

Original Article



A Comparative Study of Virtual Education Challenges Across Semesters for Laboratory Science Students

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Abstract

Background: Virtual education is planned learning in which learning and teaching usually take place in separate environments. In this research, the challenges of using virtual education in different academic years for laboratory science students are investigated during the days of COVID-19.

Methods: The research population consisted of 143 laboratory science students, who were selected based on the entry criteria using a stratified random method. The data collection tool was a researcher-made questionnaire. Exploratory factor analysis was used to determine the dimensions of the questionnaire, and Cronbach's alpha coefficient was utilized to check the internal consistency of the questions. The results were analyzed using SPSS 26.

Results: Most of the students participating in this study were girls, between the ages of 18 and 20, and in the 4th semester. The mean standard deviation of the overall score of the virtual education problem questionnaire was 53.57 (17.41). In addition, the highest score in the aspect of academic conditions and motivation was 64.86 (19.73), and the lowest score in universal access to the Internet was 25.45 (54).

Conclusion: The technical factor and the overall score of the virtual education problem questionnaire were significantly higher in male students than in female students. Further, the average scores of the questionnaire of virtual education problems and all the dimensions of the questionnaire, including conditions and overall motivation, were significantly higher in younger students than in older students.

Keywords: Virtual education, Students, Laboratory science, COVID-19 virus



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Introduction

Virtual education is any planned learning in which learning and teaching usually take place in separate environments. Establishing continuous communication between professors and students in electronic education, as well as the possibility of using it anytime and anywhere, is one of the merits of modern education methods, but the professors have less control over students and face-to-face and non-verbal communication is lost. The unfamiliarity of some professors with the online education system can be called one of the challenges of virtual education (1–3).

Learning is a process in order to acquire knowledge and skills, as well as the ability of people to make decisions and perform, ultimately leading to a change in their behavior. Education is available in face-to-face and non-face-to-face forms. Face-to-face education is mainly teacher-centered, and in non-face-to-face education, media is the agent that provides non-adjacent communication between these two

important educational components. In a general sense, electronic learning is the use of network technology (e.g., the Internet) for the purpose of designing, delivering lessons, and implementing the educational environment in order to realize and continue learning (4).

Among the needs and concerns of professors in this type of education are the use of new technologies, telecommunication infrastructures, and suitable bandwidth for transmitting and receiving information and skills and the ability to apply them, and the lack of preparation of students and professors in adapting themselves to soft systems. Considering the software and teaching methods of this field and the lack of observation of virtual teaching patterns during the professors' time as students pointed out (5, 6), e-learning by using technology provide many interactions to access information and establish various types of communication (7).

E-learning is a successful and efficient system if it



produces appropriate educational content and can perform appropriate evaluations (8). However, it has limitations, such as the lack of accurate understanding of virtual spaces, the lack of complete familiarity with its capabilities and functions, and the dependence of the learner's success on his technical and technical skills (9).

Statistics in America show that 58% of American universities in 1998 and 84% of them in 2002 offered 2- and 4-year courses online (10). Accurate statistics on the amount of virtual education in Iran are unavailable, and there are no studies on the obstacles to electronic education. From the point of view of students, it is rare. A successful university, as an institution, is constantly growing and flourishing its abilities, meeting the needs and expectations, and increasing the satisfaction level of students (11).

Regarding electronic education in the field of exams, Faghihi et al considered the experiences of students participating in electronic pre-internship exams satisfactory (12). On the other hand, crises always leave undeniable effects (13), and undoubtedly education and university are not exceptions. All over the world, in addition to the significant statistics of emergencies, aspects of microbial warfare have also received attention (14). Due to the critical conditions in early March 2018 and the closing of face-to-face classes in universities, the discussion of online teaching in universities and virtual training, created a new experience in the shadow of Corona. Virtual education using information and communication technology has been introduced as a new strategy in the continuous improvement of medical science education, which is in line with global developments and can play an important role in gaining national and global recognition in the medical schools of the country (6). Researchers believe that providing students' satisfaction is one of the factors affecting the growth and improvement of educational centers (14). Considering that students are the main audience for education, paying attention to their opinions and expectations and providing appropriate feedback to them are considered acceptable actions for evaluating the quality of education (15) and are important in increasing awareness of the educational process and its quality (16).

To the best of our knowledge, none of the previous studies has specifically investigated the obstacles of virtual education in different academic years of a field at Hamedan University of Medical Sciences from the students' point of view. Considering the importance of the problem, the present research was conducted to evaluate and compare the problems of virtual education in different academic years of laboratory science students in Hamadan Paramedical Faculty in 2021.

Materials and Methods

The population of this descriptive-cross-sectional study included all laboratory science students studying in the Paramedical Faculty of Hamedan University of Medical

Sciences. After the proposal was approved by the University Research Council and the Ethics Committee, with the coordination of the faculty's education, the questionnaire link was sent to all students through the Navid system and social messaging networks, and they were requested to answer the questions of the questionnaires in the form of a self-report. All ethical standards, including obtaining permissions, written consent, a statement of objectives, the confidentiality of information, and the use of information for research, were observed in this study.

All laboratory science students studying in Iran at Hamadan Paramedical School in 2021 were included in this study. On the other hand, students who had been transferred, or were on study leave, or were visiting students were excluded from the study. Due to the fact that the number of laboratory science students at Hamadan Paramedical Faculty was about 143 in March 2019, a census of all students was included in the study.

To determine the content validity of the questionnaire, the opinions of 10 experts in this field were utilized, which were examined based on the content validity ratio formula. In addition, the content validity index for relevance, clarity, and simplicity was 0.89, 0.93, and 0.90, respectively, which is acceptable considering that they have a value higher than 0.79. After verifying the validity, to identify the number of dimensions of the questionnaire, exploratory factor analysis was used, and the internal consistency of the questions was obtained using Cronbach's alpha coefficient of 0.94, which indicates the high internal consistency of the questionnaire questions. The results were analyzed using SPSS software, version 26.

Results

Most of the students participating in this study were female ($n = 109$, 76.22%), between the ages of 20 and 18 ($n = 109$, 76.22%), and in the 4th semester ($n = 43$, 30.07%), the details of which are provided in Table 1.

Based on the results of Table 2, the average (standard deviation) score of the questionnaire was 53.57 (17.41). Educational conditions and motivation received the highest scores in the dimensions of this questionnaire, with an average of 64.86 (19.73), while the lowest score belonged to universal access to the Internet, with an average of 45.25 (24.54).

According to the results of Table 3, there was a significant difference in the average conditions and inclusive motivation, professor and teaching method, technical factors, and the overall score of the questionnaire of virtual education problems based on the gender of the students. As shown, the average of these grades for male students was significantly higher than that of girls. No significant difference was observed in the average scores of universal access to the Internet and support, based on the gender of the students.

The results of Table 4 revealed that there was a significant difference in the average of all dimensions, except for the overall conditions and motivation, and the overall score of

the virtual education problem questionnaire based on the age of the students. Further, the average of these grades in students with younger ages was significantly higher than that of students with older age. Based on the results of Table 5, no significant difference was found in the average of all dimensions or the overall score of the questionnaire of virtual education problems based on the academic semester of the students.

Discussion

Most of the students participating in this study were girls, between the ages of 18 and 20 years, and in the 4th semester. The mean (standard deviation) of the overall score of the virtual education problem questionnaire was 53.57 (17.41). Furthermore, the highest score in the aspect of academic conditions and motivation was 64.86 (19.73), whereas the lowest score was in universal access to the internet at 25.45.

The mean scores of inclusive conditions and motivation, teacher and teaching method, technical factor, and the overall score of the virtual education problem questionnaire were significantly higher in male students than in female students. Moreover, the average score of the questionnaire of virtual education problems and all the dimensions of the questionnaire, including conditions and overall motivation, in younger students was significantly higher than in older students. In total, the inhibiting factors were classified into 5 groups.

The findings showed that problems that had the most share in using virtual education were comprehensive conditions and motivation with 8 components, including a decrease in student motivation due to being passive in the virtual education environment, a lack of concentration

in virtual education classes, and a weakness in planning to download education files, weak time management for attending virtual education, a lack of comprehensibility of content compared to traditional classes, a decrease in student motivation due to system problems, a lack of a suitable platform for virtual education in previous semesters, and the presence of disturbing factors such as loud noises in the inclusive environment for learning. Motivation is the driving force behind human activities and a guiding factor that has a highly important effect on learning among learners.

In fact, academic motivation is considered one of the necessities of learning, which provides energy to the learner (17). Paola Torres Maldonado et al (18) reported the positive growth of motivation in accepting and using the virtual education system. Accordingly, differences between virtual (non-attendance) and traditional (attendance) education should be taken into consideration by professors and managers, and the level of expectations in education should not be the same depending on the type of education. Within the virtual education environment, issues such as how to log into the system, how to register, and how to download materials should be given more attention. Professors are one of the main pillars of the teaching-learning process, who play an undeniable role in creating or de-qualifying education. In their study, Ghorbankhani and Salehi (19) identified the qualifications that professors should have in virtual education and categorized them into 3 groups. They included electronic skills (use of facilities and access to the Internet, use of electronic content, and mastery of the classroom environment and system), interactional features (having communication with students outside the virtual space), and educational features (participating students in discussions, having a lesson plan, having diversity in teaching methods, mastering the teaching topic, and attending on time). The other qualifications were research features (knowledge; they categorized research and updating information, and research-oriented classes) and moral and behavioral characteristics (determination and motivation, giving advice and solutions, and mutual respect) that the professors have in relation to education.

In the research of Aslami et al, the competencies of teachers in the virtual education environment were related to factors such as the use of simultaneous communication tools such as audio-video conferences, online meeting

Table 1. Frequency Distribution of Demographic Variables of Laboratory Science Students of Hamadan University of Medical Sciences

Variable		Number	%
Gender	Male	34	23.78
	Female	109	76.22
Age	18–20	107	74.83
	≥21	36	25.17
Semester	Semester 2	35	24.48
	Semester 4	43	30.07
	Semester 6	36	25.17
	Semester 8	29	20.28

Table 2. Distribution of the Average Dimensions of Virtual Education Problems Questionnaire According to Laboratory Science Students of Hamadan University of Medical Sciences

Variable	Number	Minimum	Maximum	Mean	Standard Deviation
Circumstances and pervasive motivation	143	6.25	100.00	64.8601	19.73016
Teacher and teaching method	143	15.63	93.75	53.0376	19.49074
Universal access to the Internet	143	.00	100.00	45.2506	24.54397
Technical agent	143	5.00	100.00	46.4336	18.16030
Support and officials	143	25.00	91.67	53.3800	19.98233
Total score	143	10.00	93.33	53.5664	17.41439

Table 3. Comparison of the Average Dimensions of Virtual Education Problems Questionnaire Based on the Gender of Laboratory Science Students of the University of Sciences

Variable		Number	Mean	Standard Deviation	P Value ^a
Circumstances and pervasive motivation	Male	34	75.28	28.51	<0.001
	Female	109	61.61	14.79	
Teacher and teaching method	Male	34	65.35	22.22	<0.001
	Female	109	49.20	16.91	
Universal access to the Internet	Male	34	55.39	37.50	0.199
	Female	109	42.09	17.89	
Technical agent	Male	34	53.97	25.13	0.002
	Female	109	44.08	14.74	
Support and officials	Male	34	58.82	21.61	0.142
	Female	109	51.68	19.24	
Total score	Male	34	63.46	25.39	<0.001
	Female	109	50.48	12.70	

^a Mann-Whitney test.

Table 4. Comparison of the Average Dimensions of Virtual Education Problems Questionnaire Based on the Age of Laboratory Science Students of Hamadan University of Medical Sciences

Variable		Number	Mean	Standard Deviation	P Value ^a
Circumstances and pervasive motivation	18–20	107	65.98	21.68	0.117
	>21	36	61.55	11.85	
Teacher and teaching method	18–20	107	56.34	20.19	<0.001
	>21	36	43.23	13.23	
Universal access to the Internet	18–20	107	48.05	26.57	0.015
	>21	36	36.92	14.51	
Technical agent	18–20	107	49.16	18.26	0.002
	>21	36	38.33	15.45	
Support and officials	18–20	107	56.07	20.49	0.003
	>21	36	45.37	16.12	
Total score	18–20	107	56.03	18.91	<0.001
	>21	36	46.25	8.60	

^a Mann-Whitney test.

tools, stagnation in virtual classes, and podcasts, as well as being up-to-date and learning the required software. A teaching process such as a learning management system was emphasized as well (17). It is suggested that training workshops be held to empower the professors to provide virtual education. Moreover, points should be considered for the professors who are creative in providing virtual education, and the creativity will be exposed to the rest of the professors so that they also benefit from it. The factor of access to the Internet, with 6 components, at a low level. The third group of challenges of using virtual education from the students' point of view was learners' mastery of the virtual environment (login to the system, download the files, how to attend, and the like) and lack of familiarity with the environment of the virtual education system. The remaining challenges of this group included lack of access to the electronic system (mobile and computer), the high cost of using virtual education, and the low level of

Table 5. Comparison of the Average Dimensions of Virtual Education Problems Questionnaire Based on the Academic Semester of Laboratory Science Students of Hamadan University of Medical Sciences

Variable		Number	Mean	Standard Deviation	P Value ^a
Circumstances and pervasive motivation	Semester 2	35	65.54	19.73	0.990
	Semester 4	43	64.24	19.70	
	Semester 6	36	64.50	20.42	
	Semester 8	29	65.41	19.92	
Universal access to the Internet	Semester 2	35	54.46	19.87	0.948
	Semester 4	43	52.47	19.78	
	Semester 6	36	53.39	19.97	
	Semester 8	29	51.72	18.89	
Support and officials	Semester 2	35	45.95	25.37	0.988
	Semester 4	43	44.19	23.99	
	Semester 6	36	45.25	25.36	
	Semester 8	29	45.98	24.56	
Circumstances and pervasive motivation	Semester 2	35	46.71	18.35	0.999
	Semester 4	43	46.28	17.60	
	Semester 6	36	46.39	18.35	
	Semester 8	29	46.38	19.45	
Teacher and teaching method	Semester 2	35	53.33	20.03	0.999
	Semester 4	43	53.49	19.61	
	Semester 6	36	53.24	20.24	
	Semester 8	29	53.45	21.19	
Universal access to the Internet	Semester 2	35	54.31	17.68	0.991
	Semester 4	43	53.02	17.22	
	Semester 6	36	53.54	17.91	
	Semester 8	29	53.51	17.64	

^a Analysis of variance test.

personal experience (not attending virtual classes).

The necessary means must be provided to achieve a goal. For students to be able to effectively benefit from virtual education, it is necessary to provide the facilities and conditions of benefit. Accordingly, for providing students with facilities to purchase an internet, mobile, or computer account, holding a workshop to familiarize students with the virtual education environment should be considered by the authorities and managers.

The technical factor included the lack of familiarity of education officials with virtual education, the failure of the Navid system (disruption of the system for a limited period), the creation of excessive fatigue due to back-to-back training, and the weakness of professors in expressing the course content in the virtual environment. Briggs (20) confirmed that, in addition to the technical competence of the teacher, access to technology and the existence of infrastructure and applications are essential as well. In the current situation where we are faced with a large amount of information, or in other words, in the age of information explosion, the weakness in technical resources cannot be ignored, or the weakness is removed by replacing other factors; in other words, it is a specified obstacle and a factor that is fundamental, which requires the attention

and support of managers seriously (21). Eventually, it is suggested that the confirmatory analysis factor be used to check the construct validity of this questionnaire more closely in future studies.

Conclusion

The mean scores of inclusive conditions and motivation, teacher and teaching method, technical factor, and the overall score of the virtual education problem questionnaire were significantly higher in male students than in female students. In addition, the average overall score of the virtual education problem questionnaire and all dimensions of the questionnaire, including conditions and overall motivation, in younger students was significantly higher than in older students. In general, the results of this study revealed that the use of virtual education and the technical factor were the least important challenges compared to other cases. Of course, all factors have extensive influences on their position. However, what is considered important from the point of view of the students of the Paramedical Faculty of Hamedan in terms of motivation is the reduction of student motivation to be passive in the virtual education environment, which is achieved by holding workshops to empower professors and familiarize them with it. With the principles of teaching and learning in virtual education, this problem can be solved to some extent.

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Authors' Contribution

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Competing Interests

The authors have no conflict of interests.

Ethical Approval

This study was approved by the Ethics Committee of Hamadan University of Medical Sciences, with the ethics code IR.UMSHA.REC.1400.176.

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