Designing an educational software for teaching and evaluation of radiology course in dentistry

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Abstract

Background and purpose: Radiology course has different parts in dentistry curriculum in Iranian medical universities. The third part of this course involves the diagnosis of facial and jaw's bone lesions. In this study an educational software was designed, by using Access Database Software, to teach this course to dentistry students and after one semester the efficacy of it was tested by examining the students' opinion about it.

Methods: In this study the radiology course part 3 was thought to the 32 students in 2 parts. In the first part (before mid-semester) the traditional method of teaching and in the second part (after the mid-semester exam) the designed software was used for teaching and evaluating the students. After each semester the opinion of the students about the course was examined by using a standard questionnaire. The students in the first and second part of the semester were considered as the control and case group respectively.

Results: Most of the students (90.6%) believe that the software is useful in education and helps them to learn the subject. In addition, 84.4% of students believe that the soft ware can evaluate the clinical skills of students in detecting the radiological lesions and that the program can save their studying time. Overall, the students' marks in case group were significantly higher than these in control group. The overall satisfaction of 78.1% of students about this program was good while 9.3% did not have a good feeling about it and 12.5% did not express any opinion.

Conclusion: This study shows the importance of using computer for educational purposes especially in the courses with a huge amount of materials to be memorized by students. Computer science can help students in memorizing different signs and symptoms of many disorders. In addition it can help the teachers to evaluate the students at the end of the course.

Key words: COMPUTER, SOFTWARE, EDUCATION, RADIOLOGY, DENTISTRY.

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Introduction

The history of computer invention and usage go back to the Second World War (WWII) when the computers were used for military purposes. In fact scientists and engineers have developed the idea of using automating calculation and then it was adopted by the military. Those computers, however, produced only limited impacts on the war but it produced more attention to the researchers working on computer, and these groups provided more advanced in the computer technology after the war (1). Computers have had massive effects on the societies, where they are said to be largely responsible for the emergence of an "information revolution" (2).

CD-ROM was the first digital teaching aid which launched as a storage medium in the mid-1980s. Since then, the use of digital teaching or e-learning has grown increasingly. The materials used in e-learning are improving and changing very rapidly, for example, with the emergence of DVD, the CD-ROM format may soon be considered as old technology (3). In addition to the technology, the methods of teaching are changing as well. Traditional classroom/lecture-room mode of teaching is replaced by the new technology and new methods of teaching including e-learning in many universities including dental universities. In dental education the new technology is used to teach difficult courses to the students more efficiently (4). This new technology is always changing and the users are adapting to these changes very rapidly (5).

Different softwares were designed for teaching dental courses to the students and the effectiveness of these softwares and the opinion of students about them were studies and the results were published in different papers. For example, a virtual microscope and telepathology system was established for the oral and maxilofacial pathology laboratory course in a dental school. The results indicated that virtual microscopy has many advantages over real microscopy in oral and maxillofacial pathology education (6). Another study has been performed on approximately 800 dental students at 14 dental schools in USA to determine what dental students' think about information technology resources. Less than half of the students believed that the laptop and software had improved the quality of their education, but more than 70 percent rated their overall experiences with laptops as "okay," "good," or "excellent" (7). A study was conducted at the University of Jordan to investigate the current knowledge, skills, and opinions of undergraduate dental students about IT. The results showed that the students used computers for personal activities more frequently than for academic reasons. Many students (90%) used e-mail. Most students (83%) supported the idea of placing lectures on the web, and 61.2 % indicated that this would not influence lecture attendance (8). Another study reported 123 dental students' response to online manual software which was available through a web-based course management system. This software was used to transform a lecture-only course into an interactive web-enhanced course. The results showed it is possible to develop and implement web-enhanced and interactive dental education in a course that successfully delivered information beyond the textual format (9).

In more advanced techniques, computer simulations or virtual reality is used for teaching different courses (10).

Radiology course has different parts in dentistry curriculum in Iranian medical universities. The third part of this course involves the diagnosis of facial and jaw's bone lesions. In this study an educational software was designed to teach this course to dentistry students and after one semester the efficacy of it was tested by examining the students opinion about it. In this article the production of this educational software in dental education and the students' opinion about it will be discussed.

Methods

In this study an educational software was designed mainly by using Microsoft Access Database Software. All of the information about a radiological lesion including clinical signs, radiological signs and an explanation for each radiological lesion were entered in the data base of this software. These radiological lesions included; radiolucent lesions, radio-opaque lesions, and mixed radiolucent and radio-opaque lesions. After completion, this software is able to give all of the differential diagnosis of a clinical signs of a patient's radiography with all of the photographs, radiographs and histological images which are related to these differential diagnoses. In addition, this software can list all of the lesions with similar specifications. This software has some specifications such as; the ability to search the data, dynamic reporting system based on the request of the user, the ability to store data in different formats including PDF, XLS, DOC and RTF and finally the ability of having a backup system. In addition to the Microsoft Access, the other softwares were used including; Visual Studio, Net 2005, Microsoft Access 2007, Microsoft Visio 2007, Install Shield 12, Crystal Report 11 and Dotfuscator Community Edition.

 The radiology course part 3 was thought to the 32 students in 2 parts. In the first part (before mid-semester) the traditional method of teaching and in the second part (after the mid-semester exam) the designed software was used for teaching and evaluating the students. After each semester the opinion of the students about the course was examined by using a standard questionnaire. To compare the success of the students in the midterm exam with this in the final exam, the students in the first and second part of the semester were considered as the control and case group respectively.

Results

Overall 37.5% of the students were completely agree with this statement that "this program is useful for better teaching and education of students", while 53.1% were agree with this and only 9.4% didn't express any opinion. No one was against this statement. This means, that most of the students (90.6%) believe that the software is useful in education and helps them to learn the subject. In addition, 84.4% of students believe that the soft ware can evaluate the clinical skills of students in detecting the radiological lesions and that the program can save their studying time. When they were asked if this software is useful in decreasing the stress of time managements in the exam? 25% were completely agree that it can, 59.4% were agree and 12.5% had no opinion about it, and finally only 3.1% were disagree with this. Most of the students (81.3%) believed that a basic knowledge of computer is important in working with this software. Only 6.7% of students express some kinds of stress in working with this software, while 86.6% had no stress and 6.7% didn't answer this question. Overall, the students' marks in case group were significantly higher than these in control group. The overall satisfaction of 78.1% of students about this program was good while 9.3% did not have a good feeling about it and 12.5% did not express any opinion.

Discussion

Computer is now a necessary part of our daily life, as it provides a wide range of information on all aspects of our education. IT offers added value to traditional teaching methods. In spite of the learning effectiveness of e-learning applications, students request such approaches as an extra option to the traditional delivery of learning materials. A systematic process performed by an organized team is needed for the development of effective educational software (11). The use of information technology (IT) in dentistry (e.g. e-learning, distance learning, simulations and computer-based assessment) can assist in the education and ability

development of dental students. This article describes the process of development of successful educational software for teaching in dentistry education. During this process, the computer, education and dental specialists assembled the pieces of the educational program during its development. In mean time, the photographs, radiographs and other media in addition to the program code were created, and support documentation was produced. After the completion of the program, the evaluation by the development team and with students was conducted.

In one study virtual reality simulator-enhanced training was compared with laboratory-only practice on the development of dental technical skills in 68 dental students. These students were randomly assigned to practice their skills in either a traditional preclinical dentistry laboratory or in combination with a virtual reality simulator. The results indicate that students who trained with the virtual reality simulator improved significantly more than did the students in the control group (10). A similar study was performed on 59 first-year dental students to determine if there was a significant difference in the diagnostic quality of the initial full-mouth series (FMS) exposed by these students after viewing a Computer Assisted Instruction (CAI) module on radiographic technique as compared to those who did not. The results showed no significant difference in error points between the two groups. But dental students who reviewed the CAI preferred using it and recommended it to others (12). Similarly in our study students preferred the software to the traditional methods and most of them were agree that this software is very useful in their education. These studies showed that computer programs and simulations are becoming very beneficial in the area of dentistry education (13).

This study shows the importance of using computer for educational purposes especially in the courses with a huge amount of materials to be memorized by students. Computer science can help students in memorizing different signs and symptoms of many disorders. In addition it can help the teachers to evaluate the students at the end of the course.

Our conclusion is that this technology offers significant potential in the field of dental education.

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