

A Review of the Role of Integrated Education in Medical Sciences

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Abstract

Integrated education is defined as a combination of face-to-face education and e-learning, in which information and communication technologies are used, as well as providing face-to-face classes, for the learning of science seekers. In the last ten years, integrated education has been recognized as one of the most widespread learning methods in the education community and has met with great success and acceptance. Currently, many educational systems of universities, especially universities of medical sciences, have embraced this method. In this article, integrated education approaches in medical sciences universities have been studied and introduced. This article is a case study and information collection has been done using printed and electronic documents related to the topic. The successful teaching of university courses to students, the ongoing training of medical professionals, and patient education for expedited treatment are some of the methods used in integrated education in the medical sciences. Raising patients' and the public's general knowledge is a crucial component of integrated education. Currently, access to electronic information is easy, while holding a class for all people is difficult and expensive. For this reason, electronic methods and the creation of knowledge-based bases increase the chances of people learning health methods, especially in developing countries.

Keywords: Education, E-learning, Integrated education, Medical sciences

INTRODUCTION

Almost two decades have passed since the introduction of electronic education (E-learning) or computer-based education in the world, especially in universities. This method started with the power of computer tools, and then with the expansion of the global Internet network, it became possible to send all kinds of information through the Internet. Following this progress, virtual e-learning classes were created to fully simulate and implement the virtual education process, and the first virtual universities were opened to provide online and distance learning services. In the last decade, the discussion of replacing face-to-face training with virtual methods was raised and initial experiences in this field began. However, the results of these experiments were not very favorable. For example, according to published statistics, 70% of virtual education institutions in the United States failed, and the English virtual university, despite its high costs, was not well received by students. Of course, the slowness and unwillingness of universities to change the education system is also proof of this fact [1-3].

Of course, the method of electronic education has achieved some of its desirable goals and desires, goals such as reproducibility of lessons, cheapness of education, access from everywhere and at any time, etc., but what was not very successful in it was improving the quality. It was education [4]. By observing the failures resulting from the first

experiences of electronic education and of course, by understanding the outstanding features of this equipment, universities turned to an integrated approach to education, which is created by combining electronic and face-to-face education and aims to use the advantages of non- It is possible to use any of these two methods to design a model with a higher quality of learning [5-7]. This education system has been proposed today instead of only electronic or face-to-face training and has met with great success and luck in its new experiences.

This strategy is currently being used by numerous university virtual education programmes. Better learning of the medical

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sciences has also found a special place for the integrated education approach [8-11]. The volume of information in medical sciences is increasing at such a speed that it has caused many challenges to health professionals. Consolidated training has brought significant benefits to the continuation of medical education for professionals. In the field of medical sciences, in addition to educational issues, research, and information production, issues related to the treatment of patients will also be possible with the help of integrated educational methods [12-16].

In this study, we first introduce combined electronic and face-to-face training and then state its benefits in general. Next, we will outline the resources that integrated education approaches offer to the medical sciences and emphasize that these resources are available not just to medical professionals, such as physicians and nurses, but also to patients and the broader public. Then we express a general conclusion about the conducted research.

Definition of Integrated Education

Integrated education is a model of learning that deals with educational planning by emphasizing the quality of learning or using information and communication technologies (ICT). Integrated education includes a large list of applications and functions, including Web-based training, computer-based training, virtual classrooms, and digital cooperation. In the integrated education approach, all educational goals are considered electronically, without affecting the quality of education.

For further explanation, we first state the main goals of e-learning as follows [17-21]: Education from anywhere and anytime, reducing education costs, covering a larger number of students, reproducibility of learning, and the possibility of creating interaction. Faster between the student and the teacher, increasing the speed of learning, student-centered education, using audio-visual and multimedia resources as educational aids.

The important point is that quality is not very important in the above goals. But what is placed in the integrated model is the quality of learning. Quality is an issue that should not be sacrificed for the goals listed above. Based on this, it can be said that the integrated approach provides models for designing learning models in different conditions to ensure its desired quality with their help. These patterns have the property of guiding education experts by providing parameters for the highest quality planning, taking into account information and communication technologies. Therefore, integrated education is an approach to educational planning while e-learning is a tool for learning.

Benefits of Integrated Education in Medical Sciences

The benefits of integrated education in the field of medicine include a wide range of people, including students, professors, designers of medical education materials,

managers of medical education institutions, health professionals, patients, and the general public [17, 22, 23].

Teaching University Courses to Students

The use of information and communication technologies in teaching lessons can be effective in improving learning. In a study, it has been reported that 94% of the learners who completed distance learning courses believed that they had learned more compared to face-to-face classes [24].

Medical Staff Training

Due to the rapid development of medical sciences, the continuous training of medical staff in electronic form allows them to increase their knowledge and skills with modern science anywhere and anytime.

Patient Education

Electronic education of patients makes the person actively participate in the treatment process. Remember that in the field of medical sciences, you should not neglect the education of patients.

Public Education

Teaching the right ways of living is not limited to patients. It is better to make these methods available to the public using information and communication technologies. The availability of public education electronically prevents many diseases.

Current Approaches of Integrated Education in Universities of Medical Sciences

In the following, we introduce examples of electronic education methods used in medical universities.

Providing Theoretical and Laboratory Courses

One of the integrated education approaches is to provide theory courses electronically. In some cases, information and communication technologies have been used only as a teaching aid. For example, in a study in Japan, the use of a CD to teach the oral health of the elderly to medical and dental students caused a significant increase in the knowledge and skills of the participants [25]. Abdominal physical examination was used in teaching, it was found that this method helps students who are weak in learning more [26]. E-learning systems used in Iranian universities of medical sciences also have more aspects of educational assistance. These systems have been in operation since 2002. In one of the implementations of integrated education at Tehran University of Medical Sciences, 22 courses from the main and specialized nursing and midwifery courses were presented in a combined electronic and face-to-face format. The surveys' findings demonstrated that both students and lecturers preferred adopting this approach over the conventional one, and there was a noticeable difference in students' average scores and engagement rates when compared to the in-person method [27]. Shahid Beheshti University of Tehran has also benefited from a similar

implementation to provide physiology courses and medical education courses at the master's level [28]. In another study at Isfahan University of Medical Sciences, a multimedia presentation was also used during a seminar to teach lung sounds to medical students after regular training. After using this technology, the errors of the participating students were significantly less than the control group [29]. In the same university, Schwartz's physical examination training was also provided to preclinical medical students in the form of a CD. The use of this technology along with face-to-face classes led to the improvement of students' grades [30].

In another research at Isfahan University of Medical Sciences, practical and theoretical histology courses were presented in a consolidated form. In this method, a good-quality central computer with a high-quality graphics card was used in the histology laboratory. This computer is connected to a microscope by a microscope imager software and displays the images of microscope slides with different magnifications and appropriate resolution on the monitor. Both students have a monitor that is connected to the main computer in a network. On the other hand, the main computer is also connected to a comprehensive and complete information source including all microscopic images of the slides in the pathology department on the Website of Isfahan University of Medical Sciences. In this way, by connecting to the main computer, the science professor extracts the required images through a three-eye microscope or from inside the information source and displays them on his monitor. By displaying each image on the main computer, the images are also displayed on the students' monitors [31]. In other countries, with the advancement of technology in recent years, the use of these information and communication technologies has moved out of the mode of educational assistance and has assumed a wider scope of the education process. For example, in the radiology department of Harvard University, the presentation of the radiological anatomy course has changed from the face-to-face mode to the inoculation mode. In this method, students learn the educational parts in a student-centered way through the web. Also, case studies have been added to the materials in addition to laboratory courses, and of course, review sessions are held in person every two weeks [32]. Similarly, the UK Faculty of Health, as the largest provider of e-learning in Europe, uses the advantages of web-based software to train its surgical staff in a virtual learning environment [33]. Fifth-year dentistry students in a Brazilian institution receive oral health instruction online. Additionally, a study has been done on the students to assess the effectiveness of the electronic teaching approach. Three groups of students participated in this study. Only in-person instruction was provided to the first group; online access to all course materials was provided to the second group; and both electronic course materials and expert supervision were provided to the third group. The results of this research showed that the students who were trained in the third group made the most progress in acquiring knowledge and counseling in the field of improving oral health [34]. Johns Hopkins University has also provided a

large number of online medical education courses to students. Students can complete these courses completely electronically and online [35].

The advantages of electronic education can also be used in providing laboratory courses. For example, Stanford University has placed images related to the biophysics laboratory on the web, and students enter the virtual laboratory through the network and view the images and descriptions related to each device [17].

Providing Simulation Programs

Another approach to integrated education is simulation. The use of simulation software results in a lot of cost reduction. For example, at the University of Buffalo, a simulated corpse is used for teaching instead of a real one. The University of Pennsylvania uses simulation software to teach how to collect cerebrospinal fluid. By using this software, trainees observe the pressure and resistance of different body tissues when the device hits and measure their progress by getting feedback from the program. Another simulation software is also used for abdominal cholecystectomy training, in which the reaction of each tissue when dealing with the surgical instrument is calculated and shown to the surgeon [17]. At Columbia University, a medical case simulator has been designed for the training of health professionals, including medical and nursing students. This simulator is an electronic medical information record software called EMR. This software can record the information of different patients and use this information for training in a virtual environment. Students and professionals will be able to add patient information and new cases to the system. This system is used in clinics [36]. The web version of this system has also been launched for use in universities [37]. These systems have recently been designed and used, and currently countries are looking to improve and increase the efficiency of information recording systems [38]. Another example of a medical case simulator is the Second Life software. This simulator is a 3D virtual educational environment and can simulate any environment in the real world. An example of this simulator is used at the University of London. The university has created a virtual hospital in Second Life where students can see real patients, request X-rays, record diagnoses, and consult with colleagues and other students. The hospital includes operation and surgery rooms as well as restrooms for patients. For example, in the operating room, some signs show the student what the steps are to prepare for surgery (such as dressing, wearing a mask, and disinfecting the student after the virtual procedure). The student can enter the operating room see all the equipment in the operating room and read the explanations about them. Other parts of the hospital have also been created virtually in the same way [39, 40].

Another example of this software is used at the UNC School of Pharmacy. Some of the tools required for pharmacy are not available to students because of the high cost. For this reason, in this software, pharmaceutical devices and tools are

simulated in a virtual way and by the real model so that students can learn how to use them correctly before working with the real sample of the devices [39, 40]. Another example is patient simulation in US and Canadian medical universities. In this simulation program, information about patients from different medical schools is collected and recorded. This information is used to educate students as well as create interaction and share more information among health professionals [41].

Training Doctors and Sharing Information

Another advantage of integrated training is putting doctors under training [42, 43]. For example, in a study, the impact of educational environments with the help of web conferencing (Web conferencing) on increasing the knowledge of family doctors was conducted for three consecutive years. In this study, family doctors shared their information with other doctors in weekly conferences and then evaluated the effectiveness of these conferences in increasing their knowledge. The results of this evaluation showed that although these people initially preferred communicating face-to-face, they gradually became interested in communicating online. Doctors realized that establishing a web conference among places with a great distance is faster and less expensive, and this ultimately led to an increase in the number of conferences held compared to face-to-face conferences. As a result, increasing the number of conferences led to more sharing of information [44, 45].

Providing Educational Programs for the General Public

In recent years, electronic education has played an effective role in increasing the awareness of the general public about health [46]. Electronic methods and the creation of knowledge-based databases increase the chances for people to learn health methods, especially in developing countries [47]. For example, the Global Health eLearning Center has put educational programs related to public health on the web to increase the awareness of people in the community [47]. Similarly, a public distance education program has been established to prevent the public from abusing alcohol. This program is a web-based educational environment, including 3D graphic software, electronic games, and conference rooms, and provides the necessary knowledge about alcoholism and alcohol abuse to the general public, especially young people [48].

CONCLUSION

Surveys of different medical universities show that the use of integrated education as a program has been noticed in the field of medical science education all over the world. In some universities, basic theoretical and practical science courses are taught to students in a combination of face-to-face and electronic classes. Research results show that the use of information and communication technologies in teaching courses in addition to face-to-face classes is very effective in improving students' learning. In these universities, some

training is also provided using simulated programs. Simulated programs are of interest to many educational planners due to the reduction in costs and increase in learning speed. Combined training in some universities is also done in the form of medical staff training and with the help of creating virtual interaction environments. In this way, health professionals interact more and faster with each other. Establishing more communication helps a lot in sharing information and updating it. Also, virtual educational environments allow professionals to increase their knowledge and skills in line with modern science anywhere and anytime. Another very important approach in integrated education is providing general awareness for patients and the general public. Currently, access to electronic information is easy, while holding a class for all people is difficult and expensive. For this reason, electronic methods and the creation of knowledge-based bases increase the chances of people learning health methods, especially in developing countries.

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