

Assessing the Student's Perspectives on E-learning Based on Community of Inquiry Framework: A Cross-sectional Study

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ABSTRACT

Background: The expansion of e-learning has made it necessary to pay attention to the quality of the teaching and learning. This study was conducted with the aim of assessing the dimensions of the students' presence in e-learning based on Community of Inquiry (COI) Framework at the University of Tabriz, Iran.

Methods: In this cross-sectional study, 217 undergraduate students of the Department of Educational Science, at the University of Tabriz, Iran, in the months of February to May of the academic year 2020-2021, were selected using simple random method. The community of inquiry framework questionnaire with 34 items in three subscales of teaching presence (13 items), social presence (9 items) and cognitive presence (12 items) which were scored based on a 5-point Likert scale was used to collect the data; its validity was approved by experts, and its reliability was estimated using Cronbach's alpha (0.94). One-sample t-test and Pearson Product-Moment Correlation was used to analyze the data in SPSS 26.

Results: The results showed that teaching (3.83 ± 0.55), social (3.47 ± 0.72) and cognitive presence (3.66 ± 0.53) of students in e-learning was significantly ($P < 0.001$) higher than the cutoff point. Also, correlation coefficient was calculated between the students' daily study hours and teaching presence ($r = 0.17$, $P = 0.017$), social presence ($r = 0.185$, $P = 0.009$), and cognitive presence ($r = 0.285$, $P < 0.001$).

Conclusion: The COI framework suggests that presence elements are essential for e-learning and fully support constructivism and connectivism, which reduce transactional distance. In this study, it was found that the students perceived a high level of presence in their e-learning experiences, which indicates an acceptable quality level of the virtual courses offered by the university. Therefore, in order to improve learning in e-learning, it is necessary to increase the social and cognitive presence of students instead of paying attention to teaching presence.

Keywords: Distance, Education, E-learning, Community of inquiry framework, Teaching presence, Social presence, Cognitive presence

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Introduction

Despite the development of e-learning due to educational, economic, and technological needs in recent decades (1, 2), evidence reports the failure of these courses and the dissatisfaction of experts and participants due to lack of physical presence and social communication and reduced level of interaction compared to traditional learning (3-5). The shortage of communication between learners and teachers, impossibility to use verbal cues, lack of development of speech skills, social isolation of learners, increasing dropout rate, and learners' academic failure (6-11) are among the serious challenges of e-learning.

Concerns about the lack of physical presence in the e-learning environment prompted the researchers to investigate the concept of presence in e-learning (12). Garrison et al. has developed a community of inquiry framework (COI) based on the presence factor to improve the quality of online teaching and learning (13-15). Presence is a key concept in the COI of Garrison et al., which expresses the experience of being mentally in the learning environment even when one is physically in another place; it is divided into three forms of teaching, social, and cognitive presence (16). The COI based on the theory of social constructivism suggests that teachers should consider three elements of teaching, social, and cognitive presence of students in e-learning (17). It is believed that effective learning is formed as a function of balanced interaction of the three elements within a community of learners and teachers in the online environment (18, 19).

Teaching presence is defined as the design, facilitation, and orientation of social and cognitive processes to achieve the expected results according to the capabilities and needs of learners (20). Evidence shows that teaching presence is highly correlated with overall satisfaction, learning, and social presence (21). The teacher can realize the teaching presence and provide the necessary instructions by structuring the content, arranging the relations and the desired

leadership (22). Social presence is defined as the learners' ability to identify the learning community, have a sense of belonging to the community, and communicate purposefully (23). This element has a lot to do with the learning outcomes and learners' satisfaction (24). Cognitive presence refers to how learners can make meaning or establish sustainable communication through reflection (25). This element is very closely related to the process and consequences of critical thinking and is considered as the most challenging element of facilitating the e-learning environment (19).

The asynchronous and virtual nature of e-learning calls on learners to be self-directed and take responsibility for their learning, i.e., to assume greater control of monitoring and managing the cognitive and contextual aspects of their learning. This is both a challenge and an opportunity for asynchronous e-learning. The challenge is that teachers have the responsibility to provide structure and guidance that will encourage and support students assuming increased control of their learning. The opportunity is that asynchronous e-learning promotes self-directed and regulated learning (26). With the development of e-learning, interest in self-directed learning (SDL) has been increasing (27). Brookfield (28) defined SDL as a process in which learners work independently or collaboratively with others and take responsibility for planning, implementing, and evaluating their learning. Later, Brookfield (29) re-emphasized that self-directed learners decide about the content to be learned, the time to learn it, the amount of knowledge that is needed to learn, and whether they are successful in their pursuit of learning.

Several studies have confirmed the benefits of teaching presence (18, 30), social presence (31-33), and cognitive presence (34, 35) in e-learning. Ladyshevsky (36) showed in his study that teaching presence positively affected the students' satisfaction with an online course. Some studies have also shown that one of the roles of teaching presence is facilitating social and cognitive

presence in online environment (18). Also, Tan (37) showed in his research that teaching presence increased the students' motivation and performance.

Social presence in e-learning has been identified as an effective factor in increasing the student's satisfaction (31), learning pleasure (38), level of interaction (33), and participatory learning (38). Tan (37) and Yandra et al. (39) introduced social presence as the factor that has the greatest impact on academic achievement. In this regard, Bangert (40) stated that cognitive presence had no association with teaching presence and social presence in his study. Instead, the output is the existence of teaching presence and social presence in the learning environment. Lee et al. (41) concluded that the dominant element in the dynamics of the learning community was cognitive presence.

In addition, many studies have focused on the study of the factors affecting students' satisfaction with online courses (35, 39, 42, 43). Choo et al. (44) and Joo et al. (45) have examined the learning experience of students in e-courses using the COI and have stated that satisfaction with these courses is closely related to teaching presence and cognitive presence. The results of research by Li et al. (46), Ke (47), Yandra et al. (39), and Tan (37) showed that the model of learning community with the help of the three elements of presence led to deep learning.

In Iran, Khazaei et al. (48) and Naranji et al. (49) examined the COI and the level of teaching, social, and cognitive presence of students in e-learning. Taqizade and Hatami (50) and Zahedi et al. (51) showed that there was a direct and significant relationship between the three elements of presence with academic success and students' perceived learning.

Many higher education institutions around the world, including Iran, are forced to undertake online learning due to the emergence of Covid-19. The problem is that, until now, most of the higher education institutions in Iran have already been run with conventional learning. There are only a few

educational institutions that have experience in provision of structured online learning. In contrast, students do not have access to technology and the Internet. It is hard to achieve an efficient use of online learning.

Because of Covid-19 and necessity of e-learning development and lack of e-learning quality assessments, the present study was conducted with the aim of assessing the quality of the teaching-learning process on the undergraduate students of educational science field at the University of Tabriz in the second semester of the academic year 2020-2021 based on community of inquiry framework, which assesses the quality of teaching-learning process by assessing the students' teaching, cognitive, and social presence (15).

Methods

Study Design

This is a cross-sectional study conducted on undergraduate students of educational science field at the University of Tabriz who participated in e-learning in the months of February to May in the academic year 2020-2021.

Participants and Sampling

The statistical population of the study included all undergraduate students of the University of Tabriz in the field of Educational Science; they were 500 students who participated in e-learning in the months of January to May of academic year 2020-2021 in the platform of Learning Management System (LMS). A simple random sampling method was used to select the sample, which ensures that each student has an equal chance of being included in the study. The sample size was determined based on the mean estimation formula, which requires the following information: the Z score, population standard deviation (σ), and margin of error (E). The formula is:

$$n = \left(\frac{Z \times \sigma}{E} \right)^2$$

The value of σ was estimated from

previous studies that reported the descriptive statistics of the survey scores (44). A value of $E=0.1$ and $Z=1.96$ was set for a high level of precision and confidence. Table 1 shows the sample size calculations for each presence:

A total of 217 questionnaires were distributed among the students who met the inclusion criteria, and data were collected from 198 students, which exceeded the minimum sample size required for each presence.

Inclusion Criteria

1. Being an undergraduate student in the field of educational sciences at the Faculty of Educational Sciences and Psychology, University of Tabriz in the second semester of the academic year 2020-2021

2. Having at least two semesters of experience in participating in the online classes in the platform of LMS

3. Being willing to participate in the study

Exclusion Criteria

1. Being a guest student of the Department of Educational Sciences of University of Tabriz

2. Not answering more than 20 percent of the questions

Data Collection Tool

The instrument used for data collection was an online questionnaire that consisted of three sections: demographic information, presence scales, and students daily study hours. The presence scales were adapted from the standard Community of Inquiry (COI) questionnaire developed by Garrison et al. (52); contained 34 items in three subscales of teaching presence (13 items), social presence (9 items), and cognitive presence (12 items) that are scored based on a 5-point Likert scale ranging from 1 (strongly disagree)

to 5 (strongly agree). The students' daily study hours were asked at the end of the questionnaire based on a 7-point Likert scale (less than an hour=1, one to two hours=2, two to three hours=3, three to four hours=4, four to five hours=5, five to six hours=6, and more than 6 hours=7).

The data collection procedure was conducted online using the university LMS in May in the academic year 2020-2021. The students were invited to participate in the study via email and asked to complete the questionnaire within two weeks, and a reminder was sent to them twice. Participation was voluntary and anonymous, and the students were informed about the purpose and scope of the study, as well as their rights and responsibilities as research participants.

Validity and reliability: Cronbach's alpha which was used to measure reliability of the total scale was 0.94; also, for 13 teaching presence, 9 social presence, and 12 cognitive presence items, Chronbach's alpha were 0.89, 0.85, and 0.86, respectively. The validity of The COI questionnaire of Garrison et al. (52) has been confirmed in the study of Shea and Bidjerano (19). In the present study, the validity of the items was confirmed before implementation through content validity using experts' opinion. A panel of content expert consisting of 10 specialists in educational sciences was given the COI items to evaluate for content validity. In order to calculate the content validity index (CVI), the expert panel was asked to evaluate each item using a three-point Likert scale: 1=essential, 2=useful but not essential, and 3=unessential. According to Lawshe's table (53) The results of content validity ratio (CVR) indicated that all items were equal to or greater than the Lawshe's table index (0.62) within a range of 0.62-0.99. Accordingly, all items were accepted and none was deleted. For the CVI,

Table 1: Sample size estimate

Presence	σ	n
Cognitive Presence	0.6	139
Social Presence	0.7	190
Teaching Presence	0.7	190

based on Waltz and Bausell (54), the experts rated each item using a 4-point rating scale (ranging from 1=bad/not relevant to 4=very good/very relevant); the CVI scores of 0.80 or above were considered satisfactory (55).

Data Analysis

The data analysis methods included descriptive statistics (mean, standard deviation, frequency, and percentage) and inferential statistics (t-test, and Pearson correlation), using SPSS 26 software. To assess the teaching, social, and cognitive presence of students in e-learning, we used one-sample t-test at a significance level of 0.05. In this way, based on the 5-point Likert scale, the value of 3 was chosen as the cutoff point. In a one-sample t-test, the mean of the test variables was compared with the cutoff point. Pearson's correlation was used to investigate the relationship between the students' daily study hours and the elements of their presence in e-learning.

The assumption of normal distribution of variables was assessed and confirmed by Kolmogorov- Smirnov test before performing the tests, as shown in Table 2.

Results

In this study, 198 undergraduate students of educational science of University of Tabriz, Iran, in the second semester of the

academic year 2020-2021 were enrolled in the months of February to May. They had been present in the e-learning classes (Response rate=%91.24). 16 unreturned questionnaires and 3 distorted questionnaires, which were discarded due to incomplete completion or selection of duplicate options, were not investigated in the study. The characteristics of the participants are shown in Table 3.

The Status of Students' Teaching, Social, and Cognitive Presence in the E-learning Classes

One-sample t-test was used to assess the teaching, social, and cognitive presence of students in the e-learning classes (Table 4).

According to the level of significance obtained for all three variables ($P < 0.001$), the sample mean calculated for the teaching, social, and cognitive presence was significantly larger than the cutoff point (3). The relationship between the daily study hours of students and teaching, social, and cognitive presence was analyzed using Pearson Product-Moment Correlation (Table 5)

According to the level of significance obtained for the elements of teaching presence ($P = 0.017$), social presence ($P = 0.009$), and cognitive presence ($P < 0.001$), it can be concluded that there is a positive relationship between daily study hours and the rate of teaching, social and cognitive presence of students in e-learning classes,

Table 2: Tests of Normality

Variables	N	Kolmogorov-Smirnova		
		Statistic	df	P value
Teaching Presence	198	0.075	198	0.109
Social Presence	198	0.101	198	0.200
Cognitive Presence	198	0.077	198	0.625

Table 3: Characteristics of the participants

Characteristics	Frequency	Percentage	
Gender	Male	19	9.6
	Female	179	90.4
Participation tools in e-learning classes	Computer/ laptop	122	59.6
	Mobile	86	40.4
Academic semester	Second	113	57
	Fourth	13	6.6
	Sixth	72	36.4

Table 4: Results of one-sample t-test to examine the status of teaching, social, and cognitive presence elements

Variables	Test Value=3					
	N	Mean	Std. Deviation	T	P- value	Mean Difference
Teaching presence	198	3.84	0.55	21.33	<0.001	0.84
Social presence	198	3.47	0.73	9.15	<0.001	0.47
Cognitive presence	198	3.67	0.53	17.580	<0.001	0.67

Table 5: The correlation coefficients and significance level between teaching, social, and cognitive presence and daily study hours

Variables	Daily study hour	
Teaching Presence	Pearson Correlation	0.170
	P value	0.017
Social Presence	Pearson Correlation	0.185
	P value	0.009
Cognitive Presence	Pearson Correlation	0.285
	P value	<0.001

and the intensity of the relationship between cognitive presence and daily study hours is the strongest, and between teaching presence and daily study hours is the weakest.

Discussion

The present study, we aimed to assess the teaching, social, and cognitive presence of educational sciences students at the University of Tabriz based on the COI Framework. The results showed that students' teaching, social, and cognitive presence in e-learning was significantly higher than the cutoff point. Additionally, there was a positive relationship between the students' daily study hours and their level of teaching, social, and cognitive presence in e-learning.

These findings suggest that the quality of virtual courses at the University of Tabriz is at an acceptable level; this is in line with the results of Garrison et al. (18), Lear et al. (30), Bulu (31), Filippo (32), Sung et al. (33), Hosler et al. (34), Alman et al. (35), Tan (37), Taqizade et al. (50), and Zahedi et al. (51). However, the lower level of social presence compared to other elements of presence is a concern. Social presence plays an important role in student satisfaction with e-learning and is essential for creating satisfactory and effective learning experiences (56). Social

presence expresses social dynamics and the quality of relationships between learners. E-learning requires learners to share their individual experiences and perspectives (57). The lack of social presence can lead to a sense of failure or an irrational critical attitude towards teacher effectiveness and a low level of emotional learning (58). Social presence can also reduce the feelings of isolation, anxiety, and frustration that some online learners may experience (59). The low speed of the Internet and its frequent disconnection and connection, professors' and students' lack of familiarity with the LMS software environment, impossibility of communication between students on the platform of the LMS software are among the most important reasons for the drop in social presence of students. To enhance social presence, learners can use various technologies to establish their identity and personality online, communicate effectively with others using different modes (e.g., text, audio, video), and develop trust and rapport with their peers (60-62).

Cognitive presence is the extent to which learners can construct and confirm meaning through sustained reflection and discourse (63). It is influenced by the quality of the learning content, level of interaction, and degree of metacognition (64). The results

also showed that cognitive presence had the highest correlation with students' daily study hours. This highlights the importance of self-directed learning in virtual education. By strengthening self-directed learning and encouraging students to take greater control over their learning (65), it may be possible to further enhance their cognitive presence in virtual classes. This suggests that students who spend more time studying online are more likely to engage in deep and meaningful learning (66). Given the role of self-directed learning in e-learning, strengthening the elements of self-directed learning, planning, and controlling the content, time and learning activities by students can lead to strengthening their cognitive presence in virtual education, which is in line with the results of Auliarahmi's research (67). However, this does not mean that quantity is more important than quality. Rather, it implies that students who are self-directed and have a clear purpose for their learning are more likely to put in more time and effort in their online courses. They are also more likely to seek feedback, collaborate with others, and apply their knowledge to real-world situations.

Given the higher mean of teaching presence compared to cognitive and social presence, it can be concluded that the professors of the group have performed well in designing and organizing learning activities and providing educational content and assignments. This issue is very important considering the role of teaching presence in facilitating cognitive and social presence. Zhang (68) believes that the lack of sufficient presence in teaching causes the discussion between lecturers and students and between students to take place at a relatively low level, and deep learning gives way to superficial learning.

Overall, this study provides valuable insights into the teaching, social, and cognitive presence of students in e-learning at the University of Tabriz. These findings can help inform efforts to improve the quality of e-learning and enhance student satisfaction and learning outcomes.

Limitations and Suggestions

This study has some limitations that could be addressed in future research. One limitation is that the self-reported method of measuring COI Framework may introduce bias in the results. A more reliable method could be to perform an interview to collect the data. Another limitation is that the participants in this study were students who had to do e-learning due to certain circumstances. The results might differ if the participants were students who chose e-learning voluntarily. A potential direction for future research is to compare the responses of students who do e-learning by necessity and by preference. Another limitation is that this study only focused on one university and one discipline, which may limit the generalizability or transferability of the findings. A more comprehensive study could include more universities or disciplines to compare or contrast the results across different contexts or situations.

According to the research results and to improve the teaching, social, and cognitive presence of students in e-learning, it is suggested that authorities should pay more attention to the design of e-learning environments using the COI theoretical framework, encourage the students and faculty members to use the facilities of e-learning systems, and promote participatory learning and interaction between individuals. Also, identifying the goals, designing various learning activities, using continuous evaluation strategies, providing timely feedback, and preparing a questionnaire for all lessons offered to students separately are the other practical suggestions.

Conclusion

The aim of this paper was to assess the teaching, social, and cognitive presence of educational sciences students based on the community of inquiry framework at the University of Tabriz. The paper argues that the students perceived a high level of presence in their e-learning experiences, which indicates an acceptable quality

level of the virtual courses offered by the university. The COVID-19 pandemic has posed serious challenges to the education systems worldwide. E-learning has emerged as one of the most effective and feasible teaching methods that keep students and teachers in higher education on track. The COI framework suggests that teaching, social, and cognitive presence are essential for e-learning and teaching and fully support constructivism and connectivism, which reduce transactional distance. Future research is suggested to investigate new technologies that can further support constructivism and connectivism in the COI.

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Authors' Contribution

FM and SZ developed the concept and designed the study. FM collected the data and drafted the discussion section. SZ drafted the introduction, method, and result sections. FM and SZ revised the manuscript. All authors approved the final manuscript.

Ethical Consideration

The study followed the ethical principles of research, involving human subjects, such as informed consent, confidentiality, anonymity, and voluntary participation. All the participants were informed about the purpose and procedures of the study and participated in the research after their consents were obtained. All of them were assured about the confidentiality of the collected information, the use of the answers only for research purposes, and the lack of impact of the answers on their academic performance or evaluation. Also, due to the descriptive nature of the research, no experiment was done on the sample members, and they could withdraw from the study whenever they wanted; also, the ethic code was D/348/17.

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