



E-Learning in Medical Sciences Education: A Comprehensive Literature Review

Negin Ghasemi	Assistant Professor of Endodontics, Dental Faculty of Tabriz University, Tabriz, Iran.
Parisa Falsafi	Assistant Professor of Oral Medicine, Dental Faculty of Tabriz University, Tabriz, Iran.
Naser Asl Aminabadi	Department of Pediatric Dentistry, Dental Faculty of Tabriz University, Tabriz University of Medical Sciences, Tabriz, Iran.
Ramin Negahdari	Department of Prosthodontics, Dental Faculty of Tabriz University, Tabriz University of Medical Science, Tabriz, Iran.
Ayla Bahramian	Assistant Professor of Oral Medicine, Dental Faculty of Tabriz University, Tabriz, Iran.
Kazem Khodadoust	Ph.D, Department of History of Medical Science, Tabriz University of Medical Science, Tabriz, Iran.
Reza Khorshidi Khiyavi	Department of oral and maxillofacial surgery, Dental Faculty of Tabriz University, Tabriz University of Medical Science, Tabriz, Iran

ABSTRACT

Introduction: Educators need evidence-based guidance on how to develop effective e-learning in dentistry. The purpose of this literature review is to update previously published information and present a comprehensive list of articles regarding e-learning.

Method: A review of the literature was performed by using electronic and hand searching methods for e-learning from May 2000 to July 2015.

Results: The overall perceptions of online learning were positive, and although there were some frustrations, the majority of students reported learned a great deal, found the course valuable, and became familiar with the terminology; but there are concerns and challenges in relation to the value of online learning.

Conclusions : Although the experience of developing and using online courses was new in much dental school, the study results revealed that the program was feasible effective. It seems that combination of classroom and online education was the ideal teaching methodology.

KEYWORDS

Advantage; Disadvantage; Challenges; e-learning.

Introduction

The education systems are undergoing major changes all over the world, with educational courses and programs being designed in new ways accompanied by new educational contents to incorporate the most updated knowledge to pave the way for making use of new technological advances (1-6). In the higher education area, it was particularly reported that "integrating teaching, learning and technology is a mandate, not an option and doing any less would border on professional irresponsibility" From a pedagogical viewpoint, electronic education can shift the balance from the passive teacher-centered scheme to active student-centered learning process (5-9). Currently, computers have achieved a crucial and ever-increasing role in dental education. Electronic education has shifted the focus from the hard medium to the online environment, thanks to high internet speed and widespread accessibility (6, 10-13).

Blended learning combines face-to-face learning and e-learning, giving rise to didactic learning and aiming to improve the quality and quantity of educational activities both vertically and horizontally dimensions by using state-of-the-art technolo-

gies (14-16). In the horizontal dimension, the aim is to expand use of instruments to facilitate learning using a learning strategy in such a way to achieve the highest quality. In the vertical dimension, the aim is to carry out an in-depth analysis of learning in order to better understand educational materials for optimized learning (9, 14). The interactive nature of web- or internet-based e-learning, apart from facilitating access to the available learning strategies, over a wide range of time and location, enables researchers to benefit from different education management systems (10-13, 17-21).

The purpose of this literature review is to update previously published information and present a comprehensive list of articles from May 2000 to July 2015 regarding advantages, disadvantages and challenges of e-learning in human health education field; also, the limited literatures regarding that were available regarding to dental education with this new method was mentioned.

Inclusion and Exclusion Criteria

Peer-reviewed journals were searched for articles related to e-learning published in English from May 2000 to July

2015. Studies that did not meet these criteria were excluded.

Search Methodology Appropriate MeSH headings and key words related to different aspects of e-learning were searched in PubMed and Cochrane databases. Moreover, hand search of the last 2 years of issues of the following endodontic journals was conducted.

Advantages vs. Disadvantage

Advantages of online learning have been reported in previous studies and include ease of using the program, learners' working at a pace and time suitable for them, the possibility of the student-student interaction, feedback provided by the program, multiple sensory inputs, improvements made in computer literacy, enhanced self-motivation and finally, self-directed learning(2-5).

Furthermore, learners are able to gain access to the material from multiple locations; it is possible to limit access only to students enrolling in the course; learners are able to use other websites; it is possible to incorporate multimedia material at a relatively low cost; it is possible to decrease linear teaching and promote high levels of interactivity between the student and the instructor and shift from instructor-centered to learner-centered instruction(10, 18, 22-25). With the use of online learning, students are not required to attend classes at times or places dictated by the institution; therefore it is possible for them to meet both employment and family commitments while they are carrying out their educational responsibilities (22, 23, 26, 27).

The concept of convenience might be defined in different ways, from ease of access to the online program to a decrease in travel time. Students are all pleased to be able to actually acquire degrees by studying in their homes. They believe it is advantageous to complete the course at a time appropriate for them, their work and their family schedules. One student believed since his work schedule was not predictable, he was unable to enroll in traditional courses. Furthermore, students enjoy the advantage of having access to the educational program round the clock, being able to work at any pace they choose and to review the materials repeatedly until they master them(28-32). Also, it was reported that students preferred online learning because it made it possible for them to fulfill their family and occupational commitments while studying (10, 18, 20, 23-25).

In fact, many students are unable to enroll in courses if it involves in commuting to campus. Two dental hygiene students mentioned the decrease in commute times and costs alluded to in previous studies (12,13). The dental hygiene students were delighted that they did not have to attend the class on Mondays and Fridays at 8:00 a.m. All, except for two students, expressed willingness to enroll in online courses in future. It is interesting to note that these two students were on-campus dental hygiene students. They enjoyed the online program but the instructor-student and student-student interactions were more enjoyable for them(10, 18, 23-25).

Two studies on online learning in nursing and medicine showed that students were satisfied with this form of distant learning and believed it was an effective learning strategy similar to other teaching and learning methods. It was reported that technological problems did not interfere with learning, emphasizing that the teleconference- and web-based education can be as effective as traditional classroom-based teaching technique (9, 14).

Apart from the necessity of students' preparedness for learning online, other factors might affect their preferences for online versus conventional classroom courses, including personality traits, that more extroverted and sensitive students preferred online presentation of information and enjoyed the way they were evaluated in such courses (18).

Despite its advantages, the chief disadvantages of online

learning are technical issues and isolation of students. Some students miss the interaction in a traditional classroom; however, self-directed learners enjoy online education and are more successful (4), which explain why it is necessary to integrate electronic and online education with conventional problem-solving sessions or other activities (5-7). Disadvantages attributed to online education in allied health and other higher education courses chiefly concern technological problems. Students might be hampered by the slow downloading of images, high phone bills when a local number for the Internet access is not available, and also by lack of campus computer resources (13,15). A lack of direct contact with the teacher/instructor and other classmates might lead to an unpleasant feeling of isolation and disconnection(11-13, 17). Finally, some students might not accept a new learning method because the conventional lecture format is deeply rooted in educational systems(27). One study showed that students believed instruction in a conventional classroom setting covered the subjects more adequately, with more interaction and participation being involved in the classroom setting; they also found faculty preparation and interaction a very important aspect of the learning process, believing that more communication skills were required in a classroom environment(3-5).

Challenges

A consistent and paramount challenge is how to adapt educational goals and methods to the new opportunities and technological challenges and how to integrate these technologies most effectively into the educational curriculum (5, 7, 33).

Which technologies are able to help improve and augment education? Which applications are just technological fads? And, more importantly, how should one use technology in innovative ways for better educational results? Such changes require faculty members to use technology more effectively to educate students so that they can think and read critically, express themselves more clearly and persuasively, and solve complex problems more effectively. A great challenge for dental schools is how to maintain and balance a complex mix of activities, including clinical care, education, research and administration. This complexity, in itself, gives rise to computational complexity (13, 17, 19). Use of online elements in education results in many benefits compared to traditional classroom teaching (3). Despite their potential, developing critical thinking skills in these virtual text-based environments is still a challenge for educators. It involves the use of an inquiry-based environment to encourage students to challenge assumptions and consider their own experiences (5). The capacity of online discussion panels to support learning in the health fields is a successful educational strategy, especially in supporting collaborative learning in online educational programs(28-31).

The chief advantage of blended learning technique is the integration of the advantages of synchronous (conventional face-to-face) and asynchronous (online and web-based) learning modalities by dividing the class time into two parts: a part for distance or web-based learning and a part for classroom or face-to-face activity(7, 8, 34). The length of each mode will depend on the course design (5). Creating a balance between these two entities is a challenge, depending on factors such as the instructional aims, the characteristics of learners, the condition of online resources and the trainer's experience(15, 16).

E-learning in Dentistry

Studies suggest that online learning is a valuable method for teaching dental terminology and is advantageous to students who have difficulty gaining access to the educational courses due to long geographical distances. Online courses can be a great choice for distant learning in dental hygiene programs (2, 4, 22, 25).

Only a limited number of studies are available in relation to e-learning in different fields of dentistry. A literature review showed that the majority of these studies are related to restorative dentistry. A cohort study in relation to the evaluation of the results of teaching using an online technique showed

an increase in the students' motives for learning, an improvement in learning and an increase in students' skills in the field of restorative dentistry. The results of this study are consistent with those of two other studies in which the students' skills significantly increased in the evaluation and diagnosis of dental caries with the use of e-learning model compared to presentation of lectures (2, 31-33). In a study aiming to evaluate the e-learning strategy in restorative dentistry, all the under- and post-graduate students reported that their skills increased significantly in restoring teeth, with post-graduate students exhibiting better performance with this educational model (16).

A study used blended-learning model for education in the prosthetic pre-clinic courses, which showed an increase in students' satisfaction with the educational content and in usefulness of the courses. In addition, the majority of students suggested web-based examinations (18).

In another study the opinions of under- and post-graduate dental students in relation to holding web-based examinations were evaluated. The results showed good reliability and security of such examinations. However, the major problem was access to the internet and the limited band width in some areas, which had a negative effect on exam results (10, 11).

Another study evaluated the skills of dental students in relation to the physical examination of patients using a web-based educational program and the results indicated that the majority of students were satisfied with this learning technique (12). Little attention has been directed toward the different aspects of web-based educational model in Iran. Only one study has shown the positive effect of online teaching and learning model on dental students compared to the lecture technique (26).

Conclusions

The overall perceptions of online learning were positive, and although there were some frustrations, the majority of students reported learned a great deal, found the course valuable, and became familiar with the terminology. Students enjoyed the convenience of taking the course at a time appropriate for their schedule without having to commute long distances. Technical issues and student isolation were the chief disadvantages of online learning. Some students missed the interaction existing in a regular classroom and strongly believed that one had to be a self-directed learner to be successful in online learning. Furthermore, visual learners were more successful than audio learners in online learning.

There are concerns in relation to the value of online learning. Some students believed a combination of classroom and online education was the ideal teaching methodology. Combining these two methodologies would maximize the positive attributes of each methodology, with students having flexible access to the content, but they would also enjoy the interaction between the students and teacher in the classroom that would allow for discussions that are not easily provided by the computer format.

Further support is necessary to train teachers to effectively incorporate online teaching elements in their curriculum to achieve their final educational objectives. The results of this study are the first faltering step toward providing evidence-based research, highlighting specific pedagogies in incorporating effective online components within the dental curriculum. Exploring students' perceptions regarding this new technology might provide a better understanding of the advantages and disadvantages of learning online and might be useful for programs in relation to distant education initiatives and/or students planning to enroll in online courses.

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