Original Article

Designing, implementing, and evaluating an introductory course on virtual learning in the Covid-19 pandemic era

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Abstract

Background & Objective: The sudden outbreak of Covid-19 affected the educational systems worldwide and highlighted the necessity of students' virtual education. Therefore, the present study aimed to compile, implement, and evaluate an introductory course on virtual learning for medical students.

Materials & Methods: The present scholarly research was conducted in four stages: 1) needs assessment and establishment of objectives, 2) content determination, 3) implementation, and finally, 4) evaluation of the program at Arak University of Medical Sciences in the years 2020-2021. Needs assessment data were obtained via structured interviews and focus group meetings for 30 students and 12 professors. The content was produced for each purpose and uploaded on the Navid system for training. The first two levels of the Kirkpatrick model were used for evaluation. A researcher-made questionnaire was employed and electronically distributed to assess the level of students' satisfaction.

Results: Based on the results, the mean scores of students' satisfaction and learning were 18.43±1.5 and 16.8±2.5 out of 20, respectively.

Conclusion: The curriculum developed in this study for first-semester students can increase their knowledge of virtual education methods and satisfaction during the Covid-19 and Post-COVID-19 era.

Keywords: Covid-19, Empowerment, Student, Virtual education

Introduction

Today, we are witnessing rapid growth in online education, which is expected to increase, creating new opportunities for students, professors, educational administrators, and educational institutions. Currently, medical knowledge is undergoing dramatic changes due to knowledge sharing in virtual learning across the globe. Moreover, online education provides easier access to education, bringing the vast majority of people considerable advantages in the coming years (1).

In the field of medical education, the Ministry of Health has emphasized the provision of medical science education in cyberspace in the past few years. Nonetheless, no practical course of action had been taken in this field at the country level, and only some universities had conducted virtual courses. The sudden outbreak of Covid-19 brought about changes in healthcare systems, posing a daunting challenge to the field of education in most countries worldwide, including Iran (2). In order to prevent Covid-19 and

observe social distancing, face-to-face courses were canceled in universities (3).

During social distancing, medical students received courses that were irregularly provided on social networks. However, over time, the universities of medical sciences were required to use the Navid system (special university learning software). Professors and students benefited from the capabilities of this system after registering in this system. This system had already been designed and used in some universities; nonetheless, it had not been used nationwide in all universities of medical sciences (4-7). Although the Covid-19 pandemic caused numerous problems in society, it opened up good opportunities in the country, such as the flourishing of virtual education.

Even in the Post-Covid-19 era, virtual education will continue alongside face-to-face education. According to predictions and existing conditions, it seems that the development of online simulators in the field of medicine, the promotion of virtual hospitals, the remote delivery of healthcare services (telemedicine), the presentation of virtual cases, and online exams will continue to in the future (8-10). Today, there are different theories in the field of curriculum and educational planning. According to studies, students have a limited ability to use virtual education technology, and this reduces the quality of education (11).

Students have referred to a need for educational workshops in this regard and more familiarity with these technologies (12-13). According to the aforementioned need and a great emphasis on the development of virtual educational methods, the design, implementation, and evaluation of an introductory course on virtual learning was put on the agenda of the planning committee of Arak University of Medical Sciences. In addition, the implementation of this plan will pave the way for designing and implementing new virtual educational methods in line with the macro policies of higher education to improve the quality of students' virtual education.

According to the stated issues, the need for optimal use of virtual education requires the empowerment of professors and students in the effective use of virtual education systems. In the meantime, along with the closure of the classrooms, the professors participated in many workshops held by the Education Development Center of Arak University of Medical Sciences and acquired new skills. Nonetheless, it seems that with the closure of classes and students returning to their cities and villages, the students were not adequately empowered to take advantage of virtual education.

Furthermore, training students on the use of virtual education through strengthening their educational technology skills and making better use of virtual education systems will result in academic growth and the prevention of students' academic failure. In light of the aforementioned issues, the present study aimed to compile, implement, and evaluate an introductory course on virtual learning for all students of medical sciences.

Materials and Methods

Study design

This scholarly research was compiled, implemented, and evaluated at Arak University of Medical Sciences from 2020-2021. The present scholarly research was conducted in four stages: 1) needs assessment and establishment of objectives, 2) content determination, 3) implementation, and finally, 4) evaluation of the program.

1) Needs assessment and establishment of objectives

Firstly, in the survey conducted among students, it was determined that they need to become familiar with the principles of virtual education methods during virtual education. According to the stated requirement, at this stage, related articles were collected from various sources (in the field of needs assessment, education, learning, virtual education, and conditions of the Covid-19 pandemic), students, professors, and educational officials of universities and colleges.

Needs assessment of students was performed via convenience sampling, and structured interviews were conducted by a trained student. There were 30 students from different faculties. A number of 12 faculty members in various disciplines, who were directly involved with students' educational problems during the Covid-19 era, and medical education experts participated in the needs assessment. During meetings on educational needs, they expressed their opinion about semi-structured questions that were prepared based on the results of the needs assessment from sources and students.

After the collection of needs assessment data, the objectives, content, and educational strategies were reviewed by a team of experts in the field of virtual education consisting of experts in medical education,

information technology, and computer, medical education development, officials, and experts in the virtual education of the university, as well as the vice-chancellor of the faculties who were interested in cooperation. Finally, during four sessions in the presence of faculties, an educational program entitled "an introduction to virtual learning" was developed to strengthen students' skills in better and more efficient use of virtual education.

2) Development of program content

after determining the objectives, the educational content was designed based on reliable sources (14-16) and the opinion of the research team mentioned in the previous step. This content encompassed the importance of using virtual education and its benefits, familiarizing students with minimum concepts, principles, and use of computers and the Internet, management of the files needed in information technology in education, virtual education infrastructures, software, search engines for virtual education software, students' familiarity with exclusive virtual education systems, as well as mobile learning and its differences with computer-based learning.

3) Program implementation

after preparing the content based on the objectives and expert opinions, an educational strategy was designed to achieve the educational objectives. This way, Camtasia and Storyline software packages were chosen for content production; moreover, Navid System was selected as an educational platform. The lecture method was used along with photos and videos, as well as the discussion forum and the Navid message system, as well as group discussion questions and answers. Moreover, students' questions were answered online in the Samalive system. In the practical part, assignments and projects were selected for students through the system.

After necessary arrangements with the educational officials of the university and faculties, educational content was designed and produced for each objective using Camtasia and Storyline software packages and uploaded on the Navid system for education. The content was created in eight hours of theory and practice for all students and faculties, along with a simultaneous session in the Samalive system for problem-solving. After the approval of the educational council of the university, due to the readiness of faculties to add this course in that semester, it was presented to the students of five majors by two professors in medical education and curriculum planning. The discussion and assignment sections in the Navid system were used in order to provide better education and answer students' questions.

4) Evaluation of the program

The first two levels of Kirkpatrick's model were used for evaluation. In order to assess the level of satisfaction, a researcher-made electronic questionnaire was confidentially distributed among students. The structured questionnaire was designed based on several meetings in the research working group, and the items were scored on a Likert scale. The content and construct reliability and validity of the questionnaire were assessed and confirmed. Reliability was obtained at 0.87. Its content validity was approved by seven professors in medical education and other fields of medical sciences.

The questionnaire encompassed information on students' evaluation of indicators, such as uploading the lesson plan, regular upload of content, question responses, quality of assignments, feedback, interaction, presentation of new materials, practicality, and the professor's teaching style. In order to evaluate the level of learning, descriptive questions and a practical project were presented to the students in a specified time period, and their mean learning score was calculated out of 20 by the professors teaching the course (medical education and curriculum planning).

Results

The participants in the needs assessment phase included 30 students from different disciplines: medicine (n=14), nursing (n=6), surgical technology (n=1), midwifery (n=3), public health (n-4), and environmental health (n=2). The professors were also selected from the fields of medical education (n=2), nursing (n=3), health (n=1), anatomy (n=1), health education (n=2), midwifery (n=1), and medicine (n=2). Regarding needs assessment, the results illustrated that in the qualitative analysis of individual interviews with students and group discussions with professors, three main domains were extracted for the development of virtual education and students' empowerment.

1. Preparation for virtual education (subcategories: motivations for learning virtual education in students and professors, active professor-student communication in virtual education, and ethics)
2. Learning the basics or prerequisites of virtual education (subcategories: virtual content production

methods, familiarization with interactive methods in virtual education, educational software
3. Evaluation in virtual education (subcategories: familiarization with evaluation tools and methods in virtual education).
Based on the results of this study, finally, the headings of four eight-hour theoretical and practical sessions on familiarization with the virtual education method were designed and uploaded on Navid and Samalive virtual education systems. Table 1 demonstrates the content of each theoretical and practical session, as well as the summary of the subjects of the presented sessions.
Regarding the evaluation results, all the students from five majors in five classes answered satisfaction questionnaires and the test, which was administered to evaluate learning outcomes. The mean scores of students' satisfaction and learning were 18.43±1.5 and 16.8±2.5 out of 20, respectively (chart 1).

Table 1. Summary of the educational subjects in every session

Sessions	Subjects	Theoretical
First	The importance of virtual education Ethics in the use of virtual education and communication Educational software with different hardware	Theoretical and practical
Second	Familiarity with Asynchronous online education systems and its features such as communication with professors and classmates	Theoretical and practical
Third	Familiarity with Synchronous education systems and its facilities such as chatting and uploading files Evaluation in simultaneous systems	Theoretical and practical
Forth	Search Databases Search content	Practical
Fifth	Providing practical assignments and troubleshooting	Theoretical

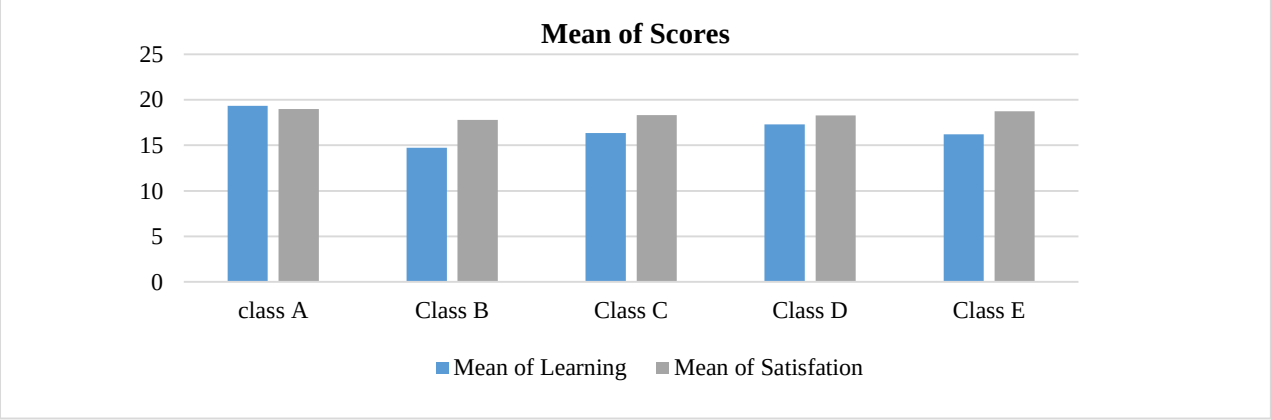

Chart 1. The average scores of learning evaluation and the level of satisfaction of students in five classes with the presentation of the introductory course on virtual education

Discussion

Due to the critical importance of the educational system, it is necessary to use the most effective methods in the design and implementation of the activities undertaken by this organization. Since the main goal of medical education is to train students so that they can fulfill the tasks assigned to them in the future, this education should be implemented using the best possible method to improve its quality. The present study was conducted in four main stages: 1) needs assessment and establishment of objectives, 2) content determination, 3) implementation, and finally, 4) evaluation of the program.
In the needs assessment for virtual learning, three general domains of preparation, basics, and evaluation were extracted, which have been referred to in other

studies on virtual education and virtual learning. In their study, Darabi et al. assessed infrastructure and professors' preparedness for the implementation of electronic education at Qazvin University of Medical Sciences. They reported mean scores of 3.36, 2.7, 3.69, 3.30, and 1.96 for cultural preparedness, technology preparedness, cognitive and knowledge preparedness, acceptance preparedness of students, and access, respectively.

In the mentioned study, 80% and 90% of cases, respectively, identified access infrastructure and human resources infrastructure as the most important problems in the section of infrastructures required for the development of virtual education. In general, the acceptance of electronic education at Qazvin University of Medical Sciences was evaluated as favorable (17). All students obtained an acceptable learning score. Choe et al. (2019) at the University of California assessed the impact of online lecture videos on student satisfaction and learning outcomes. They pointed out that online education resulted in better learning outcomes, as well as a marked improvement in students' engagement and satisfaction.

In this study, educational videos showed the satisfaction of students in surveys (18). As in the present study in which feedback was obtained from the students in the Navid system to clear up the ambiguities, students' feedback on educational content is a valuable resource that should be taken into account when designing online courses. Pei et al. (2019) also conducted a systematic review and meta-analysis in response to the question of whether online learning works better than offline learning in undergraduate medical students.

They analyzed the related articles from 2000-2017 from different databases and found no evidence of the advantage of offline learning (19). It seems that compared to offline learning, online learning has the advantage of increasing students' knowledge and skills; therefore, it can be considered a supplementary method in undergraduate medical education. Students' satisfaction with this program was 4.18 out of 20, which was considered a very good evaluation score based on the opinions of the research team.

Consistent with the results of similar studies, the findings of this research illustrated that this course could be accepted by students. For instance, Zahmatkesh et al. developed, implemented, and evaluated integrated an educational module of nanotechnology applications in the curriculum of neuroscience assistants at Tehran University of Medical Sciences. In this study, more than 80% of the students expressed their satisfaction with the course and recommended it to other students (20).

Along the same lines, Borhani et al. at Kerman University of Medical Sciences, in their study on the effect of virtual education on the attitude of nursing students towards virtual education and its relationship with learning style, concluded that the success of virtual education is not possible without considering students' opinions. They indicated that participation in a virtual education program course could improve the attitude of students participating in this course (21). Nevertheless, students' attitudes at the end of a virtual course have received less attention in previously conducted studies; therefore, there is a need for more investigations in this field.

In general, every curriculum can be implemented and taught comprehensively and reliably only after the final evaluation; however, some factors may gradually weaken the curriculum. The first factor is unprecedented changes during the implementation of the curriculum, such as the Covid-19 pandemic and the shift of education from face-to-face to virtual, which required alterations in the presentation of educational programs. The second factor is new scientific findings and information. The third factor is the incompatibility of the program with the conditions of society. Therefore, various factors cause the curriculum to gradually lose its effectiveness and need to be updated based on the created needs.

Therefore, the constant evaluation of educational programs and, if necessary, the development and implementation of new educational programs should be an integral part of educational programs in all educational centers. In their study, Latifnejad Roudsari et al. (2011) assessed student knowledge and attitude toward electronic education among students at Mashhad University of Medical Sciences. They pointed out attitude was statistically significantly correlated with students' gender, degree, and field of study.

Moreover, knowledge and educational stage showed a significant relationship with the duration of using computers and the Internet. They suggested holding educational workshops as an effective teaching strategy (12). Nonetheless, it is worth noting that the mentioned study was conducted before the Covid-10 pandemic when students were physically present in educational environments, and virtual education was implemented

as a supplement to face-to-face education on a limited level.

However, with the emergence of the Covid-19 pandemic, virtual education was suddenly recognized as the main platform for education, and students' education was mostly carried out using this method. Therefore, with the closures of universities, students returned to their cities and villages where there were information technology problems, an Internet slowdown, and a lack of access to computers. In order to mitigate these problems and help achieve educational justice among learners, and based on the results of the needs assessment performed in the present study, a course on students' familiarization with virtual learning was considered mandatory.

In the same context, Hajizadeh et al. performed a study on the challenges of virtual education during the Covid-19 pandemic era in Urmia in 2021. They indicated that, on the one hand, the Covid-19 pandemic increased the skills and educational experience of all stakeholders (learners and professors), but on the other hand, it caused physical and mental injuries, academic failure, job burnout, highlighting a need for considering virtual education as a supplement to face-to-face education (6).

Limitations

Among the notable limitations of the present study, we can refer to the lack of access to students due to the closure of universities and dormitories and, accordingly, the use of convenience sampling. Moreover, another limitation was numerous long and time-consuming meetings with experts in order to summarize opinions and agree on objectives, contents, and educational methods. On the other hand, one of the strengths of the present study was the design of a separate course to empower students and familiarize them with virtual education (at the level of Arak University of Medical Sciences).

In this course, students can benefit from the specialized training of experienced teachers in the field of medical education, curriculum planning, information technology, and computer regarding familiarity with virtual education. It is a step towards the achievement of educational justice for all students to have more appropriate access to educational content and improve their level of education.

Suggestions

It is suggested that the present study and the developed curriculum be implemented in other universities of medical sciences since, in the Post-Covid-19 era, virtual education may remain a complementary method to face-to-face education due to the establishment of its infrastructure and the familiarity of the university community with this platform.

Conclusion

The findings of this study pointed to the acceptable success of this educational plan in attracting students' interest and helping them to achieve the set educational objectives. Therefore, it can be used as a model for implementing similar educational plans in other universities in the country since the need for virtual education as a supplement to face-to-face education in the Post-Covid-19 era should not be underestimated. In general, according to the conducted needs assessments, it seems that all aspects of virtual education are considered essential by professors and students.

The implementation of this course can be an introduction to virtual learning for students in the Covid-19 period and even the Pst-Covid-19 era, leading to students' familiarity with virtual educational methods and their better use. Therefore, based on the results of this study, due to the emergence of Covid-19 and the widespread use of virtual courses, students need to be familiarized with the principles of information technology and virtual education in an attempt to prevent academic failure and establish educational justice.

Ethical considerations

The study protocol was approved by the medical education and development center of Arak University of Medical Sciences, Arak, Iran. It should be noted that participation in the study was voluntary, and informed consent was obtained from all participants. Moreover, no personal information was collected from the participants, and the data were completely anonymous during the study.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

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