.1 Open-ended answers

Similar to the questionnaire's closed-ended items, the answers to the open-ended questions, instructors described a few challenges they faced when engaging in virtual classroom instruction. Three major themes emerged from the analysis of the open-ended responses: (1) challenges in Online instruction, (2) Engaging Students Online, and (3) Technical Challenges in Online Learning (Table 9).

Table 9: The themes and items were created for the open-ended responses of instructors to the challenges of the virtual classroom

Challenges of Online Teaching
● Time management skills. ● Technical issues. ● The virtual classroom may decrease the motivation for the instructor and student alike. ● Mentally and physically, it is exhausting for both teachers and students. ● Control student's attendance.

● Students' concentration.
Engaging Students Online
● Lack of feeling of belonging to the class ● This may decrease the motivation. ● Stimulating interactive thinking patterns was challenging for students with special needs and low achievers.
Technical Challenges in Online Learning
● Different excuses due to technology. ● I would say disadvantages (cheating, etc..) may occur. ● Inability to conduct experiments or conduct practical activities.

8.3.2 Challenges of OVC-CoI

Table 9 shows instructors reported a few challenges while implementing virtual classrooms. Although instructors highlighted technical and student interaction challenges, these challenges could be overcome by increasing the social, cognitive, and teaching presence during virtual classrooms. Instructors expressed how difficult it was not to know the special needs students among the rest of the class. Adonis (2020) mentioned that instructors suspected that the reduction in participation was related to a poor internet connection as students struggled to familiarize themselves with the new learning modality. Another instructor member stated, "There is a need for designated technical personnel provided by the institution to help the students." Another challenge was teaching the course's practical parts in some specific subjects, making conducting experiments or practical activities challenging.

However, these challenges can be solved or minimized dramatically. Some solutions could be training instructors to use creative, innovative communication tools to increase 'students' interactions with content and classmates. Although attention to the challenges is essential in understanding how to support instructors who are teaching virtually, possibly the similarly significant result is that despite itemized challenges, instructors create ways in the virtual setting to teach to the best of their abilities and always consider the future of their students. This kind of human consciousness may have been the most seamlessly translated to the online format, given that many online methods already exist, with guidelines permitting some instructor path and built-in structure. Instructors facilitated and provoked 'students' thinking through various methods. These findings offer hope that a mentality can be shifted away from the belief that learning and teaching in a virtual setting is "impossible." Instructors were encouraged to best meet 'students' learning needs by providing the maximum learning opportunities. With further assistance and coaching, those who may be designated to teach virtually will be able to do so successfully and surely.

9. Conclusion

In this study, the virtual classroom designed based on the CoI framework was perceived to be effective for teaching and learning, and the study shows that virtual classrooms have benefits and challenges, as perceived by instructors. In addition, virtual classrooms demonstrated the reflection on the quality of educational outputs and the imparting of skills, experiences, and knowledge. This was evident in transforming pedagogy from mere brain feeding to creativity, interaction, and skill development. However, it can be used as the foundation for

application to other organizations in other geographical areas, which will aid in validating the results, improving the tool designed, and obtaining new findings.

Instructors using virtual classrooms were satisfied when the university could mentor, train, support, and acknowledge their accomplishments. Instructors also appreciated the individual and professional rewards they revived due to the effective use of virtual classrooms, such as flexible schedules and professional development opportunities.

Although the study showed that instructors had challenges in implementing virtual classrooms, they received all the support they needed, including extensive PD workshops and mentoring on using virtual classrooms and up-to-date technologies for online and blended learning environments. In addition, they received support by accessing a wider variety of resources and training personnel available at the Center for Excellence in Teaching and Learning at the UAE University. As a result of this support, the challenges started to be demolished as teaching continued. Students started to feel more comfortable and adaptive to this content delivery method. Similarly, instructors started realizing the benefits of implementing virtual classrooms as a new delivery method.

Understanding the advantages and challenges of virtual classrooms, particularly from the perspective of instructors using the approach, will provide valuable insights into the most effective pedagogical strategies for integrating virtual classrooms into teaching and learning. The findings of this study can be used to train instructors on the best practices for utilizing virtual classrooms to teach content and manage learner interaction.

Institutions should support instructors and indicate that their hard work is just as appreciated as instructors teaching face-to-face; administrators could create a solid, constructive image of virtual classroom teaching at their organization.

The pedagogical design of online learning plays an integral part in online teaching quality and effectiveness. Therefore, each instructor in higher education content should be aware of what works well with their learners and courses. The CoI approach used in this research may guide learners and instructors to use it better and learn through virtual classrooms.

Technical challenges will continue in all online teaching and learning contexts. The effective way to reduce the impact of these challenges is to use, implement, or utilize a pedagogically informed approach to reduce the technological load and increase the potential for cognitive growth.

10. Recommendations

Based on the research findings, the following recommendations are made for higher education institutions and future research:

- Virtual Classrooms should always be used hand in hand with PD training sessions to guarantee effective use.
- Research should focus on qualitative data collection methods as well.
- The use of virtual classrooms should also be investigated in k-12 schools.
- Stakeholders should develop a set of measures and guidelines to regulate the use of virtual classrooms in social communications within the educational system.

- There is a need for a replication of the study with students. This might shed some light on the differences between instructors' perceptions versus students' perceptions of the benefits and challenges of utilizing virtual classrooms.

11. Limitations

One of the study's limitations is that the results mirror the setting of only a single nation. Also, although the tool is influential and robust and covers instructors' populations from different fields of study, it was applied to a sample from a single higher education organization. In addition, students were not participating in responding to the questionnaire, therefore, the findings of research is limited to the instructors and instructors in higher education institutions.

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