

Original Article

Effectiveness of Virtual Education for Operating Room Nursing Students During the COVID-19 Pandemic: A Qualitative Study

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Abstract

Background: With the rapid spread of the coronavirus, which in addition to threatening human physical health has adversely affected the other aspects of life such as education, the proper use of virtual learning works as the best strategy to improve the quality of teaching and learning and providing equal opportunities. Virtual learning is known as the best educational method during the pandemic.

Methods: This qualitative study benefited from a content analysis method, and the obtained information was analyzed with the help of the Graneheim approach. In this study, 8 operating room students of Hamadan University of Medical Sciences were selected by the available sampling method. Then, the effectiveness of virtual learning was explained using semi-structured interviews.

Results: After analyzing the interviews, the main problems found in virtual learning at Hamadan University of Medical Sciences in the field of operating rooms were categorized into technical communication factors, effective environmental factors, problems related to professors and the Department of Education, and problems related to students.

Conclusion: The effectiveness of e-learning was explained in this study. Depending on the policies of each university and the unique problems associated with it, the problems of e-learning may vary from university to university, thus more studies need to be performed at different universities to reach more comprehensive solutions.

Keywords: E-learning, Virtual education, Coronavirus, COVID-19, Operating room, Nursing, Students, Pandemic

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Introduction

The rapid spread of the coronavirus was such that it killed a large number of people in just two months (1). After the outbreak of the coronavirus, China was the first country whose government ordered the closure of schools in order to reduce and prevent the spread of the disease (2). In the Philippines, coronavirus had a huge impact on higher education institutions, and the country immediately opted for online education (3). During this period, some teachers recorded their lessons online and uploaded them to various sites so that students can access them (3). In Iran, since late February, the Ministry of Science and the Ministry of Education have successively ordered the closure of universities and schools (1). All around the world, Corona pandemic has had different consequences on all aspects of people's life; education is one issue that has been strongly affected by the current crisis (1). UNESCO introduced virtual-space-based teaching methods as the

most effective teaching-learning method in 2005 (1). Due to the current crisis, educational institutions can no longer teach and train properly with the previous methods, and the need for virtual learning is felt more than ever (1). Virtual learning is not just about taking a specific course on a computer (4). In a broader definition, E-learning includes any use of web and Internet technologies that create learning experiences (5). Appropriate use of virtual learning is the best strategy to improve the quality of teaching and learning and create equal opportunities (6). Nowadays, the internet and the World Wide Web have affected all aspects of life in societies, especially in the field of education (7). The competitive environment of today's world and the development of science and technology have made the use of virtual learning inevitable in human societies (6). In addition, this type of education has created many flexibilities in educational methodologies, content management, and student evaluation that caused



the learning process to shift focus from being teaching-centered to being learning-centered (8). Most institutions that previously considered virtual learning to be a fleeting fashion are rapidly offering virtual learning programs (9). Upgrading and developing the educational quality level require the transfer of knowledge in the shortest time, and traditional educational systems are not sufficient to meet this need (6). Virtual learning saves learners' time and money (4). Using the virtual learning method, which is also more in line with the learning styles of individuals, makes it possible for learners living in remote areas and absentees to have access to the course materials; furthermore, it eliminates the temporal-spatial constraints and problems related to compulsory attendance at the university (10,11). On the other hand, in developing countries, challenges such as the increasing number of students, the increasing amount of women's participation, and the lack of enough space and supplies have made virtual education to be considered a viable option (11). Of course, virtual education has disadvantages such as the lack of face-to-face interaction between the teacher and the learner and disruption of network speed as well (12). In Virtual learning, quality is of great importance, and to prevent the loss of human and financial resources, coordination between the development of educational systems is essential (8). However, despite the excitement, possibilities, and appeals that virtual learning can have and offer, employing it, without analyzing whether it is effective or not, may lead to failure in achieving its goals (9). The word effectiveness means achieving goals (5). When measuring the effectiveness of a virtual (electronic) learning system, it is necessary to pay attention to the learners' points of view (4). The expansion of virtual learning following the coronavirus pandemic and the need to pay attention to this type of education led us to explore the effectiveness of these courses for operating room students of Hamadan University of Medical Sciences in 2021, which coincided with the coronavirus pandemic. In this study, it was attempted to expound on those influential factors that have an impact on the effectiveness of this type of education for operating room students who are involved in clinical work.

Materials and Methods

Study Setting

The present qualitative study benefits from a content analysis method and has been conducted at Hamadan University of Medical Sciences in 2021. The samples of the study included 8 undergraduate operating room students who were selected via the available sampling method.

Participants

Samples were selected from the undergraduate operating room students; the inclusion criteria were showing a willingness and passing at least one semester of their studies, while the exclusion criterion was the participant's reluctance to participate in the study.

Data Collection

To explain the problem, data were collected through interviews and library studies. In the field of library studies, many articles have discussed the effectiveness of virtual learning and factors that have an influence on this type of education. In the interviews, some questions were designed as a preliminary guide before the interview; therefore, semi-structured interviews were conducted, during which exploratory questions were asked to make the interviews clearer and deeper. In addition, the interviews were conducted face-to-face on the university campus, dormitory, and hospital. The time of the interviews varied between 20 and 40 minutes. Several questions were used as the preliminary interview guides, including "Has virtual learning been effective for you?" "Why do you say yes or no?" "Do you have any experiences with virtual learning?," and "Tell us about it". During the study, numbers (P1, P2, P3,... P8) were used instead of the names of the participants. The researchers conducted 10 interviews in this study, but due to data saturation in the last 2 interviews and due to the repetition of the previous codes, the corresponding codes were extracted from the first 8 interviews.

Data Analysis

In this study, which was conducted by utilizing the content analysis method, information was collected using the one-to-one interview method and analyzed through the Graneheim approach (13). First, the text of the interviews was transcribed word for word and employed as the main data of the research. Next, the text of the interviews was divided into summary and short semantic units. Subsequently, according to the sentences that the participants expressed about their experiences on the topic, the obvious and hidden concepts of meaning units were identified in the form of sentences or paragraphs, then they were coded and summarized accordingly. In the fourth step, the codes were compared in terms of similarities and differences and classified into more abstract groups. Finally, the content hidden in the data was identified as the subject of the study by comparing the classes with each other and deeply reflecting on them (14). Information was collected, analyzed, and categorized at the same time so that the obtained information was meaningful, comprehensive, valid, and accurate, and finally, the characteristics, gaps, and damages related to the investigated phenomenon were identified as well. The process of analysis and coding was started less than 24 hours after the first interview.

Rigour

The four-dimension criteria of credibility, dependability, confirmability, and transferability were applied to assess the rigour of the study (Guba and Lincoln, 1986). The researcher, as an operating room nurse, was involved with the subject and the research environment for 2 years; he fully interacted with virtual learning, which led to in-depth interviews and valid data. For the credibility of the

study, the researcher had long and persistent involvement with the data and the participants and employed the review technique for the participants. Regarding dependability, the peer review method was used, implying that, after initial coding and categorization, the researcher provided his teammates with the early analysis of the collected data seeking their evaluation and correction. Due to dependability and confirmability, data collection methods (semi-structured interviews, observations, and library studies) were carefully used in interview and data analysis techniques. Student citations and full descriptions of categories, as well as characteristics of participants, data collection, method of analysis, and sampling with maximum diversity, are the components that made this study transferable.

Results

In the present study, after interviewing 8 people, we reached data saturation due to the repetition of previous codes (Table 1). Overall, 4 categories and 12 sub-categories were obtained based on the results (Table 2). The mean and standard deviation of the age of the participants were 22.25 and 1.02, respectively. An example of the extracted codes is provided in Table 3.

Technical and Communication Problems

One of the students' concerns repeatedly referred to in interviews was the code related to the technical and communication problems of online classes; this has reduced the student's interest in attending virtual classes and includes four sub-categories, which are explained as follows:

a. Connection to Online Classes

One of the problems that students face is their inability to connect to the virtual education site that is called

Navid in Iran; this problem occurs due to either Internet problems or the incompatibility of this site with some of the browsers used by the public. Failure to announce the browsers compatible with this site has caused confusion for the students, resulting in their absence, especially with new students. In this regard, one participant indicated that: "... I remember the first time I tried to connect to the Navid site, I couldn't. First, I tried with a laptop, but I saw that I couldn't. Then, I tried to connect with my mobile and computer, but that did not work either. Then, I realized that I could only be connected using a certain browser, and this caused me to miss several classes ..." (P5).

b. Question and Answer in Online Classes

Unlike online classes, the lack of instant question-and-answer capability in offline virtual classes makes the students bored and demotivated to concentrate and study more. On the other hand, the lack of proper control over questioning and answering in online classes prevents effective communication between professors and students. In this regard, the following participants acknowledged:

"... in online classes, because the teacher could ask us a question at any time, we would review the contents of that session before the class started. But, in offline classes,

Table 1. Participants' Information

Row	Age	Gender	Education Rate
P1	21	Male	Two semester of operating room nursing undergraduate
P2	21	Male	Two semester of operating room nursing undergraduate
P3	23	Male	Four semester of operating room nursing undergraduate
P4	23	Female	Six semester of operating room nursing undergraduate
P5	21	Female	Two semester of operating room nursing undergraduate
P6	23	Female	Four semester of operating room nursing undergraduate
P7	23	Male	Eight semester of operating room nursing undergraduate
P8	23	Male	Eight semester of operating room nursing undergraduate

Table 2. Category and Sub-category

Category	Sub-category
Technical and communication problems	<ul style="list-style-type: none"> • Connection to online classes • Question and answer in online classes • Large number of students in the class • Problems with virtual learning systems
Effective environmental factors	<ul style="list-style-type: none"> • Educational atmosphere • The dull atmosphere of the virtual learning systems
Problems related to professors and Department of Education	<ul style="list-style-type: none"> • The way the professors teach • Quality and quantity of assignments professor's teaching content • Professors' work order
Problems related to students	<ul style="list-style-type: none"> • Engagement in extracurricular activities • Possibility of cheating on exams

Table 3. An Example of Coding

Category	Sub-category	Initial Codes
Effective environmental factors	Educational atmosphere	<ul style="list-style-type: none"> • Lack of being in the atmosphere of face-to-face training • Lack of interaction between students in virtual education • Lack of competitive atmosphere in virtual education
	The dull atmosphere of virtual learning systems	<ul style="list-style-type: none"> • An experience of a uniform mode in virtual education • Boring offline educational classes

wherein this was not possible, there existed no stimulus for us to go and review the content ..." (P6).

"... the chat box in the class of some teachers was all open. Then, whenever anyone had a question, they would ask it and the questions would get mixed up. Sometimes, the teacher did not see my question at all among all those questions, and this made it difficult for me to communicate with the teacher ..." (P4).

c. Large Number of Students in the Class

The large number of students in online classes, especially in general courses, causes difficulty in communication and chaos in the class, and one participant (P2) pointed out this fact:

"... In my online classes, the number of students increases a lot. For example, professors mix their students who are in different levels of education together in one class; this makes a little bit chaos; you can't ask your questions from the teacher or communicate with him easily ..."

d. Problems With Virtual Learning Systems

Navid site, due to providing the possibility of communication only in text, has made it impossible for students and professors to communicate effectively with each other. In addition, failure to indicate when the professors viewed the messages or when the professors were previously online has made it difficult for students to follow up on getting the answers to their messages. In this respect, participant 7 mentioned that:

"... in these virtual learning systems, communication is very difficult because not only are the messages in the text format but also we do not see if the professors are online or not. Text messages do not have a tone; therefore, they often cause me not to be able to convey my point to the teacher or the teacher misunderstands what I mean. Also, we do not see whether the professor is online or has seen our messages or not; we do not know when to follow up to find out if the professor has answered us or not ..."

Effective Environmental Factors

Environmental factors are another problem that students suffer from. Lack of presence in the university atmosphere makes the students tired of monotonous educational conditions. In addition to this problem, the strict and monotonous atmosphere of virtual systems causes students to be doubly tired and unmotivated to continue taking courses from virtual systems. This category contains two sub-categories as follows:

a. Educational Atmosphere

Not being in the atmosphere of the university and lack of face-to-face communication have negative impacts on learning and the process of listening to classes. Especially, the interaction between students in face-to-face classes works as a stimulus for them, and the lack of such interaction in virtual classes has taken away this mobility from students. Participant 4 declared that:

"... When we have face-to-face education, the learning environment around me greatly influences the process of listening to the teacher, the learning process, and even the interaction between the students and the teacher. On the contrary, in virtual learning, we do not see this influence because we are not in that educational environment, and this makes me no longer have the previous motivation to study ..."

b. The Dull Atmosphere of Virtual Learning Systems

The monotonous and dull atmosphere of virtual learning, especially in offline educational classes, has had negative impacts on students and affected them psychologically. In this regard, participant 1 indicated that:

"... Monotony in virtual learning is really bad. You sit in front of the computer every day and read a file. This is not good for me at all. I'm totally disappointed to read the content ..."

Problems Related to Professors and Department of Education

The most important concerns that students acknowledged during the interviews were the codes related to professors and the university's Department of Education (A department in Iran that is located inside the universities and oversees the educational processes the order of classes and the performance of professors), which have 4 sub-themes as follows:

a. The Way the Professors Teach

The formal tone of professors in virtual classes and the fast pace of their teaching cause the students to be discouraged and show little desire to follow the materials presented by that professor. The statements of participants 2 and 8 reflect this fact.

"... if the teacher uses a better tone and is a little more intimate when he teaches, I will understand the lesson very easily ..." (P2).

"... we had a teacher who only read from the source books to us. His speed when reading this material was so fast that we could not even understand what he was saying ..." (P8).

b. Quality and Quantity of Assignments

Failure to assign homework for teaching sessions will prevent students from studying the material presented in that course; likewise, assigning homework that is unrelated to the teaching sessions will discourage them. Participant 3 mentioned that:

"... The homework, of course, was not enough for us. For example, we did not have any homework for surgical technologies at all. This led us to stop studying during the term and everything was left for the night of the exam, which made our work very difficult. Some professors, like the foreign language teacher, gave homework that was not related to his teaching sessions and that really took our energy when studying the foreign language ..."

c. Professor's Teaching Content

The incompleteness of the content of the professors' files and their failure to take into account the educational needs of students have caused confusion for the students; the statements of participant 1 reflect this issue. This participant has been a student of operating room nursing only for two semesters; since new students are less familiar with the university environment and are taking their prerequisite courses, the incompleteness and incoherency in the educational files can cause confusion and difficulty in their understanding.

"... The teachers' files seemed to be somewhat incomplete. When I read the content from the book, I understood it better than when I read it from the teachers' files. Sometimes, the text of the book was more coherent, at least to me. But, when the professor himself was teaching the content, he missed some parts, and his teaching was not coherent; it was really annoying for me and made me confused ..." (P1).

d. Professors' Work Order

Failure to hold classes regularly and not uploading the educational files according to the curriculum set by the university's Department of Education will cause students to lose interest in attending classes or following their content. On the other hand, it is the duty of the Department of Education to follow up on the holding of classes, and the repetition of the codes related to professors' work order reveals the managerial weakness of the Department of Education. In this regard, participants 3 and 7 asserted that: *"... our classes were not held on time and, sometimes, its cancelation was announced half an hour before the class; this made us lose that little bit of enthusiasm that we had, and the Department of Education did not even care to follow up on whether the classes were held on time or not at all ..."* (P3).

"... we had a professor who made well-ordered PowerPoints beforehand and uploaded them at a certain time; he uploaded all the files either at the beginning of the semester or at regular intervals. Somehow, he was moving forward with a plan and this was better for us; we could learn more comfortably ..." (P7).

Problems Related to Students

Other problems that were expressed by the participants in this study were related to the students themselves. Following the virtualization of education in universities, some students have become engaged in other tasks, which in turn has filled their time and made them pay less attention to their lessons and studies. On the other hand, according to the participants, the possibility of cheating in virtual exams has made the students be less interested in studying; they prefer to think of cheating ways instead of studying their taught lessons when having virtual exams.

a. Engagement in Extracurricular Activities

Due to the virtualization of universities, students have

found a lot of free time; this has led to an increase in their extracurricular activities, indicating that students have now less time to study. Participant 3 pointed out this issue.

"... now that it's virtual, extracurricular activities have increased. For example, I personally go to work and find little time to study ..."

b. Possibility of Cheating on Exams

The lack of proper facilities to control and monitor students in virtual exams has made it easy for them to cheat on virtual exams held after the completion of the relevant virtual course. This reduces the motivation of students to study and leads to less knowledgeable or illiterate students. Participant 3 mentioned this matter.

"... The existence of the possibility of cheating reduces our motivation to study. For example, I know that I have an exam the day after tomorrow and I know that I am going to take the exam with my friend; therefore, I arrange to study only half of it and my friend studies the other half. Hence, this makes our motivation to study disappear ..."

Discussion

This qualitative study aimed to explain the effectiveness of virtual learning in the field of operating room nursing using a content analysis method. The results of the study were divided into four main themes, including technical and communication problems, effective environmental factors, problems related to professors and the Department of Education, and problems related to students.

Technical and communication problems are one of the main categories of this study. In their study, Bakouei et al (15) concluded that hard and software problems are among the problems that students have to deal with. The students were suffering from the problem of connecting and disconnecting the internet, the difficulty of uploading and downloading files, and the structural and technological problems of the Navid system. In our study, students also discussed the problems in the virtual education system. The findings of this study demonstrated that the high number of students in virtual classes reduces the effectiveness of these classes. In this regard, Jafari et al (16) evaluated the lived experiences of students from educational justice in virtual education and found that due to the high number of students, the professors cannot deal with the problems of each of them. Adnan and Anwar (17) also reported that virtual education does not have the desired effect in countries that have problems accessing the Internet.

In our study, students talked about environmental factors affecting virtual education. They complained about the lack of a negative impact in the face-to-face educational atmosphere of the university and described the atmosphere of virtual education as highly dull and soulless. In this regard, Jafari et al (16) indicated the lack of real interaction during virtual education. Their findings revealed that the interaction between professors and students, as well as the interaction between students and the content, is extremely

fragile and short, which has reduced the effectiveness of virtual education.

Another problem that the students expressed in this research was the one related to the professors and the education department of the university. They were dissatisfied with the teaching style of some professors, the quality and quantity of assignments, the educational content, and the work routine of some professors. In this regard, Bakouei et al (15) stated that some professors do not have enough skills for virtual teaching due to their lack of familiarity with virtual education and virtual education systems. They evaluated the files uploaded by professors as incomplete with high volumes. Moreover, they were unhappy with the reading of the material by the professors. Jafari et al (16) reported content problems in virtual education. The high volume of content provided by professors and the old and outdated nature of this content were among the problems of virtual education.

The fourth and last category was student-related problems. Students mentioned that with the non-attendance of universities, they have devoted more time to miscellaneous work, and because of the ease of cheating in virtual exams, they have no desire to study. In this regard, Bakouei et al (15) admitted that the lack of planning by the student, which happened due to the change in the student's lifestyle, causes the student to move away from the content provided by virtual education. Additionally, the invalid evaluation by the professors and non-observance of the exam criteria by the students themselves have reduced the desire of the students to learn through virtual education. In their study, Sadeghi Mahali et al (18) pointed out challenges related to the virtual education process. Lack of proper concentration and mental confusion due to stimuli such as virtual space attractions and other websites have been mentioned as problems faced by students.

In another study, Wilcha (19) investigated the effectiveness of virtual medical education in the coronavirus epidemic. He stated the positive points of medical education, including improved teamwork skills to strive for a collective goal. In addition, students felt empowered and enthusiastic and indicated that they felt a sense of purpose during the uncertain period of the pandemic. Further, students could work in environments that provide access to educational materials, increase their responsibility, and create internal motivation, the interaction between clinical instructors, active medical students, and passive medical students. Finally, these environments could provide the possibility of immediate feedback. His findings contradict those of our study. Thus, performing this research in a different place and on a different target group can explain these differences.

Strengths and Limitations

Sampling took a long time due to the implementation of this project during the coronavirus disease 19 pandemic, the absence of all students in the university environment, and the unwillingness of students to conduct interviews.

Conclusion

In general, this study sought to explain the effectiveness of virtual education, and the findings demonstrated that the problems of virtual education are either from students and professors or from the university itself and the system used for virtual education. To improve the quality of e-learning, we must pay attention to problems that may arise from students, professors, or the policies of the university itself. Depending on the policies of each university and the unique problems associated with it, the problems of virtual education may be different in different universities; therefore, more studies should be performed to reach more comprehensive solutions.

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Authors' Contribution

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Competing Interests

The authors declare no conflicts of interest.

Ethical Approval

The present study was reviewed at Hamadan University of Medical Sciences and was approved with the ethics ID of IR.UMSHA. REC.1400.765. Written informed consent was obtained from the participants prior to their participation in the study. Maintaining anonymity, confidentiality of information, and the right to withdraw during the study were considered. The time and the place of the interviews were arranged according to the will of the participants. This study followed the EQUATOR SRQR guidelines for its qualitative research.

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