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Research article

Factors related to students' satisfaction with holding e-learning during the Covid-19 pandemic based on the dimensions of e-learning

Leili Yekefallah [a], Peyman Namdar [b], Rahman Panahi [c], Leila Dehghankar [d,*]

[a] Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, School of Nursing & Midwifery, Qazvin University of Medical Sciences, Qazvin, Iran
[b] School of Medicine, Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Science, Qazvin, Iran
[c] School of Medical Sciences, Tarbiat Modares University, Tehran, Iran
[d] Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, School of Nursing & Midwifery, Qazvin University of Medical Sciences, Qazvin, Iran

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ABSTRACT

Background: E-learners' satisfaction has a significant impact on the success of the e-learning process and leads to improving the quality of the e-learning system. Many factors affect e-learning satisfaction. This study aimed to determine the factors related to students' satisfaction with e-learning during the Covid-19 pandemic based on the dimensions of e-learning.

Methods: The present study was a cross-sectional study, which was conducted in 2020 among students studying in different fields of Qazvin University of Medical Sciences using stratified random sampling. To collect data three parts of questionnaires were used included the demographic information, the measuring the effectiveness of e-learning, and measuring the level of satisfaction with holding e-learning during the Covid-19 period. Data were entered into spss23 and analyzed by descriptive method, chi-square, and t-test.

Results: The results showed that the mean (standard deviation) score of satisfaction with e-learning in the students was 20.75 (2.13) and 59 % of them had undesirable satisfaction. There was a significant relationship between satisfaction with e-learning and variables of gender and history of attending online classes before Covid-19. Regarding the four aspects of e-learning, there was a statistically significant difference between the two groups of students with desirable satisfaction and undesirable satisfaction. The results revealed that the mean scores of dimensions of teaching and learning; feedback and evaluation; flexibility and appropriateness; and workload among students with desirable satisfaction were higher than students with undesirable satisfaction.

Conclusion: Considering the results, efforts should be made to improve the quality of e-learning and the factors affecting it, because due to the prevalence of Covid-19, distance education may be held for a long time. Lack of attention to these cases can reduce the quality of education and students' level of knowledge.

1. Introduction

The World Health Organization has stated Covid-19 as an outbreak of a specific disease worldwide. This crisis has led to stress among the world population, from the young to the elderly [1]. The coronavirus pandemic has disrupted medical education worldwide [2]. One way to help is to make sure that all students continue to get the best possible level of education by making essential changes in medical education. This can be started by recognizing the available options and using all accessible tools despite the constraints created by Covid-19 [3]. The purpose of these online classes (e-learning) is not only to complete the training course but also to maintain communication with students, promote their self-confidence, and increase students' confidence in their ability during the Covid-19 pandemic [1]. Universities too used digital media to make student education easier during the Covid-19 pandemic [4]. With the advent of the Internet and the World Wide Web, the potential for access to students around the world has dramatically increased. So that online education today provides rich educational resources in multiple media and has the ability to support synchronous and asynchronous communication between teachers and students as well as between the students themselves [5].

* Corresponding author.
E-mail addresses: Dehghan247@gmail.com, L.dehghankar@qums.ac.ir (L. Dehghankar).

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Most medical schools have quickly adapted to online classes by replacing the real clinical environment with a virtual environment [6]. The enormous impact of information technology on various aspects of life today is undeniable, nor can its growing popularity and use in education be denied. This role has become even more prominent in the academic arena due to the Covid-19 pandemic by being closed all educational institutions around the world, and as a result has created many challenges at all stages and levels of education, especially among students [7].

With the development of information technology on the one hand and the existence of numerous interested parties to enter higher education on the other hand, most universities and educational institutions have turned to designing and launching e-learning courses [8]. Rapid developments in ICT in the last decade have left the world with the instability of new changes and the pervasive need for retraining and learning. Most universities have moved towards e-learning in line with the vast changes in the world today [9].

The letter "e" in e-learning means "electronic". Parks e-learning pioneer describes the "e" as exciting, energetic, eager, emotional, extended, and educational, quoting Bernard Luskin. E-learning is learning through the Internet capability [10]. It plays an important role in medical education, is effective in enhancing learning, and has been welcomed by students. E-learning can be used both as an independent learning tool and in a combination learning environment where it is related to face-to-face learning [11].

E-learning interventions in medical education can be useful for targeting health, well-being, and quality education [12].

Two studies consider that e-learning to be a useful tool for meeting the educational needs of healthcare, especially in developing countries [13,14]. In one study, medical students preferred e-learning over traditional lecturing because of its availability, good video quality, repeatability, and practicability [15].

Despite the great potential of e-learning, learners sometimes decide to drop out of school and are reluctant to continue; therefore, it is very important to find variables to accept it. Among the variables, satisfaction is a key factor and one important indicator in the quality of education [16]. Many factors affect the satisfaction of e-learning, which have been assessed in various studies, like Pitcher et al. who considered some factors effective in e-learning satisfaction such as structure; flexibility; experiences and support of the teacher; motivation; and communication [17]. Sun et al., regarding the learners, considered important some factors such as the learners' attitude toward the computer, the learners' anxiety about the computer, and the learners' self-efficacy. About the instructor, factors such as their attitude towards e-learning and the amount of response to learners; about the educational materials, flexibility and quality of the contents; in the technology domain, technology quality and Internet; in the field of design, usefulness and ease of use; and finally regarding the learning environment, diversity and the extent of learners' interaction with others; were suggested effective on learners' satisfaction [18].

Due to the high acceptance of students e-learning [11] and the role of e-learning in improving the quality of education [19] and considering the role of satisfaction in the success of e-learning process, the quality of e-learning system can improve. Therefore, the research team conducted a study to determine the factors related to students' satisfaction with e-learning during the Covid-19 pandemic based on the dimensions of e-learning.

2. Methods

The present study was a cross-sectional descriptive one, conducted in 2020 among students studying in different fields of Qazvin University of Medical Sciences. The sampling was conducted using the stratified random sampling method so that in proportion to the total number of students of each faculty (as a class) the number of samples for each faculty was calculated, then in each faculty according to the number of fields, the sample ratio was also taken into account to the number of each field (in a way, a random quota method was used in the faculty). For sampling in each field, students were selected by simple random sampling method and the questionnaire was provided to them in the form of an online questionnaire. Inclusion criteria included the willingness to participate in the study, Iranian citizenship, and studying in one of the majors at Qazvin University of Medical Sciences. Incomplete answering to the questionnaire and dissatisfaction with cooperation were the criteria for exclusion from the study.

Considering $P = 0.5$ for the frequency of satisfaction with e-learning at the desired level and also using the Cochran sample volume formula and calculating $d = 0.05$, the sample size was estimated to be 384, at the end according to statistical experts and taking into account the 10 % probability of sample drop, 420 individuals were included in the study.

Data were collected using a three-part questionnaire:

A) Demographic and background information: including age, gender, marital status, years of study, grade point average of previous semesters, history of attending online classes before Covid-19, the suggestion to use e-learning system, more favorable educational method, and the general opinion of the students about e-learning.

B) To measure the effectiveness of e-learning, a researcher-made questionnaire was developed. For this purpose, first, the data of different databases were searched and examined. A researcher-made questionnaire was developed based on the research and the study of Yassini [20], the study of Kaur [1], and Fathi [21]. In his book, Online Education, Greg Kearsly has mentioned the ten basic elements of e-learning, including 1- Content; 2- Teaching-learning activities; 3- Designing pages; 4- Organizing educational materials; 5- Feedback; 6- Flexibility; 7- Workload; 8- Assistance; 9- Motivation; and 10- Evaluation methods. After extensive study of the theoretical foundations of e-learning, the researchers concluded it would have better that, in this study, consider the components of e-learning according to Greg Kearsly and examined them to determine the effectiveness of the e-learning course [21]. Therefore, a questionnaire consisting of 60 questions and 6 components were compiled including content and educational materials (items 1 to 16); learning-teaching activities (items 17 to 23); feedback and evaluation (items 24 to 33); flexibility (items 34 to 45); fitness and workload (items 46 to 51); and infrastructure, technology, and support (items 52 to 60). The scoring method was 5-point Likert scale, that the score 5 was for the very high option, 4 for the high, 3 for the moderate, 2 for the low, and 1 for the very low. It should be noted that these dimensions have been considered by Greg Kearsly as dimensions of e-learning and the evaluation of effectiveness has been done in the first level of Kirk Patrick model [20].

In determining the face validity from a qualitative point of view, the simplicity and clarity of the items were assessed and corrected by 20 experts, and then a quantitative method was used to remove inappropriate items and determine the importance of each question. Actually, the items in the Likert scale were rated from very strong (score 5) to very weak (score 1) and then the average of each question was calculated, if the score for one item was more than 1.5, that item was identified proper and remained for further analysis.

In content validity, it was examined whether the present tool covers all the main and important aspects of the concept? For this purpose, two methods, quantitative and qualitative, were used. In such a way that in the qualitative review of the content, experts were asked to provide the necessary feedback after reviewing the quality of the tool based on grammar criteria, using inappropriate words, placing items in a proper place, to correction could be done accordingly. To assess the content validity in a quantitative manner, the content validity ratio (CVR) and content validity index (CVI) were used. To determine the CVR, the panel of experts was asked to review each item based on a three-part range of "necessary", "useful but not necessary" and "not necessary". The answers were then calculated based on the following formula: "n" was the number of experts who selected the "necessary" option, and "N" was the number of experts. Then, the obtained CVR value was compared with Lawshe's table (1975). If the calculated value was more than the table value, the content

validity for the item was confirmed. The CVR score of the items was higher than 0.49. In CVI, Waltz & Basel method was used to investigate the content validity index. Experts determined the "relevance" of each item based on a 4-point Likert scale, that the CVI score of items was more than 0.79.

The concept of performing reliability is internal consistency, that is, the extent to which the test questions are interrelated. In this method, because the test is performed only once, the effects of the time interval of test-retest such as memory and practice are minimized. Instead of stability of test results, the homogeneity method emphasizes the uniformity and coordination of the materials or components of a test. To do so, the relevant questionnaire was given to 30 students and Cronbach's alpha method was used to measure internal consistency in reliability. The Cronbach's alpha of the whole tool was 0.95 and Cronbach's alpha of the dimensions was in the range of 0.86–0.92, indicating the existence of an appropriate internal correlation in each of the dimensions and the whole tool. The stability of the tool was assessed using the reliability of the test-retest. After reviewing the construct validity and a period of 2 weeks interval, 20 students were asked to complete the questionnaire afresh. The intra-class correlation coefficient was calculated using SPSS software version 23, that the reliability of the whole tool was gained 0.95.

C) To measure students' satisfaction with holding e-learning, the questionnaire of Kaur et al. (2020) was used, including 7 questions. The scoring scale of this tool was 5-point Likert so that the score 5 was assigned to the much-satisfied option, the score 4 to the satisfied, the score 3 to the neutral, the score 2 to the dissatisfied option, and the score 1 to the much-dissatisfied and the reliability was confirmed in this study [1]. According to the researchers in the present study, scores of 7–21 were considered as undesirable satisfaction and scores of 22–35 as desirable satisfaction with holding e-learning.

After observing the ethical and research standards, which included receiving the code of ethics from the Vice-Chancellor for Research and Technology of Qazvin University of Medical Sciences (code number: IR.QUMS.REC.1399.077), submitting a letter of introduction to faculties selected from the Qazvin University of Medical Sciences and describing the nature and purposes of the study for them and the students selected, the questionnaires were completed. Sampling was also done in the faculty environment and during the students' rest. After collection, the data were entered into SPSS software version 23 and were analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation), chi-square (examining the difference between qualitative variables), and t-test (examining the difference between quantitative variables).

2.1. Ethics approval and consent to participate

The ethical principles observed by the researchers included obtaining permission from the Ethics Committee of Qazvin University of Medical Sciences (code: IR.QUMS.REC.1399.077). In addition, written informed consent from all the participants were obtained and they were granted the right to withdraw from the study at any time. The principles of anonymity and confidentiality were applied and the participants were provided with the results upon their request.

3. Results

In total, 420 students were entered into the study (participation rate: 100 %) of which 310 people were female (73.8 %), 208 people were single (49.5 %), and 199 people were sophomores (47.4 %). The mean (standard deviation) of the participant's age was 21.14 (1.25) years. The mean (standard deviation) of the previous year's average point grade of the participants was 16.12 (1.48) out of 20. Table 1 shows the demographic and background characteristics and their relationship with satisfaction with e-learning in the students studied. The results of Table 1 showed that based on the Chi-square test, there was a significant relationship between satisfaction with e-learning and variables of gender ($P < 0.05$) and history of attending online classes before coronavirus outbreak ($P < 0.05$). Satisfaction with e-learning was higher among female students and students with a history of attending online classes before Covid-19. However, no significant relationship was observed between satisfaction with e-learning and variables of age, marital status, academic years, a suggestion for using e-learning system, a more desirable educational method from students' perspective, and overall opinion about e-learning ($P < 0.05$). Likewise, according to t-test, there was no significant relationship between satisfaction with e-learning and variables of age and grade point average of previous years ($P < 0.05$) (Table 1).

Moreover The results showed that the mean (standard deviation) score of satisfaction with e-learning of the students was 20.75 (2.13) out of 35. Furthermore, 172 students (41 %) had desirable satisfaction and 248 students (59 %) had undesirable satisfaction. Table 2 shows the scores obtained from the dimensions of e-learning in satisfaction with e-learning among the students studied. The results of this table showed that there was a statistically significant difference between the two groups of students with desirable satisfaction and undesirable satisfaction in four aspects of e-learning. The results explained that the mean scores of teaching-learning dimensions ($P < 0.001$), feedback and evaluation ($P < 0.001$), flexibility ($P < 0.001$), and appropriateness and workload ($P < 0.05$) was higher in students with desirable satisfaction than those of with undesirable satisfaction.

4. Discussion

A study was conducted to determine the factors related to students' satisfaction with e-learning during the Covid-19 pandemic based on the dimensions of e-learning. The results indicated that there was a significant relationship between satisfaction with e-learning and variables of gender and history of attending online classes before coronavirus outbreak. Satisfaction with e-learning was higher among female students and students with a history of attending online classes before Covid-19. However, the research of Narimani et al. showed that only the age factor was effective on satisfaction with holding e-learning so that with increasing age, the level of satisfaction has similarly increased [22]. In the research of Kazemi Qaracheh et al., there was no relationship between male and female students, ie gender, in the content of e-learning [23]. Eisa Al-Doub et al. [24] and Latifnejad et al. [25] were consistent with the results of the present study, but Okhovati [26] and Zolfaghari [27] were inconsistent. The reason for this discrepancy can be expressed the differences in the statistical population of the research and the use of different tools to evaluate the effectiveness of education. The reason for this difference in gender can be the positive concern of women towards men, and due to the culture of society and the limited presence of women in social spheres can be mentioned. Limitations do not prevent them from accessing different sciences, and therefore females consent to have e-learning. Moreover, the results revealed that 59 % of them had undesirable satisfaction. Kaur et al. (2020) found in India that the use of online classes at the time of Covid-19 was effective in parameters of communication, helping to develop skills and knowledge, providing a better understanding through recorded classes, in Q&A sessions, and in sending assignments, but had little effect on other parameters, indicating dissatisfaction with participation in e-learning [1]. Subramanian et al. also reported that the majority of students were dissatisfied with the e-learning process [28], but Nalini et al. (2020) stated that there was significant progress in both e-learning and traditional learning methods. In e-learning, a significant improvement in the quality of students' education was observed [29]. Zare Bidaki et al. [30] and Fox [31] in their study found that students were more satisfied with the face-to-face teaching method than the e-learning method and had no motivation to participate in e-learning. Richmond et al. (2017) in their study unveiled that e-learning may be as effective as face-to-face training on the learning of healthcare professionals, but the effects of e-learning were low and did not differ significantly compared to face-to-face training [32]. Yassini

Table 1. Demographic and background characteristics and their relationship with satisfaction with e-learning in students.

Qualitative variables		Desirable satisfaction	Undesirable satisfaction	P-value*
		Number (percent)	Number (percent)	
Gender	Female	135 (78.5)	175 (70.6)	0.039
	Male	37 (21.5)	73 (29.4)	
Marital status	Single	85 (49.4)	123 (49.6)	0.258
	Married	77 (44.8)	119 (48)	
	Divorce and death of spouse	10 (5.8)	6 (2.4)	
Academic years	Freshman	28 (16.3)	30 (12.1)	0.411
	Sophomore	85 (49.4)	114 (46)	
	Third-year student	41 (23.8)	51 (20.5)	
	Fourth-year student	18 (10.5)	53 (21.4)	
A history of attending online classes before Covid-19	Yes	141 (81.2)	92 (37.1)	0.016
	No	31 (18.8)	156 (62.9)	
A suggestion for using e-learning system	Very high	31 (18)	53 (21.4)	0.339
	High	58 (33.7)	60 (24.2)	
	Moderate	25 (14.6)	24 (9.7)	
	Low	52 (30.2)	105 (42.3)	
	Very low	6 (3.5)	6 (2.4)	
More desirable educational method	E-learning method	7 (4.1)	12 (4.8)	0.253
	Traditional teaching methods	33 (19.2)	28 (11.3)	
	It makes no difference	90 (52.3)	132 (53.2)	
	Both	42 (24.4)	76 (30.7)	
Overall opinion about e-learning	Very excellent	18 (8.7)	36 (14.5)	0.181
	excellent	49 (28.5)	62 (25)	
	Moderate	40 (23.3)	57 (23)	
	Weak	62 (36)	87 (35.1)	
	Very weak	6 (3.5)	6 (2.4)	
Quantitative variables		Mean ± standard deviation	Mean ± standard deviation	P-value**
Age		20.51 ± 1.31	21.52 ± 1.46	0.565
Grade point average of previous years		16.28 ± 1.58	16.09 ± 1.79	0.414

* Chi-square test.
** t-test.

showed that from the students' point of view, the effectiveness of the e-learning course was undesirable [20]. Factors such as lack of various forms of e-learning, lack of familiarity of professors with e-learning technology, insufficient facilities, including the inadequacy of the number of students with hardware facilities, lack of a suitable environment to use the courses offered virtually and as a result Incomplete presentation and finally insufficient familiarity of students, especially lower semester students with computer and internet can be effective in students' dissatisfaction.

The results indicated that there was a statistically significant difference between the two groups of students with desirable satisfaction and undesirable satisfaction in four aspects of e-learning. The results revealed that the mean scores of dimensions of teaching and learning; feedback and evaluation; flexibility; and appropriateness and workload among students with desirable satisfaction were higher than those of with undesirable satisfaction. Peachter et al. considered the factors of structure, flexibility, experiences and teacher support, motivation, and communication effective on e-learning satisfaction [17]. Walker [33] and Arbaugh [34] stated that timely response of the teacher, help the teacher to the learner to identify problems, and provide feedback leads to e-learning satisfaction and the quick response of the teachers significantly affects the learners' satisfaction. It is logical that when learners have problems, timely help from the teacher encourages learners to continue learning. A study by Bettinger et al. noted that e-learning has been somewhat effective in dimensions of teaching-learning, feedback, and evaluating the effectiveness of e-learning [35]. Walker Fraser stated that the learner's relationship with the teacher and other learners, sharing information with others, and teamwork contribute to learning satisfaction [33]. Sun et al., in the e-learning, categorized the learner factor into three categories: learner attitudes toward computers, learner anxiety, and learner Internet self-efficacy [36]. In general, learners' satisfaction with e-learning should be considered an important output of the educational process. Effective e-learning processes and the successful completion of them have a positive effect on learners' satisfaction [37].

A study by Sufi et al. emphasized students' satisfaction with the evaluation method. The results of Ganji Arjenki [38], Mirza Beigi et al. [39], and Arlien [40] showed that self-assessment gave learners the opportunity to review and revise what they have learned and their cognitive and metacognitive strategies. Following self-assessment, learners

Table 2. The scores obtained from the dimensions of e-learning in satisfaction with e-students studied.

Dimensions	Desirable satisfaction		Undesirable satisfaction		P-value
	Mean	Standard deviation	Mean	Standard deviation	
Educational content and materials	52.35	4.31	50.34	4.13	0.117
Teaching-Learning	21.52	3.19	15.42	4.44	<0.001
Feedback and evaluation	32.65	5.25	24.32	4.36	<0.001
Flexibility	47.22	6.57	35.73	5.72	<0.001
Appropriateness and workload	21.75	3.91	14.25	4.15	0.008
Infrastructure and technology	35.32	4.33	33.75	4.17	0.229

realized their strengths and weaknesses, and there was a strong and positive relationship between the teacher's verbal and non-verbal behaviors and the possibility of using electronic content to complete the training.

Yassini stated that from the students' point of view in the e-learning course, the effectiveness of the educational content, the design of the pages to the desired level, the effectiveness of teaching-learning activities, and helping students to the desirable level, the effectiveness of organizing educational materials, feedback, and flexibility of e-learning course have been moderate [20]. Although e-learning can provide opportunities for students to acquire self-assessment methods through information technology, their level of interaction and feedback is reduced [35].

The limitations of the present study were the low sample size and self-report by students. Furthermore, considering that the questionnaires were completed online, there was a possibility of not enough focus in completing the questionnaire.

5. Conclusion

The results of the present study indicated students' undesirable satisfaction with e-learning during the Covid-19 era. Considering the results, efforts should be made to improve the quality of e-learning and the factors affecting it, because due to the prevalence of Covid-19, distance education may be held for a long time. Lack of attention to these cases can reduce the quality of education and students' level of knowledge. As a result, their satisfaction with e-learning in particular and with the e-learning system in general decreases. Therefore, due to the undesirable satisfaction with e-learning, the best training method is combination training, which should be started as soon as the situation normalizes, because this will lead to further development of professional skills and improve the quality of training. in order to create a suitable platform for the creation and development of e-learning, the need for efforts to raise the level of knowledge of medical students and culture in this field based on their needs and desires is felt. In order to achieve this, including designing training programs such as workshops to raise awareness and the ability to use e-learning as an effective training tool, as well as improving the quality of hardware is suggested.

Declarations

Author contribution statement

Leila Dehghankar: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Leili Yekefallah: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Peyman Namdar: Conceived and designed the experiments; Wrote the paper.

Rahman Panahi: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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Data availability statement

Data will be made available on request.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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