



Research article

The university students' viewpoints on e-learning system during COVID-19 pandemic: the case of Iran[☆]Arash Salahshouri^a, Kaveh Eslami^b, Hatam Boostani^c, Mansour Zahiri^d, Simin Jahani^e, Reza Arjmand^f, Akbar Babaei Heydarabadi^a, Behzad Fouladi Dehaghi^{g,h,*}^a Department of Health Education and Health Promotion, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^b Clinical Pharmacy Department, School of Pharmacy, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^c Department of Psychiatry, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^d Department of Healthcare Services Management, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^e Department of Nursing, School of Nursing and Midwifery, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^f Department of Parasitology, School of Medicine, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^g Environmental Technologies Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran^h Department of Occupational Health, School of Health, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

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ABSTRACT

The outbreak of COVID-19 closed educational institutions and universities. The aim of this study was to explain the strengths and weaknesses of the e-learning system in Iranian universities of medical sciences in the COVID-19 pandemic. This is a qualitative study that was conducted with students enrolled in Iranian medical universities. Data was collected through an open-ended electronic questionnaire based on the interview guide and was analyzed through content analysis.

122 students from 46 medical universities participated in this study. 122 questionnaires from 46 universities of medical sciences were completed. From a total of 54 codes extracted from the results, seven (strengths/positive experiences) and six (weaknesses/challenges) themes were extracted, each of which had several subsets. E-learning has both visible and hidden layers in terms of advantages and disadvantages. The e-learning system is an essential tool to continue education during the COVID-19 pandemic. Most students believe that e-learning was a great complement to prevent academic failure, but it cannot replicate the same efficiency of face-to-face training.

1. Introduction

In late 2019, the new coronavirus (SARS-CoV-2) became a pandemic in the world (Dehaghi et al., 2020a; World Health Organization, 2020). The impact of the pandemic depends on the number of cases, transmissibility and severity of its clinical symptoms (Zhang et al., 2020). In this regard, airborne transmission of this disease occurs by respiratory droplets, so that COVID-19 patients can be asymptomatic or with symptoms of mild to severe disease, which causes acute respiratory distress syndrome (Alsrhani et al., 2020; Jamshidnezhad et al., 2021). Almost all countries, including Iran, tried to prevent the spread of this infectious disease by applying crisis management through strategies such as using face mask, physical distance (2 m), imposing traffic restrictions and shutting down all activities (Dehaghi et al., 2020b; Sjödin et al., 2020). E-learning programs have been around for many years but were

not implemented in many academic institutions before the COVID-19 pandemic. Universities that had previously implemented innovative e-learning programs could use them in this emergency situation. Therefore, due to the nature of the training process, which requires face-to-face interaction; the closure of educational and academic institutions in the COVID-19 pandemic led to an unprecedented impact on the education services system. In order to compensate for the disruption of the education process, new decisions were needed. In this regard, advanced technologies and learning education system (LMS) for educating and evaluating students, provided an alternative approach for teachers and policy makers to use information technology to continue the education process while applying the constraints caused by the pandemic (Sahu, 2020). E-learning methods can include offline or online learning activities. In addition, this form of learning can provide e-learning from the basic conversion of face-to-face content to digital format to the more

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sophisticated deployment of digital technologies (e.g., mobile education, virtual patients, and virtual reality). Instructors conducted e-learning with several types of e-learning software such as Adobe connect, sky-room, etc. to provide students with the highest access to educational content in pandemic conditions (Kumar et al., 2020).

In Iran, as in other countries, educational institutions and universities were closed by the government following the outbreak of COVID-19. However, the ministry of education directed all educational institutions and universities to have LMS for creating online classes so that there would be no disruption in teaching and learning (Shah et al., 2020). Several studies have shown the importance and effectiveness of the e-learning system (Co et al., 2021a; Huynh, 2017; Navimipour and Zareie, 2015). Despite the advantages of e-learning, there are limitations such as lack of interaction between learner and teacher (teachers and students, faculty and students) (Davis et al., 2019). With regard to this approach in teaching in Iran, both students and professors face problems in e-learning.

1.1. Literature review

Any information system needs the use of the system by users for its success (Almaiah, 2018). Therefore, in the field of e-learning system, student acceptance of e-learning is considered as one of the main elements for success in e-learning. Several studies have addressed the issues of e-learning in many countries around the world. Almaiah et al., used technology acceptance model and the innovation and diffusion theory model to examine the critical factors influencing the use of the Malaysian student e-learning system. The results showed that comparative advantages, observability, flexibility, perceived adaptability, complexity and enjoyment of the mind are factors that play an important role in students' decision to use the e-learning system in Malaysia (Almaiah et al., 2016). Salloum et al., showed that four factors (innovation, quality, trust and knowledge sharing) were observed to better achieve e-learning system acceptance among students (Salloum et al., 2019).

The use of e-learning among users is a challenge for many universities in all countries, but it is likely to be a concern in developed countries for their students' willingness to accept and use e-learning. Eltahir showed that the challenges of adopting an e-learning system in developing countries are still real due to the problem of getting access to these technologies (Eltahir, 2019). Aung and Khaing, stated that the lack of knowledge of information technology (IT), poor network infrastructure and poor content development are the main challenges of accepting the e-learning system in developing countries (Aung & S.S., 2016). A study in Pakistan found that system features, Internet experience, and computer self-efficacy were the most important issues that prevented the successful adoption of the e-learning system (Kanwal and Rehman, 2017). Another study identified three main challenges to e-learning: inadequate IT infrastructure, lack of technical skills, and financial constraints (Tarus et al., 2015). A study by Kisanga and Ireson found that inadequate technical support and lack of IT skills are the main obstacles that prevent the successful implementation of existing e-learning projects (Kisanga and Ireson, 2015). In a study during the COVID-19 outbreak the level of psychosocial stress in 110 medical students was evaluated. The results showed a high level of stress (in all aspects) in the case group compared to the control group. Also, academic performance during the COVID-19 pandemic among medical students declined (Co et al., 2021c). Also, Co et al., in another study, reported that teaching technical skills, including surgery, through web-based training during the COVID-19 pandemic in medical students was no different from face-to-face training. In such a way that even after the end of the COVID-19 outbreak, this educational system can be used beside other training methods (Co et al., 2021b). Hodges et al., differentiated between online education and emergency distance education, indicating that the first model relies on informed and advanced design - often six to nine months of planning. Distance education, on the other hand, is a temporary and sudden shift towards educational delivery due to crisis such as the weather, war, or health

threatening conditions. Distance learning is not and cannot be the same as planned online education. Due to the rapid shift of educational delivery to distance learning in the spring of 2020, Hodges et al., highlighted that: "The main goal in this situation is not to re-create a strong educational ecosystem, but to provide temporary access to educational support in a way that is quick to set up and reliably available in an emergency or crisis" (Hodges et al., 2020). Considering that there were limited studies to determine the problems of the e-learning system, the aim of this study was to determine the strengths and weaknesses of e-learning in Iranian universities of medical sciences in the COVID-19 pandemic from the students' point of view.

2. Materials and methods

2.1. Study design

This was a qualitative study of contractual (inductive) content analysis using semi-structured interviews with the students of medical universities in Iran which was conducted between March 2020–August 2020 to explain the strengths and weaknesses of e-learning.

2.2. Study population

Purposeful sampling with maximum variety was performed to select the participants. Therefore, a heterogeneous group of students with a wide range of underlying characteristics (gender, age, educational field of study) were selected from governmental medical universities. Which were similarly closed-up with the outbreak of COVID-19.

2.3. Selection criteria

Medical students aged 18 years or older participated in the study. The inclusion criteria were giving consent to participate in the study; and medical student with experience in e-learning during or before the COVID-19 pandemic. The exclusion criterion was the student without access to internet.

2.4. Sample size

A total of 122 students from various profession (nursing, rehabilitation, paramedical, health, pharmacy, dentistry and medicine) in different educational levels participated in the study and answered the semi-structured electronic questionnaire based on the interview guide.

2.5. Data collection procedures

In the present study, in order to collect the data, a semi-structured electronic questionnaire based on the interview guide was used and was placed in the university official website. Then, by introducing the questionnaire link, students' opinions were received. A total of 122 questionnaires (open-ended) were received from 46 governmental medical universities across the country. The students were asked to enter their student ID, so that it could be controlled that only medical students have completed the questionnaire. The data collection process was completed within four months. No personally identifiable information was obtained from the participants.

After studying the participants' answers due to the ambiguity of some of the answers as well as the questions created in the minds of the researchers, the interviews were repeated with 31 participants. The semi-structured interviews continued until data saturation.

2.6. Data analysis

The interview data were entered into Microsoft Word (57 pages) and then were entered into MAXQDA 10 software. The data was analyzed using the Graneheim and Lundman approach (Graneheim and Lundman,

2004). This approach involves the step by step writing down the interviews and studying them several times to get a general view; then dividing the text into summarized semantic units; Abstract semantic units summarized and tagged by codes; Separation of codes in sub-themes by comparing them based on their similarities and differences and setting themes as an indicator of the hidden content of the text (Graneheim and Lundman, 2004). When all of the data was encrypted and the categories were created, the authors evaluated each category for saturation. All steps of interviewing, typing interviews transcriptions and encryption were done in Persian. To ensure the accuracy of this study, the integrated criteria for quality research reporting (COREQ) were followed. Graneheim and Lundman criteria were also used for data robustness. Participants were selected with different experiences, ages and genders. Much effort was made in selecting semantic units, summarizing and abstracting them, and selecting topics and themes. Whenever there was a disagreement, the authors discussed it in order to reach an agreement. Table 1 presents the sociodemographic characteristics of the study participants.

2.7. Confirmation of ethics and consent to participate in the study

The study was started after the approval of the present study in the research committee of Ahvaz Jundishapur University of Medical Sciences and after receiving the code of ethics committee on research with human (IR. AJUMS. REC.1399.542). All participants were fully informed about the study purpose and method and signed the consent form to participate voluntarily based on the Declaration of Helsinki.

3. Results

A total of 122 students from 46 medical universities participated in this study, which was 68% of the response rate compared to all universities in the country (67 universities). A total of 122 questionnaires (open-ended) from 46 universities of medical sciences were completed. Qualitative data analysis was performed in two main areas including strengths/positive experiences and weaknesses/challenges. From the participants' statements, it was found that strengths/positive experiences had seven categories (including desirable education and information; support and accompaniment of managers in the implementation of virtual education programs; cooperation and coordination inter and intra sectors; responsibility, availability and full-time responding responsibility; evaluating, monitoring and providing feedback on an ongoing basis; having capable and specialized e-learning staff; and enjoying and prioritizing e-learning). Also, weaknesses/challenges had six categories including: common attitudes, beliefs and attitudes towards

Table 1. Sociodemographic characteristics of the study participants.

| Gender | Frequency (%) |
|---------------------------------|---------------|
| Male | 52 (42.6) |
| Female | 70 (57.3) |
| Age: Median years | |
| 18–23 | 25 (20.5) |
| ≥24 | 97 (79.5) |
| School of | |
| Medicine | 35 (28.6) |
| Pharmacy | 5 (4) |
| Dentistry | 5 (4) |
| Health | 15 (12.3) |
| Nursing | 37 (30.3) |
| Rehabilitation | 15 (12.3) |
| Paramedical | 10 (8.2) |
| Former experience of E-learning | |
| Yes | 15 (12.3) |
| No | 107 (87.7) |

e-learning; early experience; lack of comprehensive regulations and protocols in e-learning; insufficient familiarity with e-learning; and barriers to access and coordination (Tables 2 and 3).

3.1. Strengths and experiences

1 Desirable education and information:

The first main category in the field of strengths is "desirable education and information" which is divided into two sub-categories "preparation, compilation and communication of virtual education regulations and instructions" and "timely education and information in the field of e-learning by managers". Setting virtual content standards, developing guidelines for e-learning, approving by regulations and communicating them to faculty members, administrators, faculties, students, and the support team through formal correspondence and holding classes and workshops are some of the most important strengths mentioned.

As one student has said: "The University very quickly drafted the university's e-learning regulations and communicated it to the faculties and faculty through the administrators. This was perhaps the turning point in our education process".

Ali said: "The University provided the latest virtual content preparation information to the faculties very quickly and several courses in the field of electronic content production and how it works".

2 Supporting and accompanying managers in the implementation of virtual education programs:

This category itself consists of two subcategories "Support and Encouragement for the Development of Virtual Education" and "Support and Cooperation of Managers in the Development of Virtual Education". Analysis of participants' experiences indicates that the support, support and encouragement of university and college officials are effective factors in the development and implementation of e-learning programs. This support is achieved through the support of officials for virtualization decisions or material and spiritual encouragement of users (faculty and students) and executives, as well as empowering them on issues related to virtual education.

Zahra said: "The university supervisors supported all of our virtualization decisions and they were the first to participate in the virtual learning sessions and workshops".

Another student said: "The Managers very well encouraged faculty to provide and deliver virtual educational content".

3 Cooperation and coordination inter and intra sectors

This category is divided into three sub-categories: the existence of specialized e-learning committees and working groups at the university level; Cooperation of managers in providing e-learning facilities and infrastructure; and the cooperation and coordination of managers at different levels in the virtual development of the university. Based on the analysis of the results, the existence of communication between different departments as well as the alignment of all different departments at the university and Ministry of Health in order to develop e-learning has been reminded as a positive experience by the participants.

Reza said: "The collaboration between the information technology (IT) and education development center (EDC) departments of the university with students and faculty was very effective in the development of e-learning. This was a privilege that exists in fewer universities".

A student collaborating with EDC said: "The presence of a specialized virtual education team and a virtual committee in EDC with the membership of senior educational administrators helped us a lot in the development of virtual infrastructure".

4 Responsibility, availability and full time responding responsibility

Accountability as well as full time accountability of university administrators and educational experts in the field of virtual education to the educational problems of students have been mentioned as a strength and a positive experience by the participants.

Table 2. Code, subcategory and category of strengths and positive experiences of e-learning development.

| Category | Subcategory | Codes |
|---|--|---|
| Desirable education and information | Preparation, compilation and communication of virtual education regulations and guidelines | <ul style="list-style-type: none"> Defining in-campus virtual content standards Preparing and compiling the necessary guidelines regarding e-learning Approving the regulations of virtual education and notify it to the faculty members Timely follow-up in preparing an educational package for using the virtual system for students |
| | Timely training and information in the field of e-learning by managers | <ul style="list-style-type: none"> Timely and regular information to the faculties by the university administrators Fast performance in providing the latest virtual content preparation information Timely information and continuous guidance of managers Holding online electronic content production courses for faculty Holding workshops to work with the Navid system and solving faculty problems Informed faculty in a timely manner Provide timely training to the support team |
| Support and accompaniment of managers in the implementation of virtual education programs | Support and encourage the development of e-learning | <ul style="list-style-type: none"> Full support of the deans of the faculties for the virtualization decisions of the Vice Chancellor for Education Support managers for virtualization and production of electronic content Support and encouragement in the form of promises and promises to prepare and provide virtual educational content Material and spiritual support for the implementation of virtual education programs Encourage faculty to produce standard content Encourage educational assistants from successful faculty in virtual education Organizing various virtual training courses to empower teachers Close interaction of administrators with professors and students and encouraging them to use virtual learning facilities and systems |
| | Support and cooperation of managers in the development of virtual education | <ul style="list-style-type: none"> Support and cooperation of managers in the discussion of virtualization of university affiliates Accompanying managers in the implementation of e-learning programs Membership of staff and environmental education managers in virtual education working groups Being active in approving and implementing e-learning regulations Managers take the lead in using virtual learning systems and software Production of at least one electronic content by 70% of educational administrators Comprehensive cooperation with students and faculty in holding virtual classes Continuous participation of managers in meetings related to the development of e-learning |
| Cooperation and coordination inter and intra sectors | Cooperation of managers in providing e-learning facilities and infrastructure | <ul style="list-style-type: none"> Cooperation of managers in providing online training software Providing the necessary platform for e-learning by managers Utilizing the maximum capacity of faculty facilities for e-learning |
| Responsibility, availability and full time responding responsibility | Availability of managers and experts | <ul style="list-style-type: none"> 24-hour and online access of students to educational administrators Full-time availability of system support experts for guidance and response |
| Evaluating, monitoring and providing feedback on an ongoing basis | Continuous evaluation and monitoring of the production of produced content | <ul style="list-style-type: none"> Supervising the production of educational content for practical and internship courses Supervising the educational content of theory courses Regular evaluation of the quantity and quality of content provided in the Navid system Diligently pursue the improvement of quantitative and qualitative content |
| Availability of capable and specialized e-learning staff | Availability of specialized and skilled personnel and experts in the field of e-learning | <ul style="list-style-type: none"> Availability of an active expert in the field of electronic content production Availability of experienced IT experts familiar with working with virtual education systems Availability of software, hardware and network experts Availability of skilled experts in solving system problems Availability of expert and compassionate experts in the IT department of the university Availability of e-learning expert active in the field of educational design Availability of e-learning expert, medical informatics and information technology in the university |
| Enjoying and prioritizing e-learning | Prioritize e-learning | <ul style="list-style-type: none"> Priority in multimedia production Decisive decision of managers to start virtual education at the beginning of quarantine Take timely actions to expedite the use of e-learning Understanding the priority of e-learning All managers agree on the need for professors to use virtual programs Prioritizing e-learning in university programs Managers' emphasis on implementing virtual education |

Ehsan said: "Some support managers and experts answered our questions 24 h a day, even during off-hours. Many of them were really responsible. It helped a lot to solve system problems and make e-learning more effective." Mahdi said: "It was great that managers responded through various means of communication such as WhatsApp, SMS, email, etc. This helped a lot".

5 Evaluating, monitoring and providing feedback on an ongoing basis Based on data analysis, reporting, monitoring and continuous monitoring of faculty/students' performance and educational problems; Continuous evaluation and monitoring of the production of content produced by the faculty members in both theoretical and practical

courses and internships; Also, monitoring the performance of the experts of the e-learning unit and the faculties by the managers and supervisors of the e-learning unit were among the important and effective factors in the proper implementation of e-learning.

Fatemeh said: *"In my opinion, the evaluation and monitoring of students' e-learning activities by faculty members is effective in improving the quality of e-learning"*.

6 Availability of capable and specialized e-learning staff

It is clear that one of the basic requirements for the proper implementation of e-learning is availability of capable and specialized human resources. In this regard, universities that had a history of graduate education in the field of e-learning or had the conditions for hiring technical manpower, announced that due to the employment of capable and specialized managers in the field of e-learning; Existence of specialized and capable faculty members; And employing specialized experts in the field of e-learning are more prepared for the development of e-learning.

A Member of EDC said: *"We have trained several master's degree students in e-learning and we have hired some of them. Therefore, we had enough specialized staff to implement e-learning"*.

Amir said: *"We had a lot of experts and technicians in the fields of software, hardware, networking, e-content production, and familiarity with e-learning systems who were very capable of implementing e-learning"*.

7 Enjoying and prioritizing e-learning

One of the factors that the participants considered as a factor in the development of e-learning was the interest, belief, enjoying and prioritizing e-learning and efforts to launch its fields, as well as removing barriers and problems of systems and software. Participants also mentioned the priority of virtual education for educational administrators and senior university administrators as an important factor in this regard.

A student said: *"The attitude of the university administrators towards e-learning was very positive. In fact, it can be said that they were determined in the development of e-learning and made a lot of efforts to eliminate obstacles and problems in systems and software. To some extent, it can be said "After the fight against corona eradication, virtualization of education was a priority for our managers' programs."*

3.2. Weaknesses and challenges

1. Limitations of service clients and e-learning infrastructure

The first major category in terms of weaknesses and challenges is "Limitations of service clients and e-learning infrastructure", such as barriers and limitations in hiring specialized manpower, Lack of specialized and experienced staff in the field of virtual education, Weakness of e-learning facilities and infrastructure.

Hoda said: *"Weak electronic infrastructure, lack of evaluation infrastructure in Navid system; the impossibility of using the Navid system in teaching practical courses as well as the shortcomings of the system in holding the exams correctly were among the challenges of universities in holding online classes and developing virtual education"*.

Hadi said: *"At our university, the Internet infrastructure for e-learning is very weak"*. Farzad said: *"Navid system, which is used as the main system of virtual education in our university and most universities in the country, does not have a suitable infrastructure for evaluating the quality of virtual education, it is not suitable for evaluating students' activities, more usability"*.

2 Common tendencies, beliefs and views towards e-learning

Concern and distrust of some students about the quality of e-learning; Lack of interest of managers in virtual education; and users' resistance to e-learning was one of the challenges mentioned by some of the participants.

Shahin said: *"It can be said that our main problem in the development of e-learning is the concern of managers and their disbelief in the quality of e-learning. Users' resistance to e-learning is a major challenge, with some professors and students refusing to attend classes in person, even during the*

Covid 19 pandemic, and waiting until the universities reopen; compensatory classes".

3 Early experience

Given that virtual education has begun its first days in the country, it is associated with many issues. As some participants do not internalize the role of technology in traditional education; much more pressure on professors by managers and students due to high demand; and cited little experience in conducting online training courses as effective barriers to the development of e-learning.

Sadra said: *"In some faculties, conventional education still plays a leading role, in fact, the need to change the mode of education has not yet been accepted by some students"*.

4 Lack of comprehensive regulations and protocols in the field of E-learning

Some participants stated the lack of comprehensive regulations on measuring the quality and quantity of e-learning; Lack of standards in the field of content development and how to evaluate professors and students are important challenges of e-learning.

A student said: *"There is no single guideline for performance appraisal or content development. For example, one person uploads a pdf file as a session and another uploads a PowerPoint file"*.

5 Insufficient familiarity with virtual education

Based on the analysis of participants experiences, unfamiliarity with virtual education and how to evaluate the quality of virtual activities, as well as unfamiliarity of some students and professors as the most important elements of the educational system with virtual education software are other challenges in developing virtual education. Other participants also mentioned the lack of familiarity of experts and managers with the basic principles of e-learning.

Hossein said: *"Many students are unfamiliar with online education software. So effective education is almost impossible for everyone"*.

6 Barriers in access to coordination

Cooperation and support of managers has an important role in developing and improving the activities of an organization, and if this support is not provided and there is no cooperation between managers of different departments, the activities of that organization will be disrupted. In this regard, some participants considered the lack of proper communication and cooperation between educational administrators and information technology, as well as the lack of cooperation of some group managers in pursuing students' virtual problems as an important challenge in the field of virtual education. One of participants said: *"There is no proper communication and cooperation between university administrators and administrators of the university's virtual education department. I do not know why, but this challenge has shown its impact on the development of virtualization. Some participants also stated that professors' difficult access to educational administrators and students and vice versa is a major challenge in the development of virtual education in universities."*

Bahram said: *"We have difficulty accessing educational administrators; we have no way to offer them our suggestions, so they make virtualization decisions regardless of the suggestions."*

4. Discussion

The present study evaluated the strengths and weaknesses of e-learning in universities of medical sciences during the COVID-19 pandemic in Iran from the students' point of view. The outbreak of COVID-19 has led to the sudden suspension of all educational institutions. In such challenging time, teachers used e-learning tools to continue the process of educating students. In the present study, various questions were asked from the students of medical universities to assess their views on strengths and weaknesses of e-learning system. The importance of evaluating e-learning platforms has been discussed in many studies (Frehywot et al., 2013; Huynh, 2017). The findings of these

Table 3. Code, subcategory and category of weaknesses and challenges of e-learning development.

| Category | Subcategory | Codes |
|--|--|--|
| Limitations of service clients and e-learning infrastructure | Lack of specialized and experienced staff in the field of virtual education | <ul style="list-style-type: none"> • Lack of medical IT specialist staff in the virtual education unit • Lack of experts in content production problems • Lack of technical and educational technology expert to produce content • Few people are familiar with content development software • Lack of engineers fluent in designing and developing training systems • Lack of fluent and capable experts in the field of virtual education • Lack of trained and law-abiding experts in the field of e-learning • Inadequacy of the number of experts with the workload |
| Common tendencies, beliefs and views towards e-learning | Users' non-compliance to virtual learning | <ul style="list-style-type: none"> • Early non-compliance of users to virtual learning by students • Managers' concern about the quality of virtual education • Lack of eagerness to follow of general education instructors to hold classes online |
| Early experience | little experience in the field of e-learning | <ul style="list-style-type: none"> • Refusal to change the training model by some managers with experience • Surprise caused by the large number of applicants for virtual education • Double pressure on professors by managers in the early days • Less experience in holding training courses online |
| Lack of comprehensive regulations and protocols in the field of E-learning | Lack of evaluation regulations | <ul style="list-style-type: none"> • Lack of standard guidelines for measuring the quality and quantity of e-learning • Lack of a national standard protocol in the field of e-learning • Lack of unit virtual education regulations in the field of educational content |
| Insufficient familiarity with virtual education | Experts, managers, teachers and students are not familiar with virtual education | <ul style="list-style-type: none"> • Lack of familiarity of managers and educational experts with virtual education • Lack of familiarity of managers with the basic principles of virtual education • Insufficient familiarity of professors and students in the field of e-learning • Lack of familiarity and lack of mastery of virtual education by some professors • Lack of familiarity of professors with how to evaluate the quality of virtual activities • Insufficient familiarity of professors and students with virtual education software |
| Barriers in access to coordination | Weak cooperation and support of managers Limited access to professors, students and education administrators | <ul style="list-style-type: none"> • Lack of proper communication and cooperation between educational and information technology managers • Lack of cooperation of some group managers in following up on students' virtual problems • Difficult access to students to coordinate online classes by faculty members • Difficult access to education for students to inform online classes • Restriction in students' access to faculty and educational administrators |

surveys will help to shape strategies to improve the e-learning system. The challenge of limited scientific resources in developing countries and due to the growing need for health care providers, the importance of using e-learning system has been considered (Kumar et al., 2020; Olum et al., 2020). The results of descriptive analysis show that the desired education and information were expressed by the participants as the most important strength by the development of regulations and related instructions. The participants also stated that the support and encouragement of university and college officials are effective factors in the development and implementation of e-learning programs. Other strengths expressed by the students include 24-hour support for the e-learning system, continuous evaluation, monitoring and feedback, the presence of capable and specialized e-learning staff, and an interest in and prioritizing e-learning. According to the participants, comfort in communicating with the e-learning platform and feeling relaxed during e-learning were mentioned as other strengths. The results of the present study showed that with proper knowledge of the strengths and weaknesses of e-learning, it is possible to provide a better educational environment for students by making appropriate changes. Therefore, moving educational activities to an online format can include many benefits such as freedom from time and place limitations, scalability, interaction, and quality control. Also, data analysis indicates that the role of teachers in attracting students' attention and focus in e-learning is very important. From the participants' point of view, the weaknesses and challenges of e-learning were the limitations of the specialized human resources in the field of e-learning infrastructure, reluctance and negative view toward e-learning, mandatory use of this method due to circumstances, lack of appropriate executive instructions and unfamiliarity with this educational system and also lack of facilities and equipment were expressed. Therefore, most students believe that e-learning system is not equivalent to face-to-face education and this system is not able to improve learning

achievements. Students are dissatisfied with the institutional facilities, and they stressed that relevant training is needed to make effective use of the electronic system. The results of this study indicate that students have a less positive perception of distance education in the university. Therefore, to achieve a positive attitude and create a high level of satisfaction among students, it is necessary to address the weaknesses of the authorities in the e-learning processes. Another challenge of e-learning is that not all activities work well online and this should be taken into account when designing activities. A recent study by Romano et al., highlighted the impact of e-learning on ophthalmology education during the COVID-19 outbreak. They stated that restrictions on COVID-19 have a detrimental effect on medical graduate students (Romano et al., 2020). The results of the present study showed that students have the ability to use mobile phones and computers efficiently, have a positive relationship with the impact of e-learning system, they were not satisfied with the available facilities and emphasize the importance of education to become effective users. These findings are consistent with previous reports that students and teachers who use social media more often have significant potential to cope with the e-learning system challenges (Kimura et al., 2018; Romano et al., 2020). Another study by Chang et al., in China showed that teachers are not ready to accept the online education system. During the survey, they found that some faculty members have little knowledge of computer technology, and they prefer face-to-face interaction with students (Chang and Fang, 2020). Abbasi et al., studied medical students' perceptions of e-learning system, they concluded that although medical students are satisfied by e-learning but they concluded that this approach is not quite effective in technical and clinical skills (Abbasi et al., 2020). Similar findings were obtained in the present study.

One of the limitations of this study was the small number of respondents. However, a longitudinal survey is needed to better identify

real-time e-learning system issues. The focus of the study was on students of medical universities. Broader study population could make much more reliable results.

5. Conclusion

The e-learning system is an essential tool to continue education during COVID-19 pandemic. Most students believe that e-learning was a great complement to prevent academic failure, but it cannot replicate the same efficiency of face-to-face training. The weaknesses and challenges include the structural, equipment and unwillingness to use this educational system. Therefore, the importance of planning and setting a clear policy to promote the use of e-learning from low to high levels of education is well established. In this regard, decision makers and managers should act as the main trustees in the e-learning system.

Declarations

Author contribution statement

Arash Salahshori and Behzad Fouladi Dehaghi: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Kaveh Eslami: Conceived and designed the experiments; Performed the experiments.

Akbar Babaei Heydarabadi: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data.

Mansour Zahiri and Simin Jahani: Performed the experiments; Contributed reagents, materials, analysis tools or data.

Reza Arjmand and Hatam Boostani: Contributed reagents, materials, analysis tools or data.

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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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