



The Effect of Using the Community of Inquiry Model on the Quality of Distance Learning of the Airways Management among Anesthesia Nursing Students

ALI KHALAFI¹, PhD; OMID ZAREI^{*}, MSc; VAHID SAIDKHANI², PhD Candidate; MOHAMMAD HOSEIN HAGHIGHIZADEH³, MSc

¹Department of Anesthesiology, School of Allied Medical Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; ²Department of Nursing, School of Nursing and Midwifery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran; ³Department of Biostatistics, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Abstract

Introduction: Distance education as a training method is used today to train nurses around the world. This study aimed to determine the impact of using the community of inquiry model on the quality of distance learning of airway management among anesthesia nurse students.

Methods: This is a quasi-experimental study with a pre-test post-test design conducted at Ahvaz Jundishapur University of Medical Sciences. Participants were selected by census, and they were second, third, and fourth-year nurse anesthesia students (n=66). The participants were assigned to intervention and control groups (n=33 each) based on the table of random numbers. Given the three dimensions of the community of inquiry model, interventions were carried out in terms of social, teaching, and cognitive dimensions to increase social presence, teaching presence, and cognitive presence. Data collection tools included a questionnaire. The data were analyzed using Independent T-test, paired T-test, ANCOVA, and Chi-square in SPSS software, version 16.

Results: The results showed that the promotion of each of the three elements of the community of inquiry model had a significant effect on the quality of distance learning of airway management. Moreover, the mean scores of these elements were significantly different ($P < 0.001$) in the intervention and control groups [teaching presence (3.742 ± 0.453 vs. 2.573 ± 0.241), social presence (2.245 ± 0.488 vs. 1.434 ± 0.297), and cognitive presence (3.421 ± 0.569 vs. 2.369 ± 0.223).

Conclusion: The community of inquiry is a practical and effective framework for the better design and implementation of distance education courses. Therefore, nursing educators and course designers are strongly recommended to use this framework in nursing education.

Keywords: Anesthesia, Nursing student, Education, Airway

*Corresponding author:

Omid Zarei, MSc;
Department of
Anesthesiology,
School of Allied Medical
Sciences, Ahvaz Jundishapur
University of Medical
Sciences, Ahvaz, Iran
Tel: +98-9176862976
Email: omidzare.2912@gmail.com

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Introduction

Distance education as a training method is used today to train nurses around the world. The term “distance education” refers

to a teaching-learning experience in which the teacher and the student do not have physical interaction and is characterized by the distance in time and/or space between learners and

learning resources (1-3).

Today, distance education has become very important due to the expansion of globalization and information sharing, as well as having important features such as saving time and money, and the speed of access to information and training around the world (4, 5). Online distance education is a learning method that gives students autonomy, responsibility, flexibility, and choice. Creating a successful learning ecosystem is a complicated process that includes careful planning, design, and selection of goals (6). According to Palloff and Pratt, the key to successful distance learning lies in the establishment of a learning community where knowledge is shared and meaning is collaboratively constructed (7). The community of inquiry (COI) model is one of the models and frameworks devised to promote the learning process (6) and is one of the most extensively used frameworks in online teaching and learning (8-10). A systematic review study conducted by Estenbom in 2018 showed that studies conducted in the context of the community of inquiry framework were published in 47 prestigious journals, and this trend is still increasing (9). Following the participatory constructivist perspective, Garrison et al. (2000) developed the community of inquiry model as a conceptual framework for the optimal use of deep and top-notch learning among higher education students in a variety of distance learning environments (11, 12). At the core of this model lies the educational experience (13). Social presence, teaching presence, and cognitive presence are the three key elements of this paradigm (14).

Although the sudden outbreak of Covid-19 posed many challenges for the health care systems of the countries around the world, other sectors of society including education were also affected. With the start of the Covid-19 epidemic around the world, health protocols put strict emphasis on the observance of social distancing (15). In this regard, face-to-face training in universities was abandoned in many countries to reduce the spread of the corona virus. Although the Covid-19 pandemic brought about many problems to all aspects of society, including people's health, it led to the flourishing of some previously taken-for-granted capabilities, an example of which is the universality and prosperity of distance education (15, 16). In fact, after the pandemic, distance education seems to have entered a new phase, and it has attracted more attention, indicating its paramount importance even after the end of the pandemic and its critical role in education which will persist even more than before (17-19).

During the pandemic, the training of nurses underwent serious changes in terms of the teaching-learning processes, and an alarmingly low quality of education was observed, especially in the field of skill training (20, 21). The sudden shift from face-to-face education of theoretical courses and internships at the patient's bedside to distance learning initially overwhelmed both the educators and learners (21, 22). However, after years of distance education, this method has gradually gained popularity, and efforts to improve their quality are promising. Applying and testing the models generated in the field of distance education, such as the COI model, can help to direct and target distance education and improve the effectiveness of these models (13, 23).

On the other hand, since nursing education has shifted towards distance learning formats, and training related to airway management is the cornerstone of clinical work for anesthesia nursing students, using an effective learning framework in online and distance learning environments is very important (24-26). Thus, airway immunization was chosen as the subject of the training course in order to evaluate the effectiveness of the COI model in the training of anesthesia nursing students in the present study. The current study aimed to determine the impact of using the community of inquiry model on the quality of distance learning of airway management among anesthesia nurse students. The research hypothesizes that promoting social presence, cognitive presence, and teaching presence is effective in the quality of distance learning of airway management among anesthesia nursing students.

Methods

Sampling and participants

The participants were selected by census. The inclusion criteria were being a second-year or higher anesthesia nursing student and not participating in any in-person or virtual airway administration training course. First, all the second, third, and fourth-year students of the Bachelor of Anesthesiology program (n=78) who were learning airway management according to the educational curriculum were informed about the study and the inclusion criteria through text messages; then, they were invited to participate in an online briefing session. Then, a 1-hour meeting was held on the Google Meet platform, in which 72 selected students participated. In this meeting, the students were thoroughly briefed on the objectives of the research, the framework of the study, and the training process. Finally, 68 people gave consent to participate in the

study, completed an informed consent form, and sent it to the research team via email. During the intervention, two students withdrew from the study, and the study was done on 66 subjects whose data were finally analyzed. The participants were assigned to the intervention and control groups (n=33 each) based on the table of random numbers (Figure 1).

Study design and method

This is a quasi-experimental study held online for 8 weeks in autumn and winter of 2021 at Ahvaz Jundishapur University of Medical Sciences in Ahvaz, Iran. Given the three dimensions of the community of inquiry model, the interventions were carried out in terms of social, teaching, and

cognitive dimensions to increase social presence, teaching presence, and cognitive presence. The intervention group included 33 second, third, and fourth-year nurse anesthesia students. In the first step in implementing the interventions, we presented the airway management methods to the participants of both intervention and control groups in eight 60-minute online video sessions (1 session per week) regularly on a particular time and date during the week using Google Meet. These sessions included lectures, educational videos, live videos showing the instructor doing practical work on mannequins, questions and answers, and troubleshooting. In the intervention group, the following interventions were carried

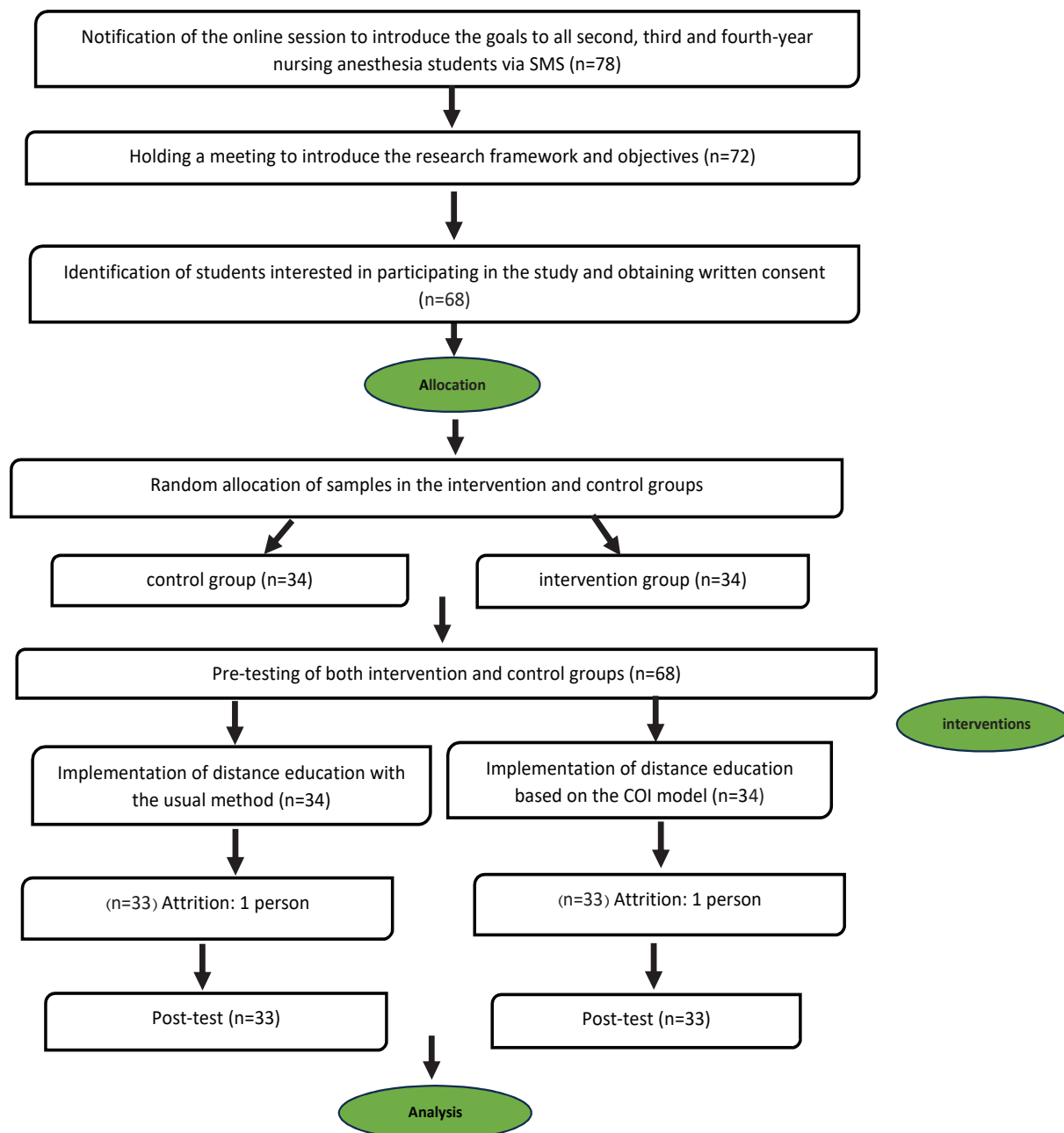


Figure 1: Flowchart of consort

out to improve the students' presence based on the COI model in three social, teaching, and cognitive dimensions.

A) Interventions made to improve social presence:

The students of the intervention group (n=33) were divided into 11 groups of 3 (trios) to do project-based assignments. Groups of three were selected by lottery. The students in each trio were required to complete and deliver the assignments given at the end of each online session. Each assignment sent to the students consisted of video scenarios about airway management prepared by instructors in the skill lab using mannequins. The students of each trio had to hold a meeting together online, discuss the video scenario, and answer the questions raised in the scenario with the help of each other. They were supposed to record the meeting and send it to the research team as a completed assignment. The meeting videos were then reviewed, and the necessary feedback was provided to the members of the same trio through text messages or WhatsApp application. The students of the intervention group were given the opportunity to raise their questions, criticisms, and suggestions with the instructors through WhatsApp.

B) Interventions made to improve teaching presence:

The intervention in this dimension was done in two ways. First, every week, one or two groups presented their specified scenario in an online session with the presence of all intervention group students for 20 to 30 minutes in the Google Meet, and all students were asked to discuss the scenario and give their additional comments. Brainstorming techniques were also used in presenting the scenarios. Another part of the intervention in this regard was formative evaluation. To this aim, every two weeks, an online multiple-choice test (a total of 4 tests until the end of the intervention) was administered to all members of the intervention group on the topics taught in the previous two weeks through Google Forms. Immediately after the end of the test, the score obtained by each student along

with the necessary feedback was sent to them through WhatsApp. The mean scores of all 4 tests were considered as the student's final score.

C) Interventions made to improve cognitive presence:

In the intervention group, after the weekly online meeting, a problem or topic about the airway management that was related to the material presented in that meeting was posed to the students of the intervention group. The students in each trio were asked to collect the necessary information by searching and studying books, journals, websites, and social networks, and answer the questions and send the answers back.

Students in the control group fully participated in 8 weekly online sessions. They did the assignments at the end of each session (video scenarios) individually, sent the answer through WhatsApp, and received their feedback in the form of a score out of 20 for each assignment. At the end of the online educational sessions, the evaluation of the control group was done using a multiple-choice test based on the materials presented in all sessions (Table 1).

Research tools

The data collection tool in this study included three sections. The first section dealt with the demographic information of the participants, and the second part included the community of inquiry framework questionnaire. Arbaugh et al. (2008) developed this questionnaire to be used for web-based environments. It includes 34 questions (12, 27). The items in this questionnaire evaluate the three elements of community of inquiry. The internal consistency of this section was evaluated, and Cronbach's alpha coefficients of 0.94, 0.95, and 0.91 were obtained for teaching presence, cognitive presence, and social presence, respectively (12). In Iran, Taghizadeh et al. (2018) did factor analysis on this instrument and checked its validity and reliability (28). The third section contains a 45-item multiple-choice questionnaire developed by the researchers to test the airway management knowledge. Content validity and

Table 1: Implementation of interventions based on the COI model in the intervention and control groups

Interventions	Intervention group	Control group
8 online training session.	Participated	Participated
Doing assignment based on video scenarios.	Doing the assignment collaboratively in groups of 3 people.	Doing assignment individually.
Receive feedback after completing assignments.	Textually	In the form of points.
Ability to ask questions after receiving feedback.	Yes	No
Presenting the solved scenario for all students.	Yes	No
Assessment	Formative	Summative
Search in sources.	Collaborative search in groups of 3 people.	No

face validity of this tool were checked. To this aim, the instrument was handed to several faculty members of the Anesthesia Department of AJUMS and anesthesiologists. The validity of the instrument was finally confirmed after making the necessary modifications. To evaluate the reliability and internal consistency of this tool, we tested it in a pilot study on 15 students who were not among the final research sample. As to reliability, a Cronbach's alpha coefficient of 0.87 was obtained.

Data collection

At the beginning of the course, the demographic and the airways management knowledge questionnaire was completed by the participants in Google Form as a pre-test. Two weeks after the end of the training course, the airways management knowledge questionnaire and community of inquiry framework questionnaire were filled out again by the students of both control and intervention groups as a post-test.

Data analysis

Statistical analyses were performed using SPSS software version 22. The normal distribution of data was checked before data analysis. T-test was used to analyze the quantitative variables, and Chi-squared test was used to analyze the qualitative variables.

Ethical consideration

All research protocols were conducted under the supervision of the University Ethics Committee (Ethic NO: IR.AJUMS.REC.1400.473). The participants' information remained preserved, and all the selected individuals participated in this study based on their consent. In addition, the participants had the absolute right to withdraw from the study at each stage.

Results

Out of 78 students enrolled in the study, the data obtained from 66 students (33 in the intervention group and 33 in the control group) were analyzed. As far as gender was concerned, 21% (14) of the participants were male and 79% (52) were female. To classify the students in terms of their academic achievement, those with a GPA of 17-20 were placed in the high level, those with a GPA of 14-16.99 in the intermediate level, and those with a GPA below 14 were placed in the low level. There were no significant differences between the control and intervention groups in terms of academic year and gender. In Table 2, qualitative demographic variables are compared using the Chi-squared test.

The mean scores of the control and intervention groups from each of the three elements of COI were compared using the independent T-test. Teaching presence, with a mean score of 3.742 ± 0.453 in the intervention group and a mean score of 2.573 ± 0.241 in the control group, had the highest mean scores among the three elements of the community of inquiry model. A significant difference was found between the mean scores of the control group and those of the intervention in terms of the element of teaching presence ($t=13.07$, $P<0.001$), social presence ($t=8.11$, $P<0.001$), and cognitive presence ($t=9.87$, $P<0.001$) (Table 3).

Results showed that there was a significant difference between the mean scores before and after the intervention ($t=9.702$, $P<0.001$), but no difference was observed in the control group ($t=1.557$, $P=0.129$). Furthermore, while there was no significant difference between the intervention and control groups before the training course in terms of their mean scores ($t=0.821$, $P=0.415$), at the end of the training course, we observed a significant difference between the mean scores of the two groups ($t=7.709$, $P<0.001$) (Table 4).

Table 2: Demographic information of the course participants

Variable	Categories	Group		X ²	P
		Intervention	Control		
		N	N		
Academic year	Second-year	11	11	0	>0.999
	Third-year	11	11		
	Fourth-year	11	11		
Sex	Male	8	6	0.363	0.547
	Female	25	27		
Academic achievement	High level	5	5	0	>0.999
	Intermediate level	22	24		
	Low level	6	4		
History Course online	Yes	33	33	0	>0.999
	No	0	0		
Satisfaction from Past online courses	Yes	7	12	1.848	0.174
	No	26	21		

Table 3: Mean scores of the COI survey elements (N=66)

Dimension and categories	Group		Independent sample t-test	
	Intervention (n=33)	Control (n=33)	t	P
	Mean±SD	Mean±SD		
1. Teaching Presence	3.74±0.45	2.57±0.24	13.07	<0.001
1.1 Design & Organization	3.46±0.46	2.38±0.36	10.56	<0.001
1.2 Facilitation	3.44±0.50	2.29±0.37	10.47	<0.001
1.3 Direct Instruction	3.54±0.61	2.62±0.66	5.86	<0.001
2. Social Presence	2.24±0.48	1.43±0.29	8.11	<0.001
2.1 Affective Express	2.24±0.48	1.43±0.29	8.11	<0.001
2.2 Open Communication	3.10±0.80	2.04±0.53	6.28	<0.001
2.3 Group Cohesion	2.96±0.70	2.32±0.44	4.43	<0.001
3. Cognitive Presence	3.42±0.56	2.36±0.22	9.87	<0.001
3.1 Triggering Event	2.97±0.75	2.24±0.42	4.86	<0.001
3.2 Exploration	2.98±0.82	1.46±0.61	8.48	<0.001
3.3 Integration	3.29±0.49	2.33±0.47	8.09	<0.001
3.4 Resolution	3.09±0.75	2.14±0.50	6.04	<0.001

Table 4: Comparison table of average scores of airway management knowledge test

	Group		Independent T-test		ANCOVA	
	Intervention	Control	t	P	F	P
Airway management Knowledge score	Mean±SD	Mean±SD				
Pre-test	19.75±8.13	18.24±6.79	0.82	P=0.41	-	
Post-test	31.81±7.32	19.36±5.70	-		89.13	<0.001
Pair t-test	t=9.70, P<0.001	t=1.55, P=0.12	-			

Discussion

This research sought to investigate how using the community of inquiry model can contribute to the effectiveness of the distant learning of airways management among anesthesia students. According to the results, among the three elements of the community of inquiry model, the teaching presence had the highest mean score in the two groups of control and intervention, which is consistent with the results of earlier research in this area. In the study of Akti Aslan et al. (2021), the mean scores of teaching presence in the intervention and control groups were significantly higher than those of social presence and cognitive presence (29). Similarly, Mills et al. (2016) found that the scores obtained from teaching presence were greater than those of social presence and cognitive presence (30). This shows the greatest effect of interventions that are based on design and organization as opposed to those based on other areas that should be designed and implemented by educational centers or instructors. It seems necessary that distance education courses be designed based on participatory-interactive methods. During a training course, students' communication with each other, with the instructor, and with the educational content should be effectively activated and maintained (31, 32).

In agreement with these findings, Shea

and Bidjerano (2009), Akyol et al. (2009), and Arbaugh (2006) emphasize the central role of teaching presence in online learning experiences, which will lead to creating and maintaining an online learning environment and achieving the desired learning outcomes (33-35). Since teaching presence is defined as design, facilitation, and orientation of instructional processes, the higher mean scores of teaching presence in the intervention group could be attributed to the wide variety of instructional techniques used in the course, which was described in detail in the methods section above. Furthermore, given the role of the instructor in improving teaching presence scores as highlighted by Fiock (2021), it can be argued that the high scores obtained in teaching presence subsets, such as design and facilitation, are directly related to the instructor's ability in this regard. Therefore, the instructor's ability to run the course must be taken into serious consideration if we are to improve teaching presence (36).

According to our results, after teaching presence, the scores of cognitive presence were higher than those of social presence, and the mean scores of cognitive presence in the intervention group were significantly higher than those of the control group. This difference may be explained by the interventions included using brainstorming techniques in video conference

sessions and the use of problem-based learning method, a method that John Dewey introduced as a stimulus for learning (37). Moreover, in the studies of Shin (2013) and Walker (2009), the very high impact of using this method in nursing education as opposed to traditional methods was emphasized (38, 39). Finally, among the three elements of the community of inquiry model, social presence received the lowest mean scores. Of course, it should be noted that in order to better promote this element, not only should innovative and effective interventions be devised but also the other two elements need to be strengthened in a parallel fashion. According to Akyol et al. (2009), teaching presence plays an essential role in establishing a sense of social presence by creating an atmosphere of trust, open communication, and group cohesion, and reciprocal social presence has a mediating role in creating context for teaching activities (teaching presence), which is consistent with this finding of the study (33).

Interpretation of the results of the airway management knowledge scores shows the effect of interventions carried out in accordance with the community of inquiry framework. Similarly, Rockinson et al. (2016) clearly support the fact that the community of inquiry framework has played a significant role in predicting scores at the end of the training course (12), with students having higher levels of perceived teaching presence, social presence and cognitive presence receiving higher scores during the course. Also, in the studies of Saadatmand et al. (2017) and Su et al. (2005), increasing the level of interaction was found to lead to enhanced quality of learning as well as significant effectiveness of learning outcomes in distance training (31, 32). Because the interaction of learners in the intervention group was greater at all three levels of instructor-learner, learner-learner, and learner-content, the difference in the mean scores of airway management knowledge might be ascribed to the degree of interactions.

Examining the level of satisfaction with the distance education of airways management based on COI framework at the end of the course showed that 66% of the participants in the intervention group and 27% in the control group were completely satisfied with this training course. Additionally, the results of the Chi-square test revealed a significant difference between the control and intervention groups in terms of their satisfaction levels with the course, which might indicate the beneficial effect of implementing COI in distance learning.

In the intervention group, the students'

satisfaction with distance education of airway management based on COI framework was significantly higher compared with the control group. This can be attributed to the more interactions the students have with other students, doing homework in groups, thinking together, and getting help from peers to present the content in the video conference. In the present study, strengthening the social and teaching presence in the intervention group with several different methods led to the students' satisfaction with the learning process. It seems that the type of distance education in which the student has very little contact with other students and instructors leads to a sense of isolation and loneliness and removes the student from the atmosphere of the teaching-learning process. The components of the COI model, on the other hand, direct the flow of education towards cooperative-interactive learning and promote multifaceted educational communication (40, 41).

Limitations

This study had limitations as to the small sample size, which was due to the limited number of anesthesia nursing students at AJUMS. Therefore, generalization of the findings to a large population of nurses should be done with considerable caution.

Conclusion

The study findings revealed that promoting each element of COI (i.e., teaching, cognitive, and social presences) had a positive impact on the quality of distance learning of airway management in anesthesia nursing students, and promoting each presence could have a direct and positive impact on the other dimensions of the model at the same time. The results of this research, moreover, demonstrated that the community of inquiry framework was successful in raising the mean scores of distance learning. Therefore, according to the findings of this study, which showed the positive effect of using the model on the quality of distance learning, wider use of this model is strongly recommended to improve the quality of distance learning in nursing education.

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Authors' Contribution

Authors AK, VS, OZ and MH participated in the conception and design of the study. AK and OZ contributed to the data collection and prepared the first draft of the manuscript. AK, MH and OZ, critically revised and checked the proposal, the analysis and interpretation of the data, and design the article. All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interests.

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