

Explaining Faculty Members' Perceptions of Virtual Learning Based on Various Types of Educational Interactions During the Coronavirus Disease 2019 Outbreak: A Qualitative Content Analysis

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Abstract

Background: Given that interaction is a vital element in virtual learning, using the professors' experiences and perceptions during the coronavirus disease 2019 (COVID-19) outbreak can provide useful information about the quality of educational interactions in virtual learning courses in order to improve virtual learning.

Objectives: This study aims to explain the perceptions of faculty members of Kerman universities regarding virtual learning based on educational interactions during the COVID-19 outbreak.

Methods: This study was conducted with a qualitative content analysis approach in the academic year of 2021 in Kerman University of Medical Sciences and Shahid Bahonar University of Kerman. The data collection method was semi-structured interviews with 13 professors of these universities who were included in the study using purposive sampling. Data analysis was performed using the qualitative content analysis method according to the steps introduced by Graneheim and Lundman.

Results: The results of this study were presented in the form of 4 main themes: 1) Teacher-learner interactions, including the tools used, how they interact, and their barriers; 2) Learner-learner interaction, learner-content interaction, and teacher-content interaction, including the professors' actions to create and increase them; 3) Teacher-teacher interactions, including professors' instructional and research interactions and their barriers; 4) Content-content interaction, which the findings indicated that professors did not pay much attention to this type of interaction.

Conclusion: Virtual learning is not limited to the COVID-19 outbreak period but can be used as a supplement to face-to-face learning, even when the universities reopen; therefore, valuable experiences of professors of virtual learning can be used to strengthen various types of educational interactions and develop virtual learning in the studied universities and other universities.

Keywords: Perception, Virtual learning, Educational interaction, Qualitative approach, COVID-19

Background

The coronavirus disease 2019 (COVID-19) pandemic, as a severe acute respiratory syndrome, which began in mid-December 2019 in Wuhan, China, has gradually spread to all countries of the world. On January 30, 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a public health emergency (1). According to the WHO report, 229,858,719 people have been infected with the disease in the world so far (September 23, 2021) due to the COVID-19 crisis, of which 4,713,543 have died. In Iran, 5,477,229 people have been infected with this disease so far (September 23, 2021) and of these, 118,191 have died (2).

The COVID-19 pandemic has caused damages to various economic, social, and cultural sectors. Education, as one of the most important national functions, has been severely affected by the current crisis (3). Due to the high population of students, the density of classrooms, the use of public and common spaces, and the high probability of the virus transmission through

this group to the community, care and control of educational spaces have been among the first measures of countries with this disease (4). Following the outbreak of this virus in Iran, schools and universities were closed from the first week of March 2019, and this closure has continued until now, September, 2021. However, the government's policy during the holiday period has been that "schools and universities are closed, but teaching and learning are not closed." Accordingly, one of the most important and serious programs proposed by the education department and also higher education department is the issue of virtual learning. Virtual learning has profoundly affected teaching-learning methods because it has provided a large number of learning resources in the form of video, text, audio and video, etc. through the Internet (5). Virtual learning provides the use of new multimedia technologies and the Internet to enhance the quality of learning through access to resources and services, as well as distance exchange and collaboration (6). This electronic

technology can include a course, a program, or even an online lesson (7), which is led by an instructor, has a specific program, and is performed in a learning management system (8). Virtual learning environments are web-based software systems that enable learners to interact with their instructors and classmates, access learning resources without time and space constraints, and use advanced communication and information technologies (9-10). Therefore, it can be said that flexibility is the most important advantage of virtual learning (11). Learning in a virtual space, due to its special features, can help reduce many current teaching-learning problems, including time management, cost reduction, greater efficiency, increased motivation, increased contact with the learner, teamwork opportunities in multimedia environments and electronic conferences, unlimited access, and sufficient space and time resources to interact with a large number of learning applicants (12).

Interaction and its tools have been mentioned as one of the ten main requirements for the development of virtual learning (13). Interaction is recognized as a core theory in distance learning research (14-15) and is the core of the learning experience (16). Regarding interaction in virtual learning environment, interaction has been defined as a two-way process of active and engaging communication between participants with the possibility of manipulating, reflecting, exchanging, and sharing content through various facilities and tools simultaneously and asynchronously to achieve the desired goal (17). According to Moore (1989), learning is based on three types of interaction: Learner-learner interaction, learner-content interaction, and teacher-learner interaction. According to Anderson (2004), in order to create interaction, three elements of student, professor, and content are needed. These three elements can create six types of interactions in relation to each other: 1- Learner-learner interaction, 2- learner-content interaction, 3- teacher-learner interaction, 4- teacher-teacher interaction, 5- teacher-content interaction, and 6- content-content interaction (18). Learner-learner interaction is a type of communication that is defined as “the interaction between a learner and other learners, alone or in a group environment, with or without the presence of a coach in real time” (19). Learner-content interaction is the time the learner spends with the content of a course or topic being studied, such as reading books or textbooks, browsing PowerPoints and web pages, or watching movies (20).

Teacher-learner interaction refers to the relationships and interactions between professor and student and to actions such as referring to the professor

during office (and non-office) hours and asking him/her for help (21). It also includes how to motivate learners, providing information, providing feedback, and support and encouragement to learners (8). In explaining the teacher-teacher interaction, Anderson refers to the mutual communication and cooperation of professors to expand and update their knowledge, especially in complex areas. Teacher-content interaction refers to the production and use of content by the professor. Garrison and Anderson (2003) have mentioned content preparation as one of the main roles of the professor in distance learning. Content-content interaction is the newest, most abstract, and most subtle type of interaction, in which, by using information and communication technology and artificial intelligence, content is able to automatically interact with other computer information sources, find and update new scientific content related to itself, and inform the professors and students of the updated content after its changes have reached an acceptable level (22).

Given the importance of interaction in learning and its role in virtual learning environments, numerous studies have been conducted in this field so far (8, 19, 23-28). Since professors and instructors in virtual learning, like other types of learning, have a very special place, they can provide the audience with useful information regarding the quality and efficiency of the educational course; however, in reviewing the conducted studies, there was no research that comprehensively examines and analyzes the experiences and perceptions of faculty members of virtual learning based on various types of educational interactions. Therefore, using a qualitative approach, this study deals with identifying faculty members' experiences and perceptions of virtual learning based on various educational interactions during the COVID-19 outbreak and while recognizing existing and potential limitations and harms, proposes solutions to help its trustees amend the current situation and move in the direction of a possible and desirable situation.

Objectives

Considering that virtual learning is currently provided in Kerman universities due to the COVID-19 outbreak and faculty members are experienced in using it, better results can be achieved based on their views. This research is an applied study conducted to identify the experiences and perceptions of faculty members of Kerman universities of virtual learning based on various educational interactions during the COVID-19 pandemic period.

Methods

This qualitative study was conducted using the content analysis approach in 2021. Data collection was performed in Kerman universities (Kerman University of Medical Sciences and Shahid Bahonar University of Kerman) and the data collection method was semi-structured interviews with faculty members of the mentioned universities. Interview questions and interview guides were developed by reviewing the theoretical literature. The interview was conducted using the interview guide, i.e., a list of written questions and topics that should be followed in a specific sequence, but if interesting topics are raised during the interview, the researcher is free to ask unpredicted questions. Purposive sampling was used to select participants in order to use the experiences of key and effective individuals who had the most information about the method of educational interactions in the virtual learning environment. In this regard, knowledgeable and experienced individuals in virtual learning, who were willing to express their perceptions and experiences in the field of educational interactions in the virtual learning environment, were asked for help. Having an executive background or related articles in the field of education was the criterion for selecting participants. At the end of the interview, they were also asked who they knew that could help the researchers in this regard. Sampling was performed gradually until the data saturation. Prior to the interview, due to the existing conditions (the COVID-19 pandemic), participants were contacted by phone and the study objectives were explained to them. In order to comply with ethical considerations, principles such as obtaining permission, observing the principles of confidentiality, maintaining anonymity, and the participants' right to leave the study were observed. After agreeing to the face-to-face interview (in accordance with health procedures), necessary arrangements were made for the time and place of the interview, and the interviews took place in any place suggested by the participants, including their office at the university. Participants' consent was recorded orally at the beginning of the interview. Also, with their permission, the transcripts of the interviews were recorded for more detailed analysis, and the manuscripts were then approved by the participants. Interviews ranged from 40 to 50 minutes. After 13 interviews, data saturation was obtained. Data analysis was performed using the qualitative content analysis method according to the steps introduced by Graneheim and Lundman (29) in such a way that after the interview, the conversation text was implemented from the recorded file and reviewed several times, and

each interview was coded. The texts of the interviews were analyzed after several careful readings as an open coding system to produce the first categories. For this purpose, the text of each interview was initially divided into semantic units and in the next step it was summarized and converted into codes. Different codes were compared based on their differences and similarities and classified into categories. MAXQDA software was used for this purpose. In order to strengthen the analysis validity, the researchers discussed and revised the primary categories to arrive at the themes. There was a process of feedback and discussion among researchers on how to categorize and organize the codes. Important concepts were categorized by examining through repeated reading and abstracting of meanings to ensure that information about the categories was not omitted. Simultaneous data analysis, key participant selection, the use of time integration, continuous monitoring and observation, and accurate and in-depth description and review of observers were used to increase the data validity and acceptability. For the data acceptability, Guba and Lincoln's (1994) four criteria, including credibility, confirmability, dependability, and transferability (30), have been constantly considered by researchers. Despite devoting enough time to collecting data, communicating well with participants, conducting interviews at participants' chosen locations, reviewing the extracted codes by the participants (codes extracted from participants' conversations were given to them and they were checked for the correct interpretation of their sentences), re-reading the extracted codes by other colleagues and concluding and summarizing with the agreement of the researchers and the approval of a supervisor outside the research, an attempt has been made to achieve them. In order to transmit the findings, participants' quotes were presented as stated. This research was reviewed in the ethics committee of Shahid Bahonar University of Kerman and has been accepted with the ethics code of ID IR.UK.REC.1400.025.

Results

The participants of the present study were 13 faculty members of Shahid Bahonar University of Kerman and Kerman University of Medical Sciences. In terms of gender, the faculty members of Kerman University of Medical Sciences were 1 woman and 6 men, and the faculty members of Shahid Bahonar University were 4 women and 2 men, all with at least 5 years of teaching experience. The participants of Kerman University of Medical Sciences were from the departments of statistics and epidemiology, health education, health information (virtual learning), and medical education. Also, the

participants of Shahid Bahonar University of Kerman were from the departments of educational sciences, computer, agriculture, mathematics, and law. The analysis of data obtained from the interviews with participants led to the extraction of 6 components, 26 categories, and 95 subcategories.

Question 1: What are the faculty members' experiences and perceptions of learner-learner interactions in virtual learning during the COVID-19 outbreak period?

In general, in-depth analysis of faculty members' perspectives led to the identification and classification of faculty members' actions to create and increase interactions between students in order of the frequency of the obtained responses. These actions include 9 categories, which are classified in Table 1. Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants' statements in the research regarding learner-learner interactions are as follows:

Interviewee Code 1: "I usually perform grouping in all my classes and give projects to the students and I am aware of their interactions; for example, for one of my master's degree lessons, considering the system capabilities, I designed four rooms in the system and divided the students into four groups. In these rooms, the students of each group interacted with each other, and it was possible for me to move between the rooms and monitor the students' activities."

Interviewees Code 2, 5, 10, 13: "I use the group discussion method and students consult with each other

in groups, but due to the low speed of the Internet and the weakness of the systems, it was not face-to-face."

Interviewees Code 3, 4, 13: "Sometimes, I give homework individually and ask students to score each other's work."

Interviewees Code 3, 8, 13: "Using the forum, I encourage students to stay in touch."

Interviewee Code 1: "I am sure that among my students there are individuals who know other students in our field of study at other universities. I can encourage my students to coordinate with those students and give them the class link so that they can come to our class for one session and explain to us what resources they have for a particular course at their own university and how the professor teaches; this is called the same 'network interactions' that students create in a network."

Question 2: What are the faculty members' experiences and perceptions of learner-content interactions in virtual learning during the COVID-19 outbreak period?

After analyzing the data obtained from the interviews, in order of the frequency of the obtained responses, it was found that in faculty members' perspectives, professors and students should take some actions to increase the learner-content interaction. The actions of faculty members to create and increase learner-content interactions include 2 categories and 11 subcategories, which are classified in Table 2. Excerpts from the transcripts of the interviews are presented in the following as evidence.

Table 1. Faculty members' experiences and perceptions of learner-learner interactions in virtual learning during the COVID-19 outbreak period

Component	Category
Faculty members' actions to create and increase learner-learner interactions	Considering a group project for students
	Using participatory teaching methods such as group discussion
	Evaluating each student's individual work by his/her classmates
	Raising questions in the virtual classroom system discussion forum
	Raising questions by students in the WhatsApp group
	Encouraging students to critique each other's opinions
	Asking and answering questions by the student from his/her classmates in the online class
	Encouraging students to engage in network interactions
Involving students as a group in the production of electronic content	

Table 2. Faculty members' experiences and perceptions of learner-content interactions in the virtual learning environment

Component	Category	Subcategory
Faculty members' actions to create and increase learner-content interactions	Actions that should be taken by the professor	Holding the final exam in the virtual classroom system
		Holding midterm exams in the virtual classroom system
		Putting an exercise or question in the system
		Holding an oral exam along with activating the webcam during the course
		Introducing practical resources to students
		Uploading course materials on the system or the WhatsApp group before holding an online class

	Actions that should be taken by the student	Engaging students individually or in groups in preparing electronic content and presenting lessons in the online classroom
		Performing a project or research or practical work individually or in a group
		Doing homework
		Analyzing a movie or a book
		Using the recorded files of each session in the system by the students

The participants' statements in the research regarding learner-content interactions are as follows:

Actions that should be taken by the professor

Interviewees Code 3, 12: "For some theory courses, I consider the midterm exam in the form of open book, allowing the student to interact with the content."

Interviewees Code 1, 2, 6, 8, 9: "I define exercises in the system. This connection is established by giving the exercise, and because the exercise is basic, the student has to read the previous 5 or 6 sessions to be able to answer that task."

Actions that should be taken by the student

Interviewees Code 1, 3, 4, 5, 6, 9: "I ask the students to use up-to-date articles and present them in the class."

Interviewees Code 1, 2, 3, 11, 12: "For some lessons, there is practical work that the student has to do individually or in groups, all of which requires the student to read a lot to be able to answer."

Interviewees Code 6, 10: "Since class sessions are recorded in the system, students can use this capability of the system and listen to the course content of each session whenever they want."

Question 3: What are the faculty members' experiences and perceptions of teacher-learner interactions in virtual learning during the COVID-19 outbreak period?

In general, in-depth analysis of faculty members' perspectives, in order of the frequency of the obtained responses, led to the identification and classification of the tools used by the faculty members to interact with students, which include 3 categories and 11 subcategories. Faculty members also consider how to interact with students, including 2 categories of academic and extracurricular interactions. These items are classified in Table 3. Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants' statements in the research regarding teacher-learner interactions are as follows:

Tools used by professors to interact with students

Interviewee Code 11: "I use Skyroom for online education and Navid for offline education to upload content and exams."

Interviewees Code 1, 2, 3, 4, 5, 7, 8, 9, 12, 13: "The main backup alongside the Ims system is the groups we have created in WhatsApp."

The way of teacher-learner interactions

Academic Interactions

Interviewees Code 2, 5, 9: "I use reverse learning, i.e., I identify a topic and the students study at home and then we do our homework and troubleshoot the problems the next session in the class."

Interviewee Code 10: "Interaction is audio and through a microphone or written via Google forums."

Table 3. Faculty members' experiences and perceptions of teacher-learner interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Tools used by teachers to interact with students	Academic systems	Ims, Skyroom system, Adobe Connect, Mobin system, Navid system, GoogleMit
	Non-academic tools	Email, phone call and Skype
	Social networks	WhatsApp and Telegram and creating groups and channels in them
How to do teacher-learner interactions	Academic interactions	Answering students' emails and phone calls, answering students' messages on social media, sending assignments by students to WhatsApp groups and giving positive and encouraging or corrective feedback to students as soon as possible, asking and answering questions in the system and calling students' names to answer the questions, using the reverse learning method and troubleshooting in each session, raising the hand by the student in the system to answer the questions, presenting some of the class topics by the students in the system, asking for students' views orally through a microphone or text in the chat room of the system about lesson topics, using Google forums for textual interactions, changing the role of the student to the role of professor and managing the class by him/her at the professor's request
	Extracurricular interactions	Activating students' microphones and talking to them, greeting and roll calling in the system and communicating face-to-face with students if possible, asking students' views for expressing their suggestions and criticisms to increase the quality of classes, expressing humor issues and joking with students during their rest time in the system

Extracurricular Interactions

Interviewees Code 1, 3, 10, 13: “The first session is face-to-face and in most sessions I greet students for a quarter of the time.”

Also, after analyzing the data obtained from the interviews, it was found that in faculty members’ perspectives, the most important factors that prevent good and complete interaction with students include four categories: Issues related to 1- learner, 2- teacher, 3- infrastructures, and 4- university planning. These categories have 20 subcategories classified in Table 4. Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants’ statements in the research regarding the barriers to teacher-learner interactions are as follows:

Learner-Related Issues

Interviewees Code 2, 5, 8, 9: “Students’ lack of interest and motivation, which causes them not to communicate and not to comment.”

Interviewees Code 2, 3, 8, 11: “I did not interact with some students because they say ‘we do not have a system’ perhaps because they cannot afford the purchase.”

Interviewees Code 1, 13: “Student’s refusal to turn on the webcam, so it must be culturalized.”

Teacher-Related Issues

Interviewees Code 7, 8, 10: “In the field of human resources, our experience as professors is very low in virtual learning.”

Interviewee Code 3, 8, 9: “Sometimes, feedback is delayed due to busy schedule and makes students reluctant to interact.”

Interviewee Code 8: “Sudden shifting from face-to-face learning to virtual learning has made it difficult for professors to adapt, especially to older professors.”

Interviewee Code 10: “In simultaneous classes, the interaction problem is that the instructor is still the only speaker; so if the instructor is not trained to conduct online classes, he/she will have trouble interacting with the student.”

Infrastructure-Related Issues

Interviewees Code 1, 2, 3, 4, 5, 6, 7, 9, 11, 12, 13: “University and country infrastructures and low-speed Internet are not adequate for the virtual learning system.”

Interviewees Code 1, 2, 3, 6, 8, 9, 11, 12, 13: “When all the webcams are on, it indicates that we have simulated a face-to-face class in a virtual learning environment. I have tried several times to have a video class, but as soon as the camera is activated, the internet speed drops sharply and we log out.”

University Planning-Related Issues

Interviewees Code 2, 3, 6: “I think the virtual learning process should be in such a way that there are fewer students in the class, but it is not.”

Interviewee Code 3: “The large number of courses available to students leaves no time for them to interact. Class time is also important. Experience shows that early morning classes are not very well attended by students.”

Question 4: What are the faculty members’ experiences and perceptions of teacher-teacher interactions in virtual learning during the COVID-19 outbreak period?

In general, after in-depth analysis of faculty members’ perspectives, it was found that professors interact with colleagues inside or outside the university or abroad in relation to three categories of academic issues, research issues, and various issues that the amount of these interactions differ in professors’ views. Also, after analyzing the data obtained from the interviews, it was found that there were factors that prevented good and complete interaction of faculty members with their colleagues, involving 12 subcategories. These items are classified in Table 5.

Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants’ statements in the research regarding teacher-teacher interactions are as follows:

Interaction with colleagues inside the university

Interviewee Code 3: “I have good relationships with colleagues inside the university. For example, when a colleague is more experienced in a particular field, I try to invite him/her to a meeting to discuss that issue in my class.”

Interviewees Code 3, 11, 12: “We have research relationships with colleagues inside the university.”

Interviewee Code 10: “I hold educational technology web conferences at the university, and my colleagues use these courses.”

Table 4. Faculty members’ experiences and perceptions of the barriers to teacher-learner interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Barriers to teacher-learner interactions	Learner-related issues	Low student motivation
		Students’ economic problems
		Low student experience
		Lack of proper culture building for establishing visual communication by the student
		Students’ feeling alienated from systems
		Low student self-esteem
		Social isolation
		The problem of learners’ adapting to technology
		Ignoring the professor’s privacy by the student
	Teacher-related issues	Low professor experience
		Professors’ busy schedule and lack of timely feedback to the student
		Professors’ feeling alienated from systems
		The problem of professors’ adapting to technology
		Lack of necessary training for professors in the field of holding virtual classes
	Infrastructure-related issues	Disruption of technology
		Weakness of university systems
		Compatibility issue
	University planning-related issues	Large number of students in the class
		Many student courses
Class time		

Table 5. Faculty members’ experiences and perceptions of teacher-teacher interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Faculty members’ experiences and perceptions of the teacher-teacher interactions	Interaction with colleagues inside the university	Academic interaction
		Research interaction
		Interaction regarding various issues
	Interaction with colleagues outside the university	Academic interaction
		Research interaction
		Interaction regarding various issues
	Interaction with colleagues abroad	Academic interaction
		Research interaction
		Interaction regarding various issues
	Barriers to teacher-teacher interaction	Professors’ busy schedule
		Lack of recognition and access to colleagues in other universities
		Lack of proper culture building to interact with colleagues
		Lack of regular attendance of professors at the university or virtual meetings
		Lack of professors’ awareness of the need to interact with colleagues
		Rejection of interaction by colleagues
		Weakness in doing teamwork
		Difference in interests
		Low colleagues’ self-esteem
		Newness of virtual learning
Feeling uncomfortable when asking questions from colleagues		
University atmosphere		

Interaction with colleagues outside the university

Interviewee Code 1: “I think virtual learning is the best opportunity to invite not only academic colleagues but also colleagues from other universities to come to our virtual classroom for half an hour and give explanations on a topic they specialize in.”

Interviewees Code 3, 12: “We have mostly research interactions with colleagues outside the university.”

Interviewee Code 6: “Tarbiat Modares University has set up a panel in our field and they give very good lectures twice a month. There are also other panels at Lorestan

University, Sari University, Ahvaz University, and Tabriz University, and the members are indeed formed together.”

Interaction with colleagues abroad

Interviewee Code 8: “I use the experiences of professors abroad. For example, I got all resources of one of my lessons that a friend of mine was teaching abroad.”

Interviewees Code 3, 11, 12: “Most interactions with colleagues abroad is in research fields.”

Interviewee Code 13: “Now that learning has become virtual, the conferences and webinars are not dedicated to

a specific university and all can attend the webinars all over the country or abroad.”

Barriers to teacher-teacher interaction

Interviewees Code 1, 2, 3, 9, 13: “Too much busyness prevents us from interacting with colleagues.”

Interviewees Code 2, 5, 11, 12: “Lack of recognition and access to colleagues who teach the same courses as I am teaching and who serve at other universities in different cities are among barriers.”

Interviewees Code 1, 11, 13: “Interaction with colleagues should be culturalized. It would be great if, for example, I could invite four of my colleagues from different universities in different cities to my class.”

Interviewees Code 7, 8, 11: ‘Lack of regular attendance of professors is a barrier.”

Interviewees Code 2, 7: “Maybe we were not looking for it ourselves and do not know the need for it.”

Interviewees Code 7, 8: “Some people think that we should not interfere with the work of faculty members unless that person is a flexible one.”

Interviewee Code 10: “One of the reasons is the special atmosphere that exists in our educational environments; the lack of security and the fear that exists, makes most professors reluctant to cooperate with each other on educational issues.”

Question 5: What are faculty members’ experiences and perceptions of content-content interactions in virtual learning during the COVID-19 outbreak period?

After analyzing the data obtained from the interviews, it was found that faculty members did not pay much attention to the content-content interaction. Most participants acknowledged that it was the first time that they had been exposed to this type of interaction.

The participants’ statements in the research regarding content-content interactions are as follows:

Interviewee Code 2: “We need to be more up-to-date about virtual learning. If there are certain ways which we can learn to have all types of interaction, especially content-content interactions, I think we do not have it at all.”

Interviewee Code 3: “Sometimes, I give a link to a movie while presenting the content so that the students can fully understand the story.”

Question 6: What are faculty members’ experiences and perceptions of teacher-content interactions in virtual learning during the COVID-19 outbreak period?

In general, in-depth analysis of faculty members’ perspectives, in order of the frequency of the obtained responses, led to the identification and classification of two categories, including faculty members’ actions to select content and preparing electronic content, consisting of 17 subcategories. These are classified in **Table 6**.

Excerpts from the transcripts of the interviews are presented in the following as evidence.

The participants’ statements in the research regarding teacher-teacher interactions are as follows:

Table 6. Faculty Members’ experiences and perceptions of teacher-content interactions in virtual learning during the COVID-19 outbreak period

Component	Category	Subcategory
Faculty members’ actions for teacher-content interactions	Professors’ actions to select the course content	Identifying books
		Referring to the course title
		Reviewing up-to-date and practical articles and resources
		Checking sites and forums
		Surveying students to select content
		Content selection based on the student level
		Referring to study resources abroad
		Using other professors’ pamphlet
		Consulting with colleagues
		Professors’ actions to prepare electronic content
	Preparing electronic content in the form of videos or photos	
	Using pdf files	
	Preparing electronic content by students	
	Using electronic content prepared by colleagues	
	Using Storyline software to prepare electronic content	
	Using SCORM software to prepare electronic content	
	Participating in educational courses abroad and using their content	

Professors’ actions to select the course content

Interviewee Code 4: “We have a topic, but virtual learning tells us to change some parts of the topic, especially the practical parts.”

Interviewees Code 3, 6, 10, 11, 13: “I will mostly use newer and more practical articles to select the course content.”

Interviewee Code 3: “One semester, the first session, I asked the students if I introduce a book or specify titles that each session one person presents as conference.”

Interviewee Code 8: “I assess the students’ level at the first session with questions and answers and then, accordingly, I select the introductory or advanced content.”

Interviewee Code 9: “I refer to course resources abroad.”

Interviewee Code 9: “I use other professors’ pamphlets.”

Interviewee Code 11: “I talk mostly with colleagues.”

Professors’ actions to prepare electronic content

Interviewees Code 2, 3, 4: “I entrust the preparation of electronic content to students (individual or group) so that each session one person or one group presents it.”

Interviewee Code 10: “When the content is designed as software and as SCORM (multimedia content), this type of content is completely interactive and it is as if the instructor is teaching in the classroom. In addition, the instructor takes an exam from the student and shows the results to the student, gives feedback, and as a result, like a software instructor, can do all the work of an instructor in a real environment.”

Interviewee Code 8: “I have added educational courses abroad to my curriculum.”

Discussion

After analyzing the data obtained from the interviews, it was found that the faculty members of Kerman paid attention to various educational interactions, including teacher-learner interaction, learner-learner interaction, learner-content interaction, learner-content interaction, and teacher-teacher interaction. Also, they have taken steps to improve and increase various types of educational interactions but the amount of these interactions is different from the perspective of each faculty member. It is worth noting that professors have not paid much attention to content-content interactions.

The findings of the present study on faculty members’ experiences of the learner-learner interaction in a virtual learning environment showed that faculty members took actions to create and enhance interactions between students, the most important of which are: Considering a group project for students, group discussion, and evaluating each student’s individual work by his/her classmates. These findings are consistent with the results of studies by Kuo et al. (2014) (31), Gasell (2020) (8), Rahmanian et al. (2020) (28), Salmi (2013) (32), Kurucay et al. (2017) (21), and

Mendis et al. (2016) (33). According to this research, group discussions create opportunities for participation, knowledge sharing, and social interaction with peers. Students also love group activities because they can break the whole work into small pieces; therefore, doing homework is more controllable for them. The point to consider in group activities is work division. Although work division is one of the benefits of group activities and creates interaction between students, it does not necessarily help improve students’ learning, so online course instructors should ensure that each group member participates equally in group activities and they are engaged in all stages. Making the reports visible for all students and asking the students to give feedback to the reports of other teams is also a way to get more students involved in work and help each other.

The findings of the present study on faculty members’ experiences of learner-content interactions in a virtual learning environment showed that in order to create and enhance student-content interactions, faculty members took actions such as placing exercises or raising questions in the system, uploading course materials on the system or a WhatsApp group before holding an online class, and introducing applied resources to students. Also, by considering assignments for students such as preparing electronic content and presenting it in the class, performing a project or research or practical work individually or in group, doing homework, analyzing a movie or a book, and using the recorded files of each session, faculty members contribute to greater learner-content interactions. These findings are consistent with the results of Paiva et al. (2016) (34), Ekwunife et al. (2014) (35), Mendis et al. (2016) (33), and Emmah’s (2014) (36) studies.

According to these studies, the measurement amount of learner-content interactions is the number of downloaded and seen videos, and the number of problems solved by students. Lecture recording is also an important medium for increasing conversation in distance learning environments. In addition, access to lectures is a form of access to lesson content that highlights the importance of the learner-content interaction in the virtual learning environment. The links available in the virtual learning environments provide students with the opportunity to upload and download files and course materials so that they can download, see, and study the materials and interact with their course content. The results of this study are inconsistent with that of Rossi et al.’s (2013)(37) study. They believe that the design features of virtual learning environments are in favor of content-learner interactions. In other words, it is wrong to overemphasize the content-

learner interaction in these environments, and it is better to allow learners to interact with other learners in these environments.

The findings of the present study on faculty members' experiences of teacher-learner interactions in the virtual learning environment showed that professors used tools such as academic systems, non-academic tools, and social networks to interact with students. Regarding these tools, these findings are in line with the results of studies by Ustati et al. (2013) (38), Gasell (2020) (8), and Yazdani Kashani et al. (2013) (39). Based on these studies, in terms of usability, LMS has been perceived as a good platform for obtaining information about content and receiving feedback from instructors and creating teacher-learner interactions. There are also seven different communication tools that facilitate online interaction between learners and teachers, including email, talk page, bulletin board, blog, audio/video playback, chat, and web-conference. Social networks also provide the necessary contexts for the design and implementation of a virtual university with a focus on an interactive approach. Also, faculty members know how to interact with students, including academic and non-academic interactions.

These findings are consistent with the results of studies by Ustati et al. (2013) (38), Salmi (2013) (32), Kuo et al. (2014) (31), Paiva et al. (2016) (34), and Gasell (2020) (8). According to these studies, in order to increase academic interactions, instructors should try to regularly post questions on discussion pages, answer students' questions as soon as possible, and give immediate feedback to students; also, the measurement criterion of teacher-learner interactions is the number of messages sent and received between professors and students. In addition, the best method for virtual learning is often an introductory discussion aimed at creating a sense of membership in the virtual learning environment, where students and instructor can introduce themselves and get familiar with others in the online class. Also, according to faculty members' statements, low student motivation and large number of students, weakness of university systems and disruption of technology, lack of necessary training for professors regarding holding virtual classes, and the problem of learners and teachers' adaptation to technology are some barriers that cause the interaction between the professor and student not be done well and completely. These findings are consistent with the results of studies by Pourjamshidi et al. (2013)(40), Sundari (2017)(41), Yengin et al. (2011)(42), Saeedipoor et al. (2015)(43), Gasell (2020)(8), and Kurucay et al. (2017)(21). According to these studies, the attitudes of professors

and students toward virtual learning and their sense of satisfaction increase their interactions with each other. Also, students' skill, trust, and motivation levels are among the elements that can affect how students communicate and interact with others in the classroom. The number of learners of the virtual course affects the teacher-learner interaction, and the higher the number of learners of a course, the less their interaction with the professor. The infrastructures and norms of the virtual learning system are among the factors affecting teacher-learner interactions. The online skill educational program has also been designed to help faculty members develop online courses and improve interactions in these courses, with professors receiving the advice and support of an experienced online instructor. Lack of instructors and students' ability to use technology has been stated as an important barrier to online collaboration; therefore, instructors and students should receive clear guidance on how to use technology to collaborate.

The findings of the present study on faculty members' experiences of teacher-teacher interactions in the virtual learning environment showed that faculty members interacted with colleagues inside or outside the university or abroad, with varying degrees of interaction from professors' perspectives. Regarding this type of interaction, the findings are consistent with the results of studies by Malekipour (2020)(44) and Nouri Motlagh et al. (2012)(45). According to these studies, professors should interact with their colleagues on issues such as how to teach and evaluate students in the classroom, sharing the latest achievements and new scientific methods in the curriculum area, and providing facilities and educational materials needed in the educational space. Also, audio or video conferences and webinars can provide face-to-face interaction and increase the interaction of professors with their colleagues.

According to the participants' statements in this study, the busy schedule of professors, lack of recognition and access to colleagues in other universities, lack of proper culture building to interact with colleagues, and lack of regular attendance of professors in the university or virtual sessions are some of the barriers that cause the teacher-teacher interaction not to be performed well and completely. These findings are consistent with the results of Zarei Zavaraki et al.'s (2013)(46) study. According to this research, the reason for low interaction of professors with other professors can be due to the fact that professors teach in virtual learning courses as online and virtually and rarely attend the educational center as in-person; as a

result, professors do not know each other, leading to reduced interaction between faculty members.

The findings of the present study regarding faculty members' experiences of content-content interactions in the virtual learning environment showed that faculty members did not pay much attention to content-content interactions. Regarding the content-content interaction, the findings are in line with the results of Zarei Zavaraki et al.'s (2013)(46) study. According to this research, the content-content interaction in the electronic curriculum of Khajeh Nasir al-Din Tusi University of Technology is at a lower than average level and not much attention has been paid to this type of interaction in the virtual learning environment. The content-content interaction discussion in virtual learning requires the development of technologies and interactive tools and the availability and adequacy of hardware and software infrastructures. Given the emergence of virtual learning courses in our country, it seems natural for faculty members not to pay attention to this type of interaction but virtual learning planners and administrators must do their best to improve and promote this type of interaction in virtual courses.

Findings of the present study on faculty members' experiences of teacher-content interactions in the virtual learning environment led to the identification and classification of faculty members' actions for selecting content and preparing electronic content. The most important actions include: Identifying books, referring to course titles, reviewing up-to-date and practical articles and resources, using PowerPoint software to prepare electronic content, preparing electronic content in the form of videos or photos, and preparing electronic content by students. Regarding preparing electronic content, these findings are in line with the results of Quadir et al.'s (2019)(19) study. According to this research, to ensure effective learning, instructors are recommended to use coloring, bulletins, links to other content, and multimedia educational materials such as video clips and PowerPoint in the content.

Conclusion

The findings of the present study showed that faculty members more or less pay attention to various types of educational interactions in virtual learning and have taken steps to increase and improve these types of educational interactions, but there are also barriers that prevent interactions from being performed completely and well. In this regard, some of those barriers can be mentioned in the following: Weakness of university systems, disruption of technology, lack of necessary training for professors in the field of holding virtual classes, the problem of teachers and students adapting to technology, students' economic problems, lack of regular

attendance of professors at the university or virtual sessions, and weakness in doing teamwork.

Therefore, suggestions for improving and increasing various types of educational interaction in the virtual learning environment are as follows: Designing an active space by professors during the course, university support for professors, holding workshops for professors and students, upgrading infrastructures, forming specialized groups across the country to prepare electronic content, simulating face-to-face classes in the virtual learning environment, virtual learning alongside face-to-face learning, and benefiting from the experiences of others.

Undoubtedly, the COVID-19 pandemic is not the end of an epidemic, and there is still the risk of the emergence of other diseases and crises. In addition, virtual learning can be used as a supplement to face-to-face learning even when the universities reopen; therefore, it seems that virtual learning will be an important element in future education systems. So, it is appropriate to use faculty members' experiences of virtual learning to strengthen various types of educational interactions and benefit from it to improve and develop virtual learning in the studied universities and other universities.

Supplementary material(s): is available here [To read supplementary materials, please refer to the journal website and open [PDF/HTML](#)].

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Ethical approval

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