





Continuing higher education through the social media-based community of inquiry during the crisis: evidence from Turkey and Pakistan

Muhammad Zaheer Asghar ^{a,b,c}, Yasemin Kahyaoğlu Erdoğan ^d, Ercan Akpınar ^d and Şeyda Seren İntepeler ^e

^aDepartment of Education, University of Helsinki, Helsinki, Finland; ^bEducation & ICT (e-learning), Universitat Oberta de Catalunya, Barcelona, Spain; ^cLearning and Educational Technology Research Lab (LET Lab), Faculty of Education and Psychology, Oulu University, Oulu, Finland; ^dBuca Faculty of Education, Department of Computer Education and Instructional Technology, Dokuz Eylül University, Izmir, Turkey; ^eFaculty of Nursing, Nursing Management Department, Dokuz Eylül University, Izmir, Turkey

ABSTRACT

This study aimed to find out the social presence, teaching presence, and cognitive presence of higher education students in social media environments in developing countries such as Turkey and Pakistan during the pandemic crisis. We adopted a survey approach to collect data from higher education students in Turkey (n = 350) and Pakistan (n = 350). Consistent multiple group analysis (cMGA) analyzed that there was no difference between Turkish and Pakistani students' presence in the social media-based community of inquiry during the COVID-19 crisis. While a consistent partial least square structural equation modelling found that social presence mediates between teaching presence and cognitive presence. It shows that teaching presence is an important factor to maintain a social presence and ultimately brings a cognitive involvement of the students in social media environments during the crisis to continue higher education. This study has implications for higher education instructional designers to continue education during the crisis.

ARTICLE HISTORY

Received 8 March 2022
Accepted 27 June 2023

KEYWORDS





Cognitive presence; community of inquiry; COVID-19; higher education; social mediasocial presence; teaching presence

1. Introduction

The twenty-first century witnessed many life-threatening viral outbreaks for human beings. Some examples are Ebola, Zika, Severe Acute Respiratory syndrome coronavirus (SARS-CoV), and Coronavirus disease (COVID-19) (Shanmugaraj et al. 2020). These diseases have not only disturbed societal activities but also the teaching and learning process. There was also a rapid technological shift from web-based learning, e-learning, and blended learning to social media-based learning (Asghar et al. 2021; Okello-Obura and Ssekitto 2015). Hence, innovative technological transformation helped to continue education during the crisis. Meanwhile, the Community of Inquiry (COI) (Garrison, Anderson, and Archer 1999) has remained useful in studying the shifting technological learning environments for the last two decades (Castellanos-Reyes 2020), from face-to-face learning to the use of disruptive technologies. Almost all countries worldwide faced the COVID-19 outbreak, which interrupted the teaching-learning

process. The social media-based learning approach emerged as a trend to continue education during the pandemic crisis worldwide (Asghar et al. 2021). This research studied social media-based learning among higher education students through the community of inquiry framework in two Asian countries: Turkey and Pakistan, during the COVID-19 crisis.

Social media allows individuals to create profiles and content using Web 2.0-based applications for communication, sharing, following, and learning (Bal and Bicen 2017). With the development of technology, the number of social media users is increasing day by day. According to DataReportal (Kemp 2021), there has been a transition to remote working and the use of social media increased by 20.4% worldwide during the COVID-19 pandemic. The high usage of social media environments paved the trend of using them in a learning context (Al-Adwan et al. 2020). Social media tools used in the teaching-learning process helped to enhance students' interaction and engagement (Anderson 2019;

CONTACT Muhammad Zaheer Asghar  zaheer.asghar@helsinki.fi  Department of Education, University of Helsinki, 0014 Helsinki, Finland; Education & ICT (e-learning), Universitat Oberta de Catalunya, 08018 Barcelona, Spain; Learning and Educational Technology Research Lab (LET Lab), Faculty of Education and Psychology, Oulu University, Finland; Yasemin Kahyaoğlu Erdoğan  yasemin.kahyaoğlu@deu.edu.tr  Buca Faculty of Education, Department of Computer Education and Instructional Technology, Dokuz Eylül University, Izmir, Turkey

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Merchant and Lurie 2020). Social media networking sites are widely used in higher education for the real-time communication of the events such as conference alerts, data collection, dissemination, circulation of the research work, and teaching-learning process (Mohammadi et al. 2018). Recently, higher education institutions, research and development organisations, and scientific journals have devised social media-based communication strategies to access a larger population of their target audiences (Sugimoto et al. 2017). Altmetrics measures the social media presence and influence of the particular scientific knowledge addition (Sugimoto et al. 2017). Therefore, social media environments are helping out the scientific community to collaborate, monitor, and improve scholarship. Although, Facebook is restricted in certain countries, however, it has a great influence on the communication of scientific breakthroughs with the common audience (Collins, Shiffman, and Rock 2016). Research has also shown evidence of a larger academic presence on Twitter for scientific communication and debates (Varady et al. 2019). ResearchGate, Academia.com, and Mendeley are extensively used by postgraduate students, faculty of higher education, and researchers (Sugimoto et al. 2017).

Hence, the use of social media-based learning increased worldwide during the crisis. Researchers (Prestridge, Utami, and Main 2021) argue that teachers and students are connecting through social media environments worldwide with a certain set of their intentions to use social media for learning and social media affording for learning. Therefore, country, regional, or cultural differences may affect the learner's experience in the community of inquiry through social media environments, especially during the crisis.

According to Gaur and Gupta (2021) Globally, most liberal countries have flexible rules and regulations to access social media platforms, while some developing countries have strict regulations to monitor them (Radcliffe and Abuhmaid 2020). Community formation and information sharing in social media environments become biased due to cultural, religious, and political factors (Allcott, Gentzkow, and Yu 2019). This may restrict cross-border exposure of the population in some countries for example Middle East (Dini and Sæbø 2016). As another example, China has banned social media networks such as Facebook, WhatsApp, Twitter, and YouTube. However, the Chinese use local social media networks such as WeChat, Sina Weibo, QQ, and Weixin (He and Pedraza-Jiménez 2015). They have customised their social media networks' interface according to their culture, language, and habits. Chinese higher education academicians and students use social media for teaching, learning, and

sharing academic information and publications (Qiao and Shih 2018). If we talk about other Asian countries, there were 1.3 million internet users in Mongolia in 2015 (Gaur and Gupta 2021). Higher education faculty use Facebook, and YouTube to facilitate teaching and learning in Mongolia. It is difficult to estimate the exact number of social media users in Afghanistan due to the irregularity of Internet service providers and other infrastructure (Mushtaq and Benraghda 2018). However, Afghan students get the benefit of social media for academic discussion, access to audio-visual course contents, and sharing of knowledge on their topics (Mushtaq and Benraghda 2018). Facebook is most popular in Afghanistan, Iran, and surrounding countries among higher education students and academicians. Facebook, google+, Balatarin, and Cloob are used in Iran due to their low cost (Hajin 2013). Blogbasta is the most frequently used social network site in Kazakhstan (Laruelle, Royce, and Beyssembayev 2019). Kazakh higher education students connect on Blogbasta through the Russian language. Kyrgyzstan represents the second high internet user country after Kazakhstan in the region. However, Uzbek, Turkmen, Kazakh, and Kyrgyz academicians' use of social media for teaching, learning, and scientific sharing is invisible due to language, culture, and other factors (Freedman and Shafer 2012). We have focused this study on two Asian countries Turkey and Pakistan because social media use increased by 6.0 million (+11%) in Turkey and 11 million (+21%) in Pakistan between the years 2020–2021 during the COVID-19; Turkey has 60 million social media users, while Pakistan has 40 million social media users in January 2021 (Kemp 2021). It is necessary for Pakistan (Muzite 2020) and Turkey (Ribeiro et al. 2020) to ensure that every individual has inclusive and equal access to higher education under inclusive and quality education, which is the 4th goal of the sustainable development goals. Both Asian countries have huge young populations, depict some cultural similarities, and the increasing trend to use similar sorts of social media environments (such as YouTube, Facebook, Instagram, and Twitter), and somehow flexible social media use regulations. It seems that social media-based environments were used extensively to continue education during the crisis in Turkey and Pakistan. Therefore, we felt a need to understand the social media-based community of inquiries in the higher education of both countries during the crisis.

Garrison, Anderson, and Archer (1999) introduced the community of inquiry framework (COI) that comprised three major factors; those are social presence, cognitive presence, and teaching presence. According to a meta-analysis (Stenbom 2018), researchers

extensively used the COI framework mostly in online learning environments for almost the last two decades. This framework is still popular for rapidly changing online and blended learning environments. Although researchers (Ngubane-Mokiwa and Khoza 2021) used the COI model for computer-based conferencing, later they replicated it for synchronous and asynchronous learning environments. It is a new trend to apply COI in social media based-learning environments such as Facebook (Nazir and Brouwer 2019), WhatsApp (Zulkainain, Miskon, and Syed Abdullah 2020), Twitter (Popescu and Badea 2020), YouTube (D'Aquila, Wang, and Mattia 2019), and Wikipedia (Dasmit and D'Souza 2012). Researchers (Asghar et al. 2022) have shown the positive effect of social media tools on students' learning experiences. Most of the COI-based studies (Papamitsiou et al. 2021; Warner 2016) are in online learning, blended learning, and social media-based learning before the COVID-19 crisis. Some studies have used the COI in e-learning environments as well as hybrid learning environments (Ng et al. 2022) for university students (Lau et al. 2021) and school students (Li et al. 2021). There was a dearth of comparative studies to use COI for social media-based learning environments from different countries during the crisis. Therefore, this study aims to find out the teaching presence, social presence, and cognitive presence of higher education students in social media-based learning environments during COVID-19 in developing countries like Turkey and Pakistan. The research question arises; What was the relationship between social presence, cognitive presence, and teaching presence for social media based-learning in Turkey and Pakistan during COVID-19?

This study surveyed Turkey and Pakistan during the COVID-19. The research targeted students enrolled in higher education institutions. Community of Inquiry (COI) served as the theoretical framework. A consistent partial least square structural equation modelling helped in mediation analysis. Consistent multiple group analysis (cManalyzed) analysed the datasets from two countries.

It is significant the study that current research contributed to previous literature in four ways; first, previous studies have provided a simple correlation of the three components of the community of inquiry (Dempsey and Zhang 2019), while this research explored the cause, effect, and mediation relation of the community of inquiry components; second, previous research focused on e-learning (Akram et al. 2021; Shahzad et al. 2021; Wang, Lin, and Su 2021) but it has viewed the community of inquiry from the social media-based learning perspectives; third, previous research has provided results based on primary factors from one country

(Castellanos-Reyes 2020), while this research provided a second higher-order robust statistical analysis in two developing countries Turkey and Pakistan; fourth, if there was some research (Giunchiglia et al. 2018) on social media and community inquiry, it was mostly before COVID-19 crisis. We have studied the community of inquiry developed in the social media environment during the COVID-19 crisis. This study has practical implications for higher education policymakers to design instructional designs through social media for continuing education during the crisis. Educationists from both countries can also develop a cross-border community of inquiry through social media-based learning environments for higher education students. It would help educationists to design cross-border social media-based communities for cross-cultural understanding, and continue education during the crisis.

This research proceeded with a literature review for hypothesis and conceptual framework development. It followed research methods that comprised research design, population, sampling design, questionnaire development, and construct measurement. Data analysis provided reliability and validity measurement of the constructs. It also presented inner model testing for direct and specific in-direct relations among constructs. The discussion section elaborated on the results with the literature. Finally, we concluded the study with practical implications and future research suggestions.

2. State of the art

2.1. Social media-based learning during the COVID-19 crisis

The widespread use of social media tools has affected the learning process in all areas of life. Social media-based learning environments have an important potential to support active participation, engagement, communication, and cooperation (Iqbal et al. 2022). Especially with the COVID-19 pandemic, learning processes worldwide have transitioned to online environments. In this process, social media environments were generally used to enrich teaching-learning (Greenhow and Galvin 2020). However, especially institutions in developing countries that do not have their infrastructure and learning management systems try doing all processes through social media tools. In this process, social media played a significant role in teaching and learning environments in different countries (Sobaih, Hasanein, and Elnasr 2020). Studies on social media-based learning in Pakistan and Turkey (Azkeskin and Avci 2021) also show that social media

tools were widely used during the COVID-19 crisis to continue education.

The visibility of social networking sites increased in higher education during the crisis. University teachers considered social media tools as a source of communication to continue education. Social media proved an essential source of communication to connect higher education students with their class fellows, friends, and mentors during COVID-19 (Oliveira et al. 2022). Additionally, social media tools provided opportunities for sharing research articles and suggestions regarding research work on social media sites such as ResearchGate and Academia (Sanusi, Olaleye, and Dada 2020). Students also get information using social media sites during the pandemic lockdown. Social media environments enabled students to interact with their teachers and class fellows beyond their classroom boundaries for active learning. The social media tools' easy availability, free-of-cost use, and two-way communication made teaching-learning smoother than other sources during the pandemic crisis (Albanna, Alalwan, and Al-Emran 2022).

2.2. Research and community of inquiry

Garrison introduced the community of inquiry framework to explore online educational experiences (Aleven and Koedinger 2002). The COI framework, according to Akyol and Garrison (2010) 'generic and coherent structure of a transactional educational experience whose core function is to manage and monitor the dynamic for thinking and learning collaboratively' is based on philosophical and theoretical aspects of Dewey (1916), Peirce (1955), and Lipman (2003). The COI framework comprises three essential components.

Teaching presence is the first essential component in the community of inquiry. Researchers (Arbaugh 2008; Garrison 2015) have operationalised teaching presence into three sub-factors or categories. These categories comprised (1) design and organisation (i.e. instructor's ability to clearly communicate course outlines, goals, and milestones); (2) facilitation (i.e. instructor's ability to help out students' engagement in learning activities); (3) direct instructions (i.e. instructor's ability to provide direct instructions and subject related expertise).

Social presence is a second essential component. It highlights the social aspects of learning in certain environments. Researchers (Parker et al. 1978) have defined social presence as the perceived importance of interaction with other people and the consequential perceived importance of the interaction process itself. Social presence is also perceived as the extent to which individuals exist as 'real' in online environments

(Richardson and Swan 2003). In this perspective, social presence is viewed as a phenomenon of a group that is cohesive, interactive, and effective. Garrison (2015) operationalised social presence in virtual environments into four categories or sub-factors. These categories comprised (1) openness of communication (i.e. perceived comfort to communicate with other course participants); (2) interpersonal communication (i.e. perceived sense of belonging to a group), and (3) group cohesion (i.e. perceived sense of trust, acknowledgment, and collaboration in a group).

Cognitive presence is the third essential component of the community of inquiry. It is defined as a person's ability to acquire knowledge and develop a higher degree of understanding (Garrison 2015). Dewey (1916) presented the concept of cognitive presence which emphasises learning through exploration, construction, and resolution of the problem (Daspit and D'Souza 2012). While Garrison (2015), has operationalised cognitive presence in four sub-factors or categories as (1) triggering event (i.e. perceived motivation to explore course-related problems); (2) exploration (i.e. perceived ability to discover a set of problems posed in the course), (3) integration (i.e. perceived ability to construct explanations/ solutions to questions), and (4) Resolution (i.e. confirmation of knowledge in the learning process).

The community of inquiry is the most frequently used framework since its development. It has explored the learning experiences in online environments, as well as blended learning environments. A few studies (Rourke and Kanuka 2009) have also found a comparison between synchronous and asynchronous learning environments. Some researchers (Singh, Chandwani, and Kumar 2018) also compared online learning within blended learning environments. We reviewed the literature from three databases namely: Web of Science (2022), Scopus (2022), and ERIC (2022) to find out the research trends by using the community of inquiry framework. There was a shift of COI studies from online to blended learning

Table 1. Community of Inquiry use in research.

Keywords	WOS	Scopus	ERIC
'community of inquiry'	824	1,221	764
'community of inquiry' AND ('online learning' OR 'e-learning')	292	463	256
'community of inquiry' AND ('synchronous' OR 'asynchronous')	104	148	127
'community of inquiry' AND ('blended learning' OR 'hybrid learning')	101	131	101
'community of inquiry' AND 'blended learning' AND 'online learning'	26	28	36
'community of inquiry' AND 'social media'	1	14	22
'community of inquiry' AND 'social media' AND 'COVID-19'	1	3	1

Source: (Eric 2022; Scopus 2022; WoS 2022).

environments to social media-based learning. We found that there was a shift toward the social media-based learning community of inquiry. But fewer studies are available about social media learning. Especially, there was no comprehensive study available about the social media-based community of inquiry during the COVID-19 context. It is evident from the given [Table 1](#).

3. Conceptual framework and hypothesis development

We used the Community of inquiry framework to study higher education students' social media-based learning experience during COVID-19.

3.1. Demographic variables

Researchers (Venkatesh et al. 2003; Venkatesh and Davis 2000) presented a technology acceptance model that described the importance of demographic variables, such as gender, as moderators to affect the use of technology. Park, Nam, and Cha (2012) have also emphasised that the programme of study influences the technology usage behaviour in the teaching and learning process. However, Park and Venkatesh's study say nothing about COI. Therefore, we consider the suggestion of Garrison, Cleveland-Innes, and Fung (2010) that every discipline has its own set of epistemologies and learning styles that may affect the educational experiences of the students in a COI. We can say that demographics such as gender and programme are essential moderators for technology-based learning behaviour in general. While social media-based learning has emerged as an essential learning environment during COVID-19 worldwide (Zgheib and Dabbagh 2020). We also need to study the regional differences as moderators to adopt social media for learning. Since our focus of the study is the community of inquiry through social media-based learning environments, researchers (Carlson et al. 2012; Fung Choy and Quek 2016) have emphasised that the key demographics i.e. gender, the programme of study, and the region may affect students' perceptions about different components of COI and their learning experiences. We have derived the following hypothesis based on the above discussion:

Hypothesis 1. There is no effect of student demographics (gender, the program, and region) on the community of inquiry

According to researchers (Popescu and Badea 2020), the factors of the community of inquiry such as social presence, teaching presence, and cognitive presence have shown an application for social media-based learning

environments. However, it needs to explore how these components are interlinked with each other to continue educational experiences during the crisis. We assumed every presence as an independent factor of the social media-based learning environment. The teachers used their presence by maintaining students' social presence and cognitive presence in social media-based learning during COVID-19. For example, researchers (Nasir et al. 2018) describe teachers' presence as a function of their ability to design and organisation of courses; facilitate the course; and direct instructions. Thus, teaching presence is a second-order factor in their design and organisation, facilitation, and direct instruction. While the social presence of the students is a function of their interpersonal relationships, open communication, and group cohesion in social media environments (Arbaugh 2008; Öztürk 2014). Meanwhile, the cognitive presence of the learners is a function of triggering events, exploration, integration, and resolution (Dempsey and Zhang 2019; Garrison 2015).

3.2. Teaching presence on social presence

There is a positive relationship between social presence, cognitive presence, and teaching presence (Dempsey and Zhang 2019; Garrison 2015). Empirical studies have found the influence of teaching presence on social presence in social media learning environments. Raman, Ryan, and Olfman (2005) found that a teacher's ability to organise social media environments influences the social exchange of learning experiences among learners. It shows how teaching presence is essential for the social aspect of learning in social media environments. Researchers also observed that social media environments grow teachers' ability to provide continuous feedback, guidance, and facilitation to enhance learners' group interaction (Dempsey and Zhang 2019; Robertson 2008; Wheeler, Yeomans, and Wheeler 2008). Nutshell, teaching presence in a social media-based community of inquiry offers course structure, direct instructions, and facilitation to influence the social presence of the learners (Dempsey and Zhang 2019).

The literature describes the effect of teaching presence on social presence in different social media environments such as Twitter, Facebook, and Wikipedia (Dasplit and D'Souza 2012; Nazir and Brouwer 2019; Popescu and Badea 2020). It also needs to re-visit the teaching presence in overall social media-based learning environments for the social presence of learners during the crisis. The hypothesis arises as follows:

Hypothesis 2: Teaching presence positively affects social presence in a social media-based community of inquiry during the COVID-19

Since our study has compared the data from higher education students in Turkey and Pakistan, therefore hypothesis arises as follows:

Hypothesis 2 (a): Teaching presence does not equal and positively affect social presence in a social media-based community of inquiry during the COVID-19 in Turkey and Pakistan

3.3. Teaching presence on cognitive presence

According to Hilliard and Stewart (2019) and Lin, Hung, and Lee (2015) teaching presence significantly influences cognitive presence in social media-based learning environments as it enhances critical thinking (Garrison 2015). In other words, teaching presence is correlated with students' actual learning outcomes and experiences. Garrison and Cleveland-Innes (2005), described that teaching presence influences cognitive presence through curriculum design and the teacher's facilitation of the learning experience. Therefore, we have proposed to combine the sub-factors of the teaching presence to influence the combined sub-factors of the cognitive presence in the social media-based community of inquiry.

Some studies have found that teaching presence does not show an influence in getting feedback on the student's learning (Borup, West, and Thomas 2015), it needs to measure carefully the influence of teacher facilitation in the learning experience (Y. Wang and Liu 2020). It may be due to the reason that teaching presence influences too many cognitive processes and reduces learners' social interaction. Therefore, Wang and Liu (2020) suggests that teachers should focus more on the facilitation of learning rather than direct instructions. We argue that a social media-based community of inquiry enhances the teaching presence influence on the cognitive presence of the learners through curriculum design and facilitation of the learning experiences during COVID-19 in different cultural contexts.

Simultaneously, researchers (Daspit and D'Souza 2012; Zulkanain, Miskon, and Syed Abdullah 2020) also found the effect of teaching presence on the cognitive presence of the students on WhatsApp and Wikipedia. It needs to revisit the effect of teaching presence on cognitive presence in social media-based learning environments during the crisis. The discussion raised the following hypothesis:

Hypothesis 3. Teaching presence positively influences the cognitive presence

Since our study has compared the data from higher education students in Turkey and Pakistan, therefore hypothesis arises as follows:

Hypothesis 3 (a): Teaching presence does not equal and positively affect cognitive presence in a social media-based community of inquiry during the COVID-19 in Turkey and Pakistan

3.4. Social presence on cognitive presence

There are fewer studies available on the influence of social presence on cognitive presence. Harasim (1990) conducted a pioneer study that describes a unique relationship between social presence and critical thinking (cognitive presence) in web-based knowledge-sharing practices. Rourke and Kanuka (2009) found that cognitive presence is predicted by social presence through critical thinking among learners in a community of inquiry. Xiaojing (2006) presented a study that clearly shows the influence of social presence on cognitive presence depending on online media used for learning activities. Another pioneer research shows the influence of social interaction on the learning of the participants in social media environments (Beuchot and Bullen 2005). Social media environments offer more social interaction. Therefore, we may assume that social presence influences the cognitive presence of learners in social media environments (Dempsey and Zhang 2019). Several studies describe the influence of social presence on cognitive presence in Zoom and Wikipedia (Bakir and Phirangee 2021; Daspit and D'Souza 2012). It should determine the influence of teaching presence such as interpersonal relationships, open communication, and group cohesion on the cognitive presence of the learners such as triggering events, exploration, integration, and resolution of the learners in social media-based learning environments during the crisis. We developed the hypothesis:

Hypothesis 4. Social presence positively influences the cognitive presence

Since our study has compared the data from higher education students in Turkey and Pakistan, therefore hypothesis arises as follows:

Hypothesis 4 (a): Social presence does not equal and positively affect cognitive presence in a social media-based learning community of inquiry during the COVID-19 in Turkey and Pakistan

3.5. Social presence mediation

Social presence and teaching presence 70% predict cognitive presence with the mediation of a learning presence (Shea and Bidjerano 2009). Researchers (Garrison, Cleveland-Innes, and Fung 2010) described the role of teaching presence in strengthening the cognitive

presence and social presence. Archibald et al. (2010) found that self-regulated learning and previous collaborative learning experience in online environments moderates cognitive presence through teaching presence and social presence. Szeto (2015) researched that teaching presence influences more cognitive presence than social presence in a blended synchronous community of inquiry but another research found a higher effect of social presence on the cognitive presence (Gutiérrez-Santiuste, Rodríguez-Sabiote, and Gallego-Arrufat 2015) in asynchronous online learning environments. Hence, cognitive presence is influenced by teaching presence and social presence (Joksimović et al. 2015; Tirado Morueta et al. 2016) while the mediation of social presence between cognitive presence and teaching presence is established by previous research (Dempsey and Zhang 2019; Garrison 2015; Joo, Lim, and Kim 2011).

Previous research found the mediating role of social presence between teaching presence and cognitive presence in social media environments like Wikipedia and YouTube (D'Aquila, Wang, and Mattia 2019; Das-pit and D'Souza 2012). Since students diverted to social media-based learning environments during the crisis. It should determine the mediating role of social presence in teaching presence and cognitive presence in social media-based learning environments. We supposed the hypothesis based on the discussion as follows:

Hypothesis 5. Social presence mediates between teaching presence and cognitive presence

Since our study has compared the data from higher education students in Turkey and Pakistan, therefore hypothesis arises as follows:

Hypothesis 5 (a): Social presence not equally mediates between teaching presence and cognitive presence in Turkey and Pakistan

3.6. Conceptual framework

Hypothesis development led us to suggest a conceptual framework; at the first level, students' demographics (such as gender, the programme, and region) moderating influence on the community of inquiry's factors such as social presence, cognitive presence, and teaching presence; second, teaching presence influences cognitive presence; third, teaching presence influences social presence; fourth, social presence influences cognitive presence; while at fifth level, we proposed mediation of the social presence between teaching presence and cognitive presence as shown in Figure 1.

4. Research method

The study used a quantitative research approach. The survey design helped to collect data from the target population. There were three reasons to adopt the survey approach. First, it was essential to consider the higher education students' perceptions about their social presence, cognitive presence, and teaching presence in social media environments during COVID-19. Second, it needs an adequate sample from Turkey and Pakistan that has the generalizability of the results for the target population. Third, researchers have links with the higher education faculties in Pakistan and Turkey to access the data. We approved the study plan from the ethical board. Students gave their consent for participation in the survey.

4.1. Population and sampling design

The higher education students enrolled in the universities of Turkey and Pakistan were the target population for this study. An online calculator (Daniel 2021) measured the adequacy of sample size for the generalisation of results on the population. This calculator used an effect size of 0.25, a statistical power of 0.8, and a probability level of 95%. The power calculator suggested that the minimum sample size from each country should be 350. Our research proposal was approved by the ethical committee. We contacted the head of departments in Turkish and Pakistani universities to facilitate us in data collection. They forwarded our email to students enrolled in their departments for volunteer participation. A nominal incentive was proposed for volunteer participation in the survey. We received a pool of email addresses of the students that wanted to participate in the survey. A random sampling technique was applied to collect data from randomly selected email addresses of the students enrolled in higher education in Turkey and Pakistan. We used the Qualtrics website to collect data. A total of 400 emails were sent to Turkish students and 400 emails were sent to Pakistani students. We collected the data during the COVID-19 pandemic second wave. An intensive data-cleaning process was performed to deal with outliers and missing values. We considered 350 students' responses from Turkey who filled out the proper questionnaires; and 350 students from Pakistan who filled out the proper questionnaires. The overall rate of return of the survey was 87%. The distribution of the sample is shown in Table 2.

4.2. Questionnaire development

We adopted the Community of inquiry questionnaire developed by Garrison (2015), see the questionnaire

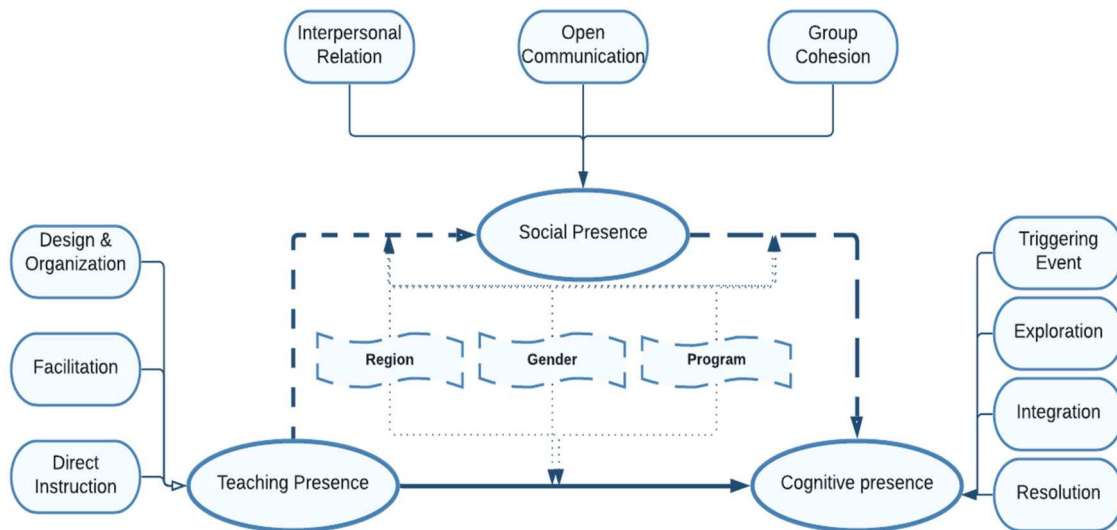


Figure 1. Conceptual framework.

Table 2. Sample distribution.

		Turkey	Pakistan	Total
Gender	Female	110	275	385
	Male	240	75	315
Programme	Undergraduate	206	90	296
	Postgraduate	44	260	304

items given in Appendix A. The questionnaire comprised three parts. The first part described the objectives of the study, the consent of the participants, demographic of the participants such as gender, programme, and country. The second part asked the students questions on a 5-point Likert-type scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The second part had three factors: cognitive presence, social presence, and teaching presence. We conducted a pilot survey of 20 Ph.D. students and 10 researchers. Researchers provided their feedback on the questionnaire. We incorporated minor changes in the questionnaires according to the suggestions of the experts.

4.3. Construct measurements

4.3.1. Teaching presence

The construct of teaching presence has three sub-factors (Garrison 2015); The first factor was design and organisation (sample item, e.g. ‘the instructor clearly communicated important course topics’), the second sub-factor was facilitation (sample item, e.g. ‘the instructor was helpful in identifying areas of agreement and disagreement on course topics that help me to learn’), and the third sub-factor was direct instruction (sample item, e.g. ‘the instructor helped to focus discussion on relevant issues in a way that helped me to learn.’). The reliability of

the sub-factors of the teaching presence was found satisfactory as Cronbach alpha was above the threshold of 0.7 (e.g. $\alpha = 0.849$ for design and organisation, $\alpha = 0.892$ for facilitation, and $\alpha = 0.806$ for direct instruction).

4.3.2. Social presence

Social presence was the second factor in the questionnaire (Garrison 2015). It has three sub-factors; the first sub-factor was interpersonal relationships (sample item, e.g. ‘getting to know other course participants gave me a sense of belonging in the course’), the second factor was open communication (sample item, e.g. ‘I felt comfortable participating in the course discussions’), and the third sub-factor was group cohesion (sample item, e.g. ‘I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.’). The reliability of the sub-factors of the social presence was found satisfactory as Cronbach alpha was above the threshold of 0.7 (e.g. $\alpha = 0.672$ for interpersonal relation, $\alpha = 0.868$ for open communication, and $\alpha = 0.79$ for group cohesion).

4.3.3. Cognitive presence

Third-factor cognitive presence has 4 sub-factors (Garrison 2015); the first sub-factor was triggering (sample item, e.g. ‘problems posed increased my interest in course issues’), the second sub-factor was exploration (sample items, e.g. ‘I utilize a variety of information sources to explore problems post in this course’), the third sub-factor was integration (sample item, e.g. ‘combining new information help me answer questions raised in course activities’), the fourth sub-factor was a resolution (sample item, e.g. ‘I can describe ways to test and apply the knowledge created in this course’).

The reliability of the sub-factors of the social presence was found satisfactory as Cronbach alpha was above the threshold of 0.7 (e.g. $\alpha = 0.866$ for triggering event, $\alpha = 0.762$ for exploration, $\alpha = 0.867$ for integration, and $\alpha = 0.847$ for resolution).

5. Data analysis

We used the consistent partial least square structural equation modelling (PLSc-SEM) approach in this study. Authors consider PLSc-SEM useful in multivariate analysis studies because it helps in theory confirmation and path comparisons (Hair, Ringle, and Sarstedt 2011). Therefore, we used PLSc-SEM to analyze the relationship among social presence, cognitive presence, and teaching presence in a social media-based community of inquiry during the crisis. The PLSc-SEM also helped us in the comparison of datasets from two developing countries such as Turkey and Pakistan. Hence, the results of the study are useful for the target population based on the inferences drawn from PLSc-SEM. We adopted a two-step analysis approach for the application of SEM. First, we measured the constructs, and second, we measured the inner model.

The outer model assessment contains the reliability and validity measurement of the constructs. The item loading showed the relevance of observed indicators with unobserved constructs or factors. The researcher (Henseler, Ringle, and Sarstedt 2015) suggests an item loading above the threshold of 0.4. The item loadings were arranged from 0.757–0.940. Therefore, items were reliable to include with the relevant factors. The rho-alpha, Cronbach alpha, and composite reliability measured the consistency of the items.

According to Hulin and Cudeck (2001), a Cronbach alpha value of 0.6–0.7 is considered good. While some researchers (Ringle, da Silva, and Bido 2014) consider reliability indicators very good if it is above the threshold of 0.7 for rho alpha, Cronbach alpha, and composite reliability. Hence, constructs in our study showed all reliability measures above 0.7 as given in Table 2. Researchers (Ringle, da Silva, and Bido 2014) also suggest measuring the AVE values for constructs to assess convergent validity. An AVE above 0.5 is satisfactory. All constructs in our study also showed AVE values above the threshold of 0.5. The same procedure was repeated for second-order factor order analysis. The second-order factor analysis was performed through consistent PLS. The second-order factor analysis was also reliable and consistent with Cronbach alpha values above 0.7 and rho_alpha values, as well as composite reliability values above 0.7. The AVE values for

Table 3. Reliability and validity.

Factors	Items	Loading	α	rho_A	CR	AVE
CPE	CPE2	0.916	0.762	0.777	0.893	0.807
	CPE1	0.88				
CPI	CPI1	0.889	0.867	0.867	0.919	0.79
	CPI2	0.896				
	CPI3	0.882				
CPR	CPR1	0.866	0.847	0.849	0.907	0.765
	CPR2	0.893				
	CPR3	0.864				
	CPR4	0.864				
CPTe	CPTe1	0.859	0.866	0.868	0.918	0.79
	CPTe2	0.918				
	CPTe3	0.888				
SPGC	SPGC1	0.911	0.79	0.79	0.905	0.826
	SPGC2	0.907				
SPIR	SPIR1	0.863	0.672	0.672	0.859	0.753
	SPIR2	0.872				
SPOC	SPOC1	0.939	0.868	0.868	0.938	0.883
	SPOC2	0.94				
TPDI	TPDI1	0.844	0.806	0.809	0.885	0.72
	TPDI2	0.867				
	TPDI3	0.833				
TPDO	TPDO1	0.819	0.849	0.852	0.899	0.689
	TPDO2	0.869				
	TPDO3	0.858				
	TPDO4	0.772				
TPF	TPF1	0.757	0.892	0.893	0.917	0.65
	TPF2	0.836				
	TPF3	0.828				
	TPF4	0.854				
	TPF5	0.798				
	TPF6	0.76				
Cognitive Presence	CPE	0.839	0.887	0.892	0.922	0.747
	CPI	0.915				
	CPR	0.839				
	CPTe	0.861				
Social Presence	SPGC	0.867	0.813	0.813	0.89	0.729
	SPIR	0.808				
	SPOC	0.886				
Teaching Presence	TPDI	0.881	0.849	0.871	0.909	0.769
	TPDO	0.816				
	TPF	0.93				

Average Variance Extracted = AVE; Composite Reliability = CR; Cronbach's Alpha = α ; TPF = Teaching Presence-Facilitation; TPDO = Teaching Presence-Design and Organisation; TPDI = Teaching Practice-Direct Instruction; SPOC = Social Presence-Open Communication; SPIR = Social Presence-Interpersonal Relationships; SPGC = Social Presence-Group Cohesion; CPTe = Cognitive Presence-Triggering Event; CPR = Cognitive Presence - Resolution; CPI = Cognitive Presence - Integration; CPE = Cognitive Presence- Exploration.

all constructs also met the threshold of 0.5. Hence, all constructs were reliable and valid as given in Table 3.

Previously, Fornell and Larcker's (1981) criteria helped identify the discriminant validity. Now, there is a new trend to use HTMT values for measuring discriminant validity. HTMT provides a more accurate measure of discriminant validity compared to Fornell and Larcker criteria. If the HTMT value is below the threshold of 0.9, researchers (Henseler, Ringle, and Sarstedt 2015) consider it a satisfactory level of discriminant validity. We observed that HTMT values for all constructs were below the threshold of 0.9 for first-order factor analysis. Hence, all first-order factors have shown a satisfactory level of HTMT ratios as given in Table 4.

Table 4. HTMT.

	CPE	CPI	CPR	CPTE	SPGC	SPIR	SPOC	TPDI	TPDO	TPF
CPE										
CPI	0.872									
CPR	0.748	0.836								
CPTE	0.752	0.83	0.698							
SPGC	0.621	0.673	0.582	0.775						
SPIR	0.645	0.718	0.7	0.733	0.699					
SPOC	0.532	0.663	0.595	0.697	0.866	0.721				
TPDI	0.633	0.679	0.624	0.716	0.66	0.814	0.668			
TPDO	0.657	0.585	0.525	0.53	0.417	0.544	0.44	0.649		
TPF	0.666	0.717	0.659	0.745	0.641	0.74	0.643	0.865	0.782	

TPF = Teaching Presence-Facilitation; TPDO = Teaching Presence-Design and Organisation; TPDI = Teaching Practice-Direct Instruction; SPOC = Social Presence-Open Communication; SPIR = Social Presence-Interpersonal Relationships; SPGC = Social Presence-Group Cohesion; CPTE = Cognitive Presence-Triggering Event; CPR = Cognitive Presence- Resolution; CPI = Cognitive Presence- Integration; CPE = Cognitive Presence- Exploration.

Table 5. Second-order constructs' HTMT.

	Cognitive Presence	Social Presence	Teaching Presence
Cognitive Presence	0.864		
Social Presence	0.726	0.854	
Teaching Presence	0.725	0.678	0.877

The values for second-order factor analysis showed that all constructs have a discriminant value below the threshold of 0.9. Hence, second-order factors have shown, or satisfactory level of discriminant validity, as shown in Table 5.

One principal component factor was used for the factor analysis. Baumgartner, Weijters, and Pieters (2021) say that unrotated factor analysis should not be greater than 50%. We found Harman's one-factor 32.4%. Hence factors did not have common method bias.

Researchers (Hair, Ringle, and Sarstedt 2011) recommend that the variance inflation factor (VIF) value must be below the critical value of 5 to determine the amount of multicollinearity. In this study, VIF values are below 3, so it shows there is no multicollinearity problem between the factors. As the Standardised Root Mean Square Residual (SRMR) value is under 0.06 and close to 0.00, the goodness of fit of the model increases (Hair 2017). Normed Fit Index (NFI) should be above the critical value of 0.8 (Hair 2017). The model has shown NFI = 0.911 and SRMR = 0.044 which showed an adequate fitness of the model, as given in Table 6.

The goodness of fit (GoF), which shows the effectiveness of the model, shows the credibility and frugality of

Table 6. Good fit model and VIF.

	Cognitive Presence	Social Presence	The goodness of fit indices
Social Presence	2.91		SRMR = 0.044 NFI = 0.911
Teaching Presence	2.876	1	

Table 7. The goodness of Fit Index.

Constructs	AVE	R-square
Teaching Presence	0.747	
Social Presence	0.729	0.78
Cognitive Presence	0.769	0.648
Average	0.748	0.714
GoF	0.73	

the model for Multigroup analysis (PLSc-MGA). It is recommended to be above the critical value of 0.36 (Tenenhaus et al. 2005). We used the 'GoF = sqrt ((average AVE) * (average R²)).' formula to calculate this value. The result of the GoF value of 0.73 shows that model was parsimonious and plausible as given in Table 7.

The F-square value is the effect size ($f^2 > = 0.02$ low, $f^2 > = 0.15$ medium, $f^2 > = 0.35$ high) (Cohen 1988). Social presence has shown a substantial effect size ($f^2 = 0.478$) on cognitive presence while teaching presence has also shown a substantial effect ($f^2 = 1.84$) on social presence. Teaching presence has also shown a moderate effect on the cognitive presence ($f^2 = 0.235$) as shown in Table 8.

The R-Square explains the variance in the endogenous variable explained by the exogenous variables. Researchers (Hair, Ringle, and Sarstedt 2011) recommended being above the critical value of 0.1 Cognitive presence has shown 78% and social presence has shown 64% power of prediction in an SEM model, as given in Table 9.

We used mean values in PLSc paths that suggested the same as beta values in regression analysis. We used mean values in PLSc paths that same as beta values in regression analysis. Beta measures the independent variable that changes per unit and the t-test supports

Table 8. f-square.

	Cognitive Presence	Social Presence
Social Presence	0.478	
Teaching Presence	0.235	1.848

Table 9. R-square.

	R Square	R Square Adjusted
Cognitive Presence	0.781	0.78
Social Presence	0.649	0.648

this. We tested the hypothesis with the help of beta values and t-test as well as bootstrapping at subsample level 5000.

It was also the aim of the study to find the difference between constructs and paths for data sets from Pakistan and Turkey. A consistent multiple-group analysis (cMGA) helped to find the difference in data from Turkey and Pakistan.

Table 10. showed that gender and programme do not affect the dependent variable of cognitive presence with a p -value greater than 0.05. It leads to rejecting hypothesis 1.

Teaching presence has also shown a positive and significant effect on the social presence ($\beta = 0.806$, $p < 0.05$). It leads us to not reject hypothesis 2. There was no difference in the path between Teaching Presence to Social Presence ($\beta_{(PK-TR)} = -0.04$, $p_{(PK \text{ vs } TR)} = 0.464$) for data from Turkey and Pakistan. It leads us to reject hypothesis 2 (a).

Teaching presence has shown a positive and significant effect on the cognitive presence ($\beta = 0.380$, $p < 0.001$). Hence, it leads us to not reject Hypothesis 3. There was no difference in the path from Teaching Presence to Cognitive Presence ($\beta_{(PK-TR)} = -0.161$, $p_{(PK \text{ vs } TR)} = 0.335$) for data from Turkey and Pakistan. It leads us to not reject hypothesis 3 (a).

Social presence has shown a positive and significant effect on the cognitive presence ($\beta = 0.557$, $p < 0.05$). Hence, hypothesis 4 was not rejected. There was no difference in the path between Social Presence to Cognitive Presence ($\beta_{(PK-TR)} = 0.044$, $p_{(PK \text{ vs } TR)} = 0.796$) for data from Turkey and Pakistan. It leads us to reject hypothesis 4 (a).

Table 10. Consistent Path Analysis and Multiple Group Analysis.

Paths	Consistent PLS-SEM			cMGA (PK - TR)	
	β	t- stats	P Values	β	P
Gender → Cognitive Presence	-0.009	0.361	0.718	0.042	0.457
Programme → Cognitive Presence	0.045	1.642	0.101	-0.015	0.841
Teaching Presence → Social Presence	0.806	29.909	0.000	-0.04	0.464
Teaching Presence → Cognitive Presence	0.380	5.027	0.000	-0.161	0.335
Social Presence → Cognitive Presence	0.557	7.184	0.000	0.044	0.796
Teaching Presence → Social Presence → Cognitive Presence	0.449	6.664	0.000	0.04	0.989

Social presence has shown a mediation between teaching presence and cognitive presence ($\beta = 0.449$, $p < 0.05$). It leads us to accept hypothesis 5 robustly. There was also no difference between Turkish and Pakistani data for mediating social presence between teaching presence and cognitive presence ($\beta_{(PK-TR)} = 0.04$, $p_{(PK \text{ vs } TR)} = 0.989$). It leads us to reject hypothesis 5 (a) as given in Table 10.

Figure 2. Shows the theoretical addition as follows:

6. Discussion

The CoI framework has been widely adopted in online learning research for 20 years (Castellanos-Reyes 2020). The community of inquiry is a widely used framework in e-learning and blended learning environments (Stenbom 2018). But there was a lack of research in the community of inquiry development through social media during the crisis. To the authors' best of their knowledge, the current study is among pioneer studies that determine the learner's social presence, cognitive presence, and teacher's teaching presence in social media environments during the pandemic crisis. This study also found the relationships among components of the community of inquiry, such as social presence, teaching presence, and cognitive presence in social media environments. It is also among the pioneer studies to compare the community of inquiry through social media between two developing countries such as Turkey and Pakistan. We measured constructs in a second order for the components of the community of inquiry, such as social presence and cognitive presence, and teaching presence. The inner model evaluation also confirmed the COI model's plausibility and parsimoniousness for social media-based learning environments during the crisis. Based on the current study, higher education policymakers can effectively use the COI framework to continue higher education through social media environments during the crisis. In the next part of the discussion, we offered the theoretical implications of the study, which is followed by practical implications for higher education instructional planners to use social media-based learning environments during the crisis.

6.1. Theoretical implications

First, in this study, we investigated whether gender, academic discipline, and region influence students' perception of their participation in social media-based COI during the crisis. This study found that demographic variables such as gender, the programme of study, and the country do not influence higher education students' participation in the community of inquiry through

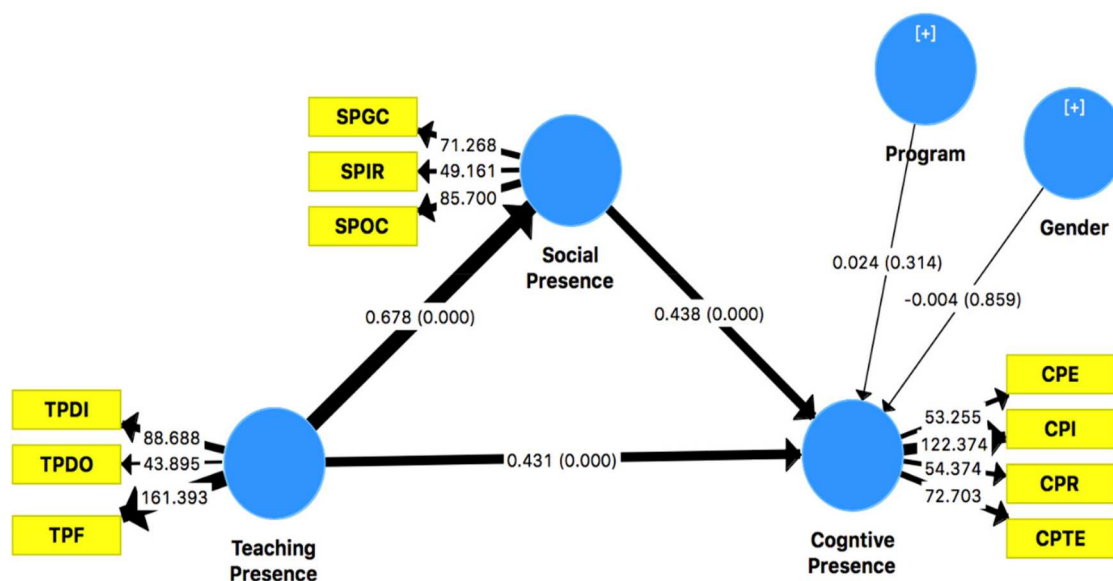


Figure 2. The social media-based community of inquiry.

social media environments during the crisis. These results depict two phenomena. The first pandemic broke out worldwide and it restricted the face-to-face teaching-learning process. Second, social media was easily available as compared to other online learning resources. Therefore, students of all gender and study programmes from different countries took part in the social media-based community of inquiries to continue their teaching-learning process. Researchers (Venkatesh et al. 2003) have observed the same phenomenon, that different demographic variables do not affect technology acceptance. Previous research (Petillion and McNeil 2020; Ramachandran and Rodriguez 2020) showed that different cultural contexts, gender, and programme do not influence different aspects (such as student engagement, social presence, and cognitive presence) of online learning communities during the crisis. Therefore, data analysis results from two countries, such as Pakistan and Turkey, have also shown that social media-based learning has become a global phenomenon during the crisis.

Second, our research found that teachers' design and organisation of the course, their way of facilitation, and direct instruction (i.e. teaching presence) influence the interpersonal relationship, open communication, and group cohesion (i.e. social presence) of the students in social media environments during the crisis. It led us to not reject hypothesis 2. The findings of the study coincide with previous research (Borup, West, and Graham 2013; Daspit and D'Souza 2012; DuBois, Krasny, and Russ 2019) that reflected the influence of teaching presence on social presence. This study found that the influence of teaching presence on social presence was stronger ($\beta = 0.806$, $p <$

0.05) than the influence of the social presence of the students on their cognitive presence ($\beta = 0.557$, $p < 0.05$), and the influence of teaching presence on the cognitive presence ($\beta = 0.380$, $p < 0.001$). It shows that teachers' facilitation is important to develop a community of inquiry in social media environments. Otherwise, a social media-based community without teachers' facilitation, instructions, and communication cannot lead learners toward educational experiences. We see a huge number of social media users traffic in social media environments. These social media environments remain static in converting into a learning community because of the absence of well-designed instructions, experts' facilitation, and directions.

Third, this study found that teaching presence influences the triggering of events, exploration, integration, and resolution (i.e. cognitive presence) of the students in social media-based learning environments during the crisis. It led us to not reject hypothesis 3. Our study findings coincide with previous research (Shea and Bidjerano 2009) that found the influence of teaching presence on cognitive presence in online learning environments. It also shows that social media environments have the potential to use for learning purposes, like other online environments.

Fourth, we found that social presence has a positive influence on cognitive presence in the social media-based learning environment. It led us to not reject hypothesis 4. It was also found that social presence influence on cognitive presence ($\beta = 0.557$, $p < 0.05$) was a bit higher than the influence of teaching presence effect on the cognitive presence ($\beta = 0.380$, $p < 0.001$).

Some other researchers have conducted studies on selected social media tools such as WhatsApp (Zulkainain, Miskon, and Syed Abdullah 2020), YouTube (D'Aquila, Wang, and Mattia 2019), and Facebook (Nazir and Brouwer 2019) but our study has found overall results of the social media environments for the development of a community of inquiry. Previous studies found that teaching presence on cognitive presence has a higher effect than social presence effect on cognitive presence in Wikipedia environments (Daspit and D'Souza 2012). Our study showed different results from Daspit and D'Souza's (2012) study because overall social media environments such as WhatsApp, Facebook, and Twitter are more dynamic for social presence compared to specific social media environments like Wikipedia.

Fifth, this study found a positive and significant mediation of the social presence between teaching presence and cognitive presence. It led us to not reject hypothesis 5. It shows the direct and indirect influence of the teaching presence on the cognitive presence of the students in the social media-based community of inquiry. Previous research also endorsed the results of this study of the mediation of social presence between teaching presence and cognitive presence in e-learning environments (Shea and Bidjerano 2009), blended learning environments (Fung Choy and Quek 2016), and Wikipedia-based learning environments (Daspit and D'Souza 2012). It applies that social presence connects the teaching presence (i.e. teacher's direct instructions and facilitation) with the cognitive presence of the learners for a better learning experience during the crisis.

Finally, this study did not find the difference between the teaching presence influence on social presence (hypothesis 2a), teaching presence influence on cognitive presence (hypothesis 3a), social presence influence on the cognitive presence (hypothesis 4a), and mediation of social presence between teaching presence and cognitive presence (hypothesis 5a) in the context of the social media-based community of inquiry in Turkey and Pakistan. Similarly, previous research (Petillion and McNeil 2020) has found that students' demographics have shown no difference in online learning during COVID-19. It was due to the phenomenon that higher education was shifted from face-to-face learning approaches to online learning approaches and students did not find alternative best learning approaches except social media-based learning environments. It is the reason that we did not find the difference of the paths for teaching presence influence on social presence, teaching presence influence on cognitive presence, social presence influence on cognitive presence, and mediation of social presence between teaching presence and cognitive

presence in the social media-based community of inquiry of two countries (i.e. Turkey and Pakistan).

6.2. Practical implications

The following practical aspects of the study would help to increase teachers' presence to enhance students' social presence and consequently cognitive presence in a social media-based community of inquiry in a cross-cultural context during times of crisis.

6.3. Design and organization

Teachers' capabilities in terms of designing and organising courses in social media environments are critical. For example, instructors should communicate course topics, clear objectives, and clear descriptions of learning activities (Cooper and Scriven 2017). They should also communicate essential deadlines for the completion of learning tasks. Usually, the community of inquiry (based on social media environments) lacks a proper curriculum. In this regard, teachers' teaching presence through a well-organised curriculum, design, and organisation in a community of inquiry (based on social media) would help to enhance the learning experience of the students. Educational institutes in cross-cultural contexts for the social media-based community of inquiry can collaborate to design and organise curricula in the mutual interests of students.

6.4. Facilitation

This study showed the importance of teaching presence for effective educational experiences through social media environments during the crisis. Teachers' roles as facilitators were seen as essential to the teaching-learning process in social media-based learning environments (Popescu and Badea 2020). Teachers as facilitators help learners find topics of agreement and disagreement to enhance their learning experience. In this way, they guide learners to clarify their thinking processes. Facilitation also enhances students' productive dialog to enhance their course engagement on specific tasks. It encourages students to explore new ideas and reinforces students' sense of belonging in COI. Especially, a social media-based community of inquiry in a cross-cultural context needs teachers' facilitation to understand cultural differences.

6.5. Direct instructions

Teachers' direct instructions in a social media-based COI maintain students' focus on relevant issues.

Instructors' feedback helps learners to understand their strengths and weaknesses, but this feedback must be given promptly according to the needs of students (Tsakeni 2021). Usually, a social media-based community of inquiry lacks the instructor's direct involvement in the learning process of students due to which these communities do not offer a quality learning experience. Teachers' presence with direct instruction would enhance the learning experience of the students in a social media-based community of inquiries.

6.6. Social presence

The second most essential component in the development of COI is students' social presence, which may be enhanced through boosting interpersonal relationships, open communication, and group cohesion.

6.7. Interpersonal relationships

Students' interaction with each other and introductory activities at the beginning of the course give them a sense of belonging to a COI in social media environments (Garrison 2015). It also helps them realise the perspectives and traits of their classmates and colleagues. Social media, which is a powerful source of socialisation, made interaction possible during the pandemic. Educational institutions should devise instructional strategies to enhance learners' interpersonal relationships in a social media-based community of inquiries for a better learning experience.

6.8. Open communication

Social media environments help students in terms of open communication. They feel comfortable discussing general and specific topics related to learning in those environments (Akyol and Garrison 2010; Daspit and D'Souza 2012). They provide students with a sense of belonging in discussions related to course topics, allowing them to feel comfortable interacting with their classmates in social media environments. Therefore, a cross-cultural social media-based community of inquiries should offer such activities to introduce students to each other, socialise them, and enhance the inclusiveness of the learners.

6.9. Group cohesion

Teachers as facilitators can produce group cohesion to enhance the social presence of the students in social

media-based learning environments (Daspit and D'Souza 2012). A social media-based COI can give students the confidence to disagree on certain topics while maintaining a sense of trust in each other (Akyol and Garrison 2010). It enhances their sense of acknowledgment and promotes collaboration. Incentives, encouragement, and different motivation strategies can help students to enhance their group cohesion. It will give them a realisation to be part of a community for a better learning experience.

6.10. Cognitive presence

A third essential factor of the community of inquiry is a cognitive presence, which may be enhanced with the triggering of events, exploration, integration, and resolution of the learning experience.

6.11. Triggering of events

A well-designed and structured curriculum and instruction in a social media-based community of inquiry would motivate curiosity in learners and increase their interest in the course. It would also result in motivating students to explore course-related problems (Kitto et al. 2015).

6.12. Exploration

Social media-based community of inquiry offers more social and interactive learning experiences. A cross-cultural community of inquiry development would help learners to use versatile information sources to find the questions related to the course. The socialisation of the learners would lead to brainstorming to explore the different solutions to content-related problems (Garrison and Akyol 2015). Social media-based cross-cultural discussions would help students to view different perspectives.

6.13. Integration

Teachers should adapt innovative instructional strategies in social media-based learning environments. Innovative instructional strategies would facilitate the social presence of the learners to construct the explanation or solutions to the problems.

6.14. Resolution

Educational institutions and educationists can devise innovative learning analytics to assess the learning experiences of the students in a social media-based

community of inquiry (Daspit and D'Souza 2012; Garrison and Akyol 2015). These innovative learning analytics need adaptive assessment strategies to measure learners' ability to apply the knowledge gained in the course and find solutions to the problem.

6.15. Limitations of study

This study conducted a self-reported survey. The findings of the study are generalisable to the population, but it needs a qualitative study for in-depth inquiry. The findings of the study are limited to measuring the relationship between second-order factors. Future studies may find the relationship between first-order factors of social presence, teaching presence, and cognitive presence. It will help understand the deep-down phenomenon under study.

7. Conclusion

Social media environments have emerged as a trend to continue the teaching-learning process during the COVID-19 pandemic. There was a lack of studies in the community of inquiry development through social media at the higher education level during the crisis. Our study provided empirical evidence of the use of social media for the community of inquiry development among higher education students during the pandemic. Since the pandemic became a worldwide problem and social media based-learning environments emerged as a worldwide phenomenon to continue and enrich learning through a community of inquiry. Our study provided evidence of a community of inquiry development among higher education students in a cross-border context such as Turkey and Pakistan. The results of the study proved that the Community of Inquiry framework is valid to study the teaching presence, social presence, and cognitive presence of higher education students in social media environments during the crisis. This study confirmed the relationship between the components of COI in social media based-learning environments like e-learning environments that learners' social presence mediates between their teaching and cognitive presence. This study also showed that the presence of teachers in social media environments influences the student's social presence and cognitive presence in Turkey and Pakistan. Therefore, higher education institutions must adopt a social media-based learning instructional strategy during the crisis to continue the teaching-learning process. The presence of the teacher as a facilitator in social media learning environments matters a lot. We also suggest

future research on how to adapt social media-based learning environments to meet the learners' social and cognitive needs. Since our study has concluded from two developing countries, such as Turkey and Pakistan. The results may be generalisable to developing countries. We also recommend conducting future research with data from diverse and more countries.

Data availability statement

The data will be available on request.

Disclosure statement

Declarations of interest: none.

Funding

This work was supported by ABC university; Universitat Oberta de CatalunyaT .

Informed consent statement

Informed consent was obtained from all subjects involved in the study.

Institutional review board statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the ethical committee of the Dokuz Eylül University (16.04.2021/E-87347630-640.99-44979).

ORCID

Muhammad Zaheer Asghar  <http://orcid.org/0000-0003-2634-0583>

Yasemin Kahyaoglu Erdogmus  <http://orcid.org/0000-0002-5302-5901>

Ercan Akpınar  <http://orcid.org/0000-0002-2128-3308>

Seyda Seren Intepeler  <http://orcid.org/0000-0001-8615-9765>

References

- Akram, H., Y. Yingxiu, A. S. Al-Adwan, and A. Alkhalifah. 2021. "Technology Integration in Higher Education During COVID-19: An Assessment of Online Teaching Competencies Through Technological Pedagogical Content Knowledge Model." *Frontiers in Psychology* 12. doi:10.3389/fpsyg.2021.736522.
- Akyol, Z., and D. R. Garrison. 2010. "Community of Inquiry in Adult Online Learning: Collaborative-Constructivist Approaches." In *Adult Learning in the Digital Age: Perspectives on Online Technologies and Outcomes*, edited

- by T. Kidd and J. Keengwe, 52–66. IGI Global. doi:10.4018/978-1-60566-828-4.ch006.
- Al-Adwan, A. S., N. A. Albelbisi, S. H. Aladwan, O. M. al Horani, A. Al-Madadha, and M. H. al Khasawneh. 2020. "Investigating the Impact of Social Media Use on Student's Perception of Academic Performance in Higher Education: Evidence from Jordan." *Journal of Information Technology Education: Research* 19, doi:10.28945/4661.
- Albanna, H., A. A. Alalwan, and M. Al-Emran. 2022. "An Integrated Model for Using Social Media Applications in non-Profit Organizations." *International Journal of Information Management* 63, doi:10.1016/j.ijinfomgt.2021.102452.
- Aleven, V. A. W. M. M., and K. R. Koedinger . 2002. "An Effective Metacognitive Strategy: Learning by Doing and Explaining with a Computer-Based Cognitive Tutor." *Cognitive Science* 26 (2): 147–179. doi:10.1207/s15516709cog2602_1.
- Allcott, H., M. Gentzkow, and C. Yu. 2019. "Trends in the Diffusion of Misinformation on Social Media." *Research & Politics* 6 (2), doi:10.1177/2053168019848554.
- Anderson, T. 2019. "Challenges and Opportunities for Use of Social Media in Higher Education." *Journal of Learning for Development* 6 (1), doi:10.56059/jl4d.v6i1.327.
- Arbaugh, J. B. 2008. "Does the Community of Inquiry Framework Predict Outcomes in Online MBA Courses?" *The International Review of Research in Open and Distributed Learning* 9 (2), doi:10.19173/irrodl.v9i2.490.
- Archibald, S., R. J. Scholes, D. P. Roy, G. Roberts, and L. Boschetti. 2010. "Southern African Fire Regimes as Revealed by Remote Sensing." *International Journal of Wildland Fire* 19, doi:10.1071/WF10008.
- Asghar, M. Z., E. Barbera, S. F. Rasool, P. Seitamaa-Hakkarainen, and H. Mohelská. 2022. "Adoption of Social Media-Based Knowledge-Sharing Behaviour and Authentic Leadership Development: Evidence from the Educational Sector of Pakistan During COVID-19." *Journal of Knowledge Management* 27 (1): 59–83. doi:10.1108/JKM-11-2021-0892.
- Asghar, M. Z., Y. K. Erdoğan, and P. Seitamaa-Hakkarainen. 2021. "Cultural Levels and Pre-Service Teachers' Behaviour Towards the Use of Open Educational Resources." *Journal of Interactive Media in Education* 2021 (1). doi:10.5334/jime.674.
- Azkeskin, C., and S. Avci. 2021. "Investigation of science centers' social media efficiencies in Covid-19 pandemic process." *Hacettepe University Journal of Education* 36 (4), doi:10.16986/HUJE.2020064805.
- Bakir, N., and K. Phirangee. 2021. "ZOOMing Into a Community: Exploring Various Teaching Practices to Help Foster Sense of Community and Engagement in Emergency Remote Teaching." *Journal of Teaching and Learning with Technology* 10 (1), doi:10.14434/jotlt.v9i2.31226.
- Bal, E., and H. Bicen. 2017. "The Purpose of Students' Social Media use and Determining Their Perspectives on Education." *Procedia Computer Science* 120, doi:10.1016/j.procs.2017.11.226.
- Baumgartner, H., B. Weijters, and R. Pieters. 2021. "The Biasing Effect of Common Method Variance: Some Clarifications." *Journal of the Academy of Marketing Science* 49 (2), doi:10.1007/s11747-020-00766-8.
- Beuchot, A., and M. Bullen. 2005. "Interaction and Interpersonality in Online Discussion Forums." *Distance Education* 26 (1), doi:10.1080/01587910500081285.
- Borup, J., R. E. West, and C. R. Graham. 2013. "The Influence of Asynchronous Video Communication on Learner Social Presence: A Narrative Analysis of Four Cases." *Distance Education* 34 (1), doi:10.1080/01587919.2013.770427.
- Borup, J., R. E. West, and R. Thomas. 2015. "The Impact of Text Versus Video Communication on Instructor Feedback in Blended Courses." *Educational Technology Research and Development* 63 (2), doi:10.1007/s11423-015-9367-8.
- Carlson, S., D. Bennett-Woods, B. Berg, L. Claywell, K. Leduc, N. Marcisz, M. Mulhall, et al. 2012. "The Community of Inquiry Instrument: Validation and Results in Online Health Care Disciplines." *Computers & Education* 59 (2), doi:10.1016/j.compedu.2012.01.004.
- Castellanos-Reyes, D. 2020. "20 Years of the Community of Inquiry Framework." *TechTrends* 64 (4), doi:10.1007/s11528-020-00491-7.
- Cohen, J. 1988. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. New York: Routledge.
- Collins, K., D. Shiffman, and J. Rock. 2016. "How are Scientists Using Social Media in the Workplace?" *PLoS ONE* 11 (10), doi:10.1371/journal.pone.0162680.
- Cooper, T., and R. Scriven. 2017. "Communities of Inquiry in Curriculum Approach to Online Learning: Strengths and Limitations in Context." *Australasian Journal of Educational Technology* 33 (4), doi:10.14742/ajet.3026.
- Daniel, S. 2021, September 12. *Sample Calculator*. <https://www.danielsoper.com/statcalc/calculator.aspx?id=47>.
- D'Aquila, J. M., D. Wang, and A. Mattia. 2019. "Are Instructor Generated YouTube Videos Effective in Accounting Classes? A Study of Student Performance, Engagement, Motivation, and Perception." *Journal of Accounting Education* 47, doi:10.1016/j.jaccedu.2019.02.002.
- Daspti, J. J., and D. E. D'Souza. 2012. "Using the Community of Inquiry Framework to Introduce Wiki Environments in Blended-Learning Pedagogies: Evidence from a Business Capstone Course." *Academy of Management Learning & Education* 11 (4), doi:10.5465/aml.2010.0154.
- Dempsey, P. R., and J. Zhang. 2019. "Re-examining the Construct Validity and Causal Relationships of Teaching, Cognitive, and Social Presence in Community of Inquiry Framework." *Online Learning Journal* 23 (1), doi:10.24059/olj.v23i1.1419.
- Dewey, J. 1916. *Democracy and Education: An Introduction to the Philosophy of Education*. New York: Macmillan.
- Dini, A. A., and Ø Sæbø. 2016. "The Current State of Social Media Research for EParticipation in Developing Countries: A Literature Review." Proceedings of the Annual Hawaii International Conference on System Sciences, 2016-March.
- DuBois, B., M. E. Krasny, and A. Russ. 2019. "Online Professional Development for Environmental Educators: Strategies to Foster Critical Thinking and Social Interactions." *Environmental Education Research* 25 (10), doi:10.1080/13504622.2018.1564247.
- ERIC. 2022, January 14. *Education Resource Information Center*. <https://eric.ed.gov/>.
- Fornell, C., and D. F. Larcker. 1981. "Evaluating Structural Equation Models with Unobservable Variables and Measurement Error." *Journal of Marketing Research* 18 (1), doi:10.1177/002224378101800104.
- Freedman, E., and R. Shafer. 2012. "Advancing a Comprehensive Research Agenda for Central Asian Mass

- Media.” *Media Asia* 39 (3), doi:10.1080/01296612.2012.11689927.
- Fung Choy, J. L., and C. L. Quek. 2016. “Modelling Relationships Between Students’ Academic Achievement and Community of Inquiry in an Online Learning Environment for a Blended Course.” *Australasian Journal of Educational Technology* 32 (4), doi:10.14742/ajet.2500.
- Garrison, D. R. 2015. *Thinking Collaboratively: Learning in a Community of Inquiry*. New York: Routledge. doi:10.4324/9781315740751.
- Garrison, D. R., and Z. Akyol. 2015. “Toward the Development of a Metacognition Construct for Communities of Inquiry.” *The Internet and Higher Education* 24, doi:10.1016/j.iheduc.2014.10.001.
- Garrison, D. R., T. Anderson, and W. Archer. 1999. “Critical Inquiry in a Text-Based Environment: Computer Conferencing in Higher Education.” *The Internet and Higher Education* 2 (2–3), doi:10.1016/S1096-7516(00)00016-6.
- Garrison, D. R., and M. Cleveland-Innes. 2005. “Facilitating Cognitive Presence in Online Learning: Interaction Is Not Enough.” *American Journal of Distance Education* 19 (1), doi:10.1207/s15389286ajde1903_2.
- Garrison, D. R., M. Cleveland-Innes, and T. S. Fung. 2010. “The Community of Inquiry Framework ten Years Later: Introduction to the Special Issue.” *The Internet and Higher Education* 13: 1–4. doi:10.1016/j.iheduc.2009.11.003.
- Gaur, P. S., and L. Gupta. 2021. “Social Media for Scholarly Communication in Central Asia and Its Neighbouring Countries.” *Journal of Korean Medical Science* 36 (4), doi:10.3346/jkms.2021.36.e36.
- Giunchiglia, F., M. Zeni, E. Gobbi, E. Bignotti, and I. Bison. 2018. “Mobile Social Media Usage and Academic Performance.” *Computers in Human Behavior* 82, doi:10.1016/j.chb.2017.12.041.
- Greenhow, C., and S. Galvin. 2020. “Teaching with Social Media: Evidence-Based Strategies for Making Remote Higher Education Less Remote.” *Information and Learning Sciences* 121 (513–524), doi:10.1108/ILS-04-2020-0138.
- Gutiérrez-Santiuste, E., C. Rodríguez-Sabiote, and M. J. Gallego-Arrufat. 2015. “Cognitive Presence Through Social and Teaching Presence in Communities of Inquiry: A Correlational-Predictive Study.” *Australasian Journal of Educational Technology* 31 (3), doi:10.14742/ajet.1666.
- Hair, J. F. 2017. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*. Thousand Oaks, CA: Sage.
- Hair, J. F., C. M. Ringle, and M. Sarstedt. 2011. “PLS-SEM: Indeed a Silver Bullet.” *Journal of Marketing Theory and Practice* 19 (2), doi:10.2753/MTP1069-6679190202.
- Hajin, M. 2013. “Seeking personal autonomy through the use of facebook in Iran.” *SAGE Open* 3 (1), doi:10.1177/2158244013483759.
- Harasim, L. M. 1990. Online education: An environment for collaboration and intellectual amplification. In *Online Education: Perspectives on a new environment*.
- He, X., and R. Pedraza-Jiménez. 2015. “Chinese Social Media Strategies: Communication key Features from a Business Perspective.” *El Profesional de la Información* 24 (2), doi:10.3145/epi.2015.mar.14.
- Henseler, J., C. M. Ringle, and M. Sarstedt. 2015. “A new Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling.” *Journal of the Academy of Marketing Science* 43 (1), doi:10.1007/s11747-014-0403-8.
- Hilliard, L. P., and M. K. Stewart. 2019. “Time Well Spent: Creating a Community of Inquiry in Blended First-Year Writing Courses.” *The Internet and Higher Education* 41, doi:10.1016/j.iheduc.2018.11.002.
- Hulin, C. R. N., and R. Cudeck. 2001. “Can a Reliability Coefficient be Too High?” *Journal of Consumer Psychology* 10: 55–58. doi:10.1207/S15327663JCP1001&2_05.
- Iqbal, J., M. Z. Asghar, M. A. Ashraf, and M. Rafiq. 2022. “Social Media Networking Sites Usage and Depression Among University Students During the COVID-19 Pandemic: The Mediating Roles of Social Anxiety and Loneliness.” *Social Media + Society* 8 (3): 205630512211076. doi:10.1177/20563051221107633.
- Joksimović, S., D. Gašević, V. Kovanović, B. E. Riecke, and M. Hatala. 2015. “Social Presence in Online Discussions as a Process Predictor of Academic Performance.” *Journal of Computer Assisted Learning* 31 (6), doi:10.1111/jcal.12107.
- Joo, Y. J., K. Y. Lim, and E. K. Kim. 2011. “Online University Students’ Satisfaction and Persistence: Examining Perceived Level of Presence, Usefulness and Ease of use as Predictors in a Structural Model.” *Computers & Education* 57 (2), doi:10.1016/j.compedu.2011.02.008.
- Kemp, S. 2021. “Digital 2021 global overview report.” DataReportal. <https://datareportal.com/reports/digital-2021-global-overview-report>
- Kitto, K., S. Cross, Z. Waters, and M. Lupton. 2015. “Learning Analytics Beyond the LMS.” ACM International Conference Proceeding Series, 16-20-March-2015. doi:10.1145/2723576.2723627.
- Kou, X. 2006. “What Students do When Chat, E-Mail, and Discussion Forum are Available at the Same Time.” *Distance Learning* 3 (4): 29–38.
- Laruelle, M., D. Royce, and S. Beyssembayev. 2019. “Untangling the Puzzle of “Russia’s Influence” in Kazakhstan.” *Eurasian Geography and Economics* 60 (2), doi:10.1080/15387216.2019.1645033.
- Lau, Y. Y., Y. M. Tang, K. Y. Chau, L. Vyas, A. Sandoval-Hernandez, and S. Wong. 2021. “COVID-19 Crisis: Exploring Community of Inquiry in Online Learning for Sub-Degree Students.” *Frontiers in Psychology* 12), doi:10.3389/fpsyg.2021.679197.
- Li, F., T. Jin, P. Edirisingha, and X. Zhang. 2021. “School-aged Students’ Sustainable Online Learning Engagement During Covid-19: Community of Inquiry in a Chinese Secondary Education Context.” *Sustainability* 13 (18), doi:10.3390/su131810147.
- Lin, S., T. C. Hung, and C. T. Lee. 2015. “Revalidate Forms of Presence in Training Effectiveness.” *Journal of Educational Computing Research* 53 (1), doi:10.1177/0735633115588772.
- Lipman, M. 2003. *Thinking in Education*. 2nd ed. Cambridge: Cambridge University Press.
- Merchant, R. M., and N. Lurie. 2020. “Social Media and Emergency Preparedness in Response to Novel Coronavirus.” *JAMA - Journal of the American Medical Association* 323 (20), doi:10.1001/jama.2020.4469.
- Mohammadi, E., M. Thelwall, M. Kwasny, and K. L. Holmes. 2018. “Academic Information on Twitter: A User Survey.” *PLOS ONE* 13 (5), doi:10.1371/journal.pone.0197265.

- Mushtaq, A. J., and A. Benraghda. 2018. "The Effects of Social Media on the Undergraduate Students' Academic Performances." *Library Philosophy and Practice* 2018. <https://digitalcommons.unl.edu/libphilprac/1779>.
- Muzite, P. 2020. *A Global Comparative Study in Disability Inclusion Legislation and Policies in the TVET Education*. doi:10.4018/978-1-7998-4867-7.ch005.
- Nasir, M. K. M., S. Surat, S. M. Maat, A. A. Karim, and Md. Y. Daud. 2018. "Confirmatory Factor Analysis on the Sub-Construct of Teaching Presence's in the Community of Inquiry." *Creative Education* 09 (14), doi:10.4236/ce.2018.914165.
- Nazir, M., and N. Brouwer. 2019. "Community of Inquiry on Facebook in a Formal Learning Setting in Higher Education." *Education Sciences* 9 (1), doi:10.3390/educsci9010010.
- Ng, B. J. M., J. Y. Han, Y. Kim, K. A. Togo, J. Y. Chew, Y. Lam, and F. M. Fung. 2022. "Supporting Social and Learning Presence in the Revised Community of Inquiry Framework for Hybrid Learning." *Journal of Chemical Education* 99 (2), doi:10.1021/acs.jchemed.1c00842.
- Ngubane-Mokiwa, S. A., and S. B. Khoza. 2021. "Using Community of Inquiry (Coi) to Facilitate the Design of a Holistic e-Learning Experience for Students with Visual Impairments." *Education Sciences* 11 (4), doi:10.3390/educsci11040152.
- Okello-Obura, C., and F. Ssekitto. 2015. "Web 2.0 Technologies Application in Teaching and Learning by Makerere University Academic Staff." *Library Philosophy and Practice* 2015. <https://digitalcommons.unl.edu/libphilprac/1248>.
- Oliveira, L., P. Silva, A. Mesquita, A. Sa Sequeira, and A. Oliveira. 2022. "Sadness, Negativity, and Uncertainty in Education During COVID-19 on Social Media." *International Journal of Online Pedagogy and Course Design* 12 (1), doi:10.4018/IJOPCD.2022010103.
- Öztürk, E. 2014. "An Adaptation of the Community of Inquiry Index: The Study of Validity and Reliability." *İlköğretim Online* 11 (2): 408–422. <https://www.ilkogretim-online.org/?mno=123168>.
- Papamitsiou, Z., M. E. Filippakis, M. Poulou, D. Sampson, D. Ifenthaler, and M. Giannakos. 2021. "Towards an Educational Data Literacy Framework: Enhancing the Profiles of Instructional Designers and e-Tutors of Online and Blended Courses with new Competences." *Smart Learning Environments* 8 (1), doi:10.1186/s40561-021-00163-w.
- Park, S. Y., M. W. Nam, and S. B. Cha. 2012. "University Students' Behavioral Intention to use Mobile Learning: Evaluating the Technology Acceptance Model." *British Journal of Educational Technology* 43 (4), doi:10.1111/j.1467-8535.2011.01229.x.
- Parker, E. B., J. Short, E. Williams, and B. Christie. 1978. "The Social Psychology of Telecommunications." *Contemporary Sociology* 7 (1), doi:10.2307/2065899.
- Peirce, C. S. 1955. *Philosophical Writings of Peirce*. J. Buchler, Ed.. New York: Dover.
- Petillion, R. J., and W. S. McNeil. 2020. "Student Experiences of Emergency Remote Teaching: Impacts of Instructor Practice on Student Learning, Engagement, and Well-Being." *Journal of Chemical Education* 97 (9), doi:10.1021/acs.jchemed.0c00733.
- Popescu, E., and G. Badea. 2020. "Exploring a Community of Inquiry Supported by a Social Media-Based Learning Environment." *Educational Technology and Society* 23 (2): 61–76. <https://www.jstor.org/stable/26921134>.
- Prestridge, S., L. P. Utami, and K. Main. 2021. "A Cross-Cultural Comparison: The Socio-Technical Affordances of Social Media as a Professional Learning Tool for Teachers." *Teacher Development* 25 (5), doi:10.1080/13664530.2021.1895881.
- Qiao, H., and P. C. Shih. 2018. "Use of Social Media for Academic Purposes in China." ACM International Conference Proceeding Series, doi:10.1145/3202667.3202679.
- Radcliffe, D., and H. Abuhmaid. 2020. "Social Media in the Middle East: 2019 in Review." *SSRN Electronic Journal*, doi:10.2139/ssrn.3517916.
- Ramachandran, R., and M. C. Rodriguez. 2020. "Student Perspectives on Remote Learning in a Large Organic Chemistry Lecture Course." *Journal of Chemical Education* 97 (9), doi:10.1021/acs.jchemed.0c00572.
- Raman, M., T. Ryan, and L. Olfman. 2005. "Designing Knowledge Management Systems for Teaching and Learning with Wiki Technology." *Journal of Information Systems Education* 16 (3): 311–320. <http://jise.org/Volume16/n3/JISEv16n3p311.pdf>.
- Ribeiro, I. C., A. D. da Silva Ferreira, I. M. de Castro Filogônio, P. D. Z. Pires, J. R. Bringhenti, and A. M. N. Korres. 2020. "Scientific Dissemination and Environmental Education Focusing on Composting and Valorization of Coffee Grounds: Contributions and Challenges to the Achievement of the Goals 4 and 11 of UN 2030 Agenda." *In World Sustainability Series*, doi:10.1007/978-3-030-30306-8_43.
- Richardson, J. C., and K. Swan. 2003. "Examining Social Presence in Online Courses in Relation to Students' Perceived Learning and Satisfaction." *Online Learning* 7 (1), doi:10.24059/olj.v7i1.1864.
- Ringle, C. M., D. da Silva, and D. D. S. Bido. 2014. "Structural Equation Modeling with the Smartpls." *Revista Brasileira de Marketing* 13 (02): 56–73. doi:10.5585/remark.v13i2.2717.
- Robertson, I. 2008. "Learners' Attitudes to Wiki Technology in Problem Based, Blended Learning for Vocational Teacher Education." *Australasian Journal of Educational Technology* 24 (4), doi:10.14742/ajet.1202.
- Rourke, L., and H. Kanuka. 2009. "Learning in Communities of Inquiry: A Review of the Literature." *Journal of Distance Education* 23 (1): 19–48. <https://www.learnlib.org/p/105542/>.
- Sanusi, I. T., S. A. Olaleye, and O. A. Dada. 2020. "Teaching Experiences During COVID-19 Pandemic: Narratives from ResearchGate." Proceedings of the 15th Latin American Conference on Learning Technologies, LACLO 2020, doi:10.1109/LACLO50806.2020.9381133.
- Scopus. 2022, January 14. *Start Exploring*. <https://www-scopus-com.libproxy.helsinki.fi/Search/Form.Uri?Display=basic#basic>.
- Shahzad, A., R. Hassan, A. Y. Aremu, A. Hussain, and R. N. Lodhi. 2021. "Effects of COVID-19 in E-Learning on Higher Education Institution Students: The Group Comparison Between Male and Female." *Quality & Quantity* 55 (3), doi:10.1007/s11135-020-01028-z.

- Shanmugaraj, B., K. Siriwananon, K. Wangkanont, and W. Phoolcharoen. 2020. "Perspectives on Monoclonal Antibody Therapy as Potential Therapeutic Intervention for Coronavirus Disease-19 (COVID-19)." *Asian Pacific Journal of Allergy and Immunology* 38 (1), doi:10.12932/AP-200220-0773.
- Shea, P., and T. Bidjerano. 2009. "Community of Inquiry as a Theoretical Framework to Foster "Epistemic Engagement" and "Cognitive Presence" in Online Education." *Computers & Education* 52 (3), doi:10.1016/j.compedu.2008.10.007.
- Singh, J. B., R. Chandwani, and M. Kumar. 2018. "Factors Affecting Web 2.0 Adoption: Exploring the Knowledge Sharing and Knowledge Seeking Aspects in Health Care Professionals." *Journal of Knowledge Management* 22 (1), doi:10.1108/JKM-08-2016-0320.
- Sobaih, A. E. E., A. M. Hasanein, and A. E. A. Elnasr. 2020. "Responses to COVID-19 in Higher Education: Social Media Usage for Sustaining Formal Academic Communication in Developing Countries." *Sustainability* 12 (16), doi:10.3390/su12166520.
- Stenbom, S. 2018. "A Systematic Review of the Community of Inquiry Survey." *The Internet and Higher Education* 39, doi:10.1016/j.iheduc.2018.06.001.
- Sugimoto, C. R., S. Work, V. Larivière, and S. Haustein. 2017. "Scholarly use of Social Media and Altmetrics: A Review of the Literature." *Journal of the Association for Information Science and Technology* 68 (9), doi:10.1002/asi.23833.
- Szeto, E. 2015. "Community of Inquiry as an Instructional Approach: What Effects of Teaching, Social and Cognitive Presences are There in Blended Synchronous Learning and Teaching?" *Computers & Education* 81, doi:10.1016/j.compedu.2014.10.015.
- Tenenhaus, M., V. E. Vinzi, Y. M. Chatelin, and C. Lauro. 2005. "PLS Path Modeling." *Computational Statistics & Data Analysis* 48 (1), doi:10.1016/j.csda.2004.03.005.
- Tirado Morueta, R., P. Maraver López, Á Hernando Gómez, and V. W. Harris. 2016. "Exploring Social and Cognitive Presences in Communities of Inquiry to Perform Higher Cognitive Tasks." *The Internet and Higher Education* 31, doi:10.1016/j.iheduc.2016.07.004.
- Tsakeni, M. 2021. "Transition to Online Learning by a Teacher Education Program with Limited 4IR Affordances." *Research in Social Sciences and Technology* 6 (2), doi:10.46303/ressat.2021.15.
- Varady, N. H., A. A. Chandawarkar, W. A. Kernkamp, and I. Gans. 2019. "Who Should you be Following? The top 100 Social Media Influencers in Orthopaedic Surgery." *World Journal of Orthopedics* 10 (9), doi:10.5312/wjo.v10.i9.327.
- Venkatesh, V., and F. D. Davis. 2000. "A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies." *Management Science* 46 (2), doi:10.1287/mnsc.46.2.186.11926.
- Venkatesh, V., M. G. Morris, G. B. Davis, and F. D. Davis. 2003. "User Acceptance of Information Technology: Toward a Unified View." *MIS Quarterly: Management Information Systems* 27 (3), doi:10.2307/30036540.
- Wang, T., C. L. Lin, and Y. S. Su. 2021. "Continuance Intention of University Students and Online Learning During the Covid-19 Pandemic: A Modified Expectation Confirmation Model Perspective." *Sustainability (Switzerland)* 13 (8), doi:10.3390/su13084586.
- Wang, Y., and Q. Liu. 2020. "Effects of Online Teaching Presence on Students' Interactions and Collaborative Knowledge Construction." *Journal of Computer Assisted Learning* 36 (3), doi:10.1111/jcal.12408.
- Warner, A. G. 2016. "Developing a Community of Inquiry in a Face-to-Face Class: How an Online Learning Framework Can Enrich Traditional Classroom Practice." *Journal of Management Education* 40 (4), doi:10.1177/1052562916629515.
- Web of Science. 2022, January 14. *Basic Search*. <https://www-Webofscience-Com.Libproxy.Helsinki.Fi/Wos/Woscc/Basic-Search>.
- Wheeler, S., P. Yeomans, and D. Wheeler. 2008. "The Good, the bad and the Wiki: Evaluating Student-Generated Content for Collaborative Learning." *British Journal of Educational Technology* 39 (6), doi:10.1111/j.1467-8535.2007.00799.x.
- Zgheib, G. E., and N. Dabbagh. 2020. "Social Media Learning Activities (Smla): Implications for Design." *Online Learning Journal* 24 (1), doi:10.24059/olj.v24i1.1967.
- Zulkanain, N. A., S. Miskon, and N. Syed Abdullah. 2020. "An Adapted Pedagogical Framework in Utilizing WhatsApp for Learning Purpose." *Education and Information Technologies* 25 (4), <https://doi.org/10.1007/s10639-019-10096-0>.

Appendix A: Questionnaire

Teaching presence

Design and organisation

TPDO1. The instructor clearly communicated important course topics.

TPDO2. The instructor clearly communicated important course goals.

TPDO3. The instructor provided clear instructions on how to participate in course learning activities.

TPDO4. The instructor clearly communicated important due dates/time frames for learning activities.

Facilitation

TPF1. The instructor was helpful in identifying areas of agreement and disagreement on course topics that helped me to learn.

TPF2. The instructor was helpful in guiding the class towards understanding course topics in a way that helped me clarify my thinking.

TPF3. The instructor helped to keep course participants engaged and participating in productive dialogue.

TPF4. The instructor helped keep the course participants on task in a way that helped me to learn.

TPF5. The instructor encouraged course participants to explore new concepts in this course.

TPF6. Instructor actions reinforced the development of a sense of community among course participants.

Direct instructions

TPDI1. The instructor helped to focus discussion on relevant issues in a way that helped me to learn.

TPDI2. The instructor provided feedback that helped me understand my strengths and weaknesses relative to the course's goals and objectives.

TPDI3. The instructor provided feedback in a timely fashion.

Social presence

Interpersonal relationship

SPIR1. Getting to know other course participants gave me a sense of belonging in the course.

SPIR2. I experienced a good way of communication and interaction with other course participants.

Open communication

SPOC1. I felt comfortable conversing with other course participants.

SPOC2. I felt comfortable participating in the course discussions.

Group cohesion

SPGC1. I felt comfortable disagreeing with other course participants while still maintaining a sense of trust.

SPGC2. Interactive discussions help me to develop a sense of collaboration.

Cognitive presence

Triggering event

CPTE1. Problems posed increased my interest in course issues.

CPTE2. Course activities piqued my curiosity.

CPTE3. I felt motivated to explore content related questions.

Exploration

CPE1. I utilised a variety of information sources to explore problems posed in this course.

CPE2. Interactive discussions were valuable in helping me appreciate different perspectives

Integration

CPI1. Combining new information helped me answer questions raised in course activities.

CPI2. Learning activities helped me construct explanations/solutions.

CPI3. Reflection on course content and discussions helped me understand fundamental concepts in this class.

Resolution

CPR1. I can describe ways to test and apply the knowledge created in this course.

CPR2. I have developed solutions to course problems that can be applied in practice.

CPR3. I can apply the knowledge created in this course to my work or other non-class related activities.