Research Paper: A Comparison of the Effects of Multimedia and Lecture on Learning the Color Recognition and Esthetic Course in Dental Students

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ABSTRACT

Introduction: Today changing health care and medical curriculum has made computer-assisted learning more valuable than before. In fact, currently the increasing availability of accessing suitable hardware and software for Electronic-learning has provided a new horizon for educational institutes. This study evaluated the effects of multimedia and lecture on learning the color recognition and aesthetic course in dental students.

Materials and Methods: The present study was an Quasi-experimental study which consisted of 46 undergraduate students in sixth semester at the school of dentistry of Guilan University of Medical Sciences. The sampling method was based on the total population of the study. The students were randomly selected and divided into two groups: the experimental (n = 26) and control groups (n = 20). The multimedia and lecture methods were used in the experimental and control group.

Results: There was a significant relationship between pre-test and post-test scores in both experimental and control groups ($P \leq 0.001$). Independent t-test was used to compare the pre-test score between the control and experimental groups and the post-test score between these groups. There was no significant relationship between the pre-test scores as well as the post-test scores in the two groups ($P > 0.05$).

Conclusion: Considering the inevitable use of technology and computers in teaching students and as well as the strengths and weaknesses of electronic methods and lectures in the classroom, it is suggested to use a combination of electronic methods and lectures for teaching students.

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Introduction

Traditionally, the teaching of health professionals is performed through theoretical and practical classes, and the consultation material consists of books and scientific journals. Now with the availability of new technologies and opportunities to teachers and students are opened. The use of these new technologies, however, have been a target of ongoing debate, as well as the need for the development of new strategies that favor the improvement of teaching standards(1). Dental students today belong to a new generation. One of the most striking generational differences is that access to and use of technology are simply assumed by today's learners. Researchers in education have found that while earlier generations were introduced to information through print, this new generation takes a digital path. Having grown up with computers, the Internet, online resources, and instantaneous access, this generation of learners has never known life without computers. These students deal with information differently than those in previous generations: they have hypertext minds, and they leap around. They are more visually literate and able to move between the real and virtual instantaneously. For this student generation, a linear thought process is much less common than the ability to piece information together from multiple sources(2). Also today changing health care and medical curriculum has made computer-assisted learning more valuable than before. In fact, currently the increasing availability of accessing suitable hardware and software for Electronic-learning has provided a new horizon for educational institutes (3). The use of e-learning, specifically interactive media is a departure from the traditional, linear lecture format. Traditional lectures are acknowledged to have low levels of interactivity(2).

Dental students are at least chronologically adults. Adults prefer to learn in an environment that is self-paced, interactive, full of robust feedback, and has as independent a schedule as possible. Computer-assisted learning (CAL) has shown promise by introducing interactivity and independence into learning experiences(4). Hillenburg et al. in their study reported that several IT specialists suggested that dentistry could form a national consortium of schools to develop standardized courses taught by recognized authorities in dental education. This would allow for greater sharing of limited resources, improved calibration, increased access to information and provision of meaningful assessment among institutions. Digital technology will play an important role in the future of dental education. Factual-based didactic material lends itself well to computer-assisted learning(5). Silva et al. found that the use of a multimedia online resource had a positive impact on student's learning in respiratory therapy field in which instrumental and manual resources are often used and can be explored using this technology(1). Zhang reported that in a traditional classroom setting, learning is instructor-centered and is a sequential process. The instructor controls content and learning pace. Most students do not question or ask for repetition in the class even if they do not understand instructors. In addition, they do not have an opportunity to listen repeatedly to what instructors explained. An interactive multimedia e-learning environment enables learner-centered activities and provides necessary learner–content interaction(6).

Here, we compared the efficacy of using Multimedia with lecture on learning of dental esthetic and color diagnosis in two groups of dentistry students before and after teaching. Our interest was to evaluate potential learning benefit when the students taught with multimedia or lecture.

Materials and Methods

The present study was an experimental study which consisted of 46 undergraduate students in sixth semester at the school of dentistry of Guilan University of Medical Sciences in Iran. The sampling method was based convenience method and all of 46 students selected for this study. The students were randomly selected and divided into two groups: the experimental (n = 26) and control groups (n = 20). The multimedia and lecture teaching methods were used in the

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experimental and control group, respectively. Initially, educational content based on learning objectives and in accordance with the color recognition and beauty course plan in dentistry was prepared and then the educational multimedia was provided using the iSpring suite Ver.7.0 software for the experimental group; after obtaining the necessary licenses and permits from the Faculty Education and the Education Development Center (EDC) of University, this software was loaded through the LMS (Learning Management System). Students in the experimental group had access to educational content through the LMS. The instrument of this research was a researcher-made questionnaire consisting of ten multiple-choice questions on color recognition and esthetic course in dentistry. Content validity was determine by expert panel and reliability of the questionnaire was established by Cronbach's alpha. Sampling was done after explaining the research objectives for students. Students voluntarily entered the study, informed written consent was obtained and they were assured of the confidentiality of their responses. First, a pre-test session was conducted for the two groups, and after the intervention, the post-test was performed in the experimental and control groups. The total score and mean of the questionnaire was compared in two groups. For data analysis, SPSS V.21.0 software and descriptive statistics (frequency and percentage, mean and standard deviation) and inferential statistics (Kolmogorov-Smirnov test to determine the normal distribution of data, paired t-test and independent t-test) were used with 95% confidence interval and 90% test power.

Results

The mean score of pre-test and post-test in the control group was 3.25±1.41 and 8.15±1.59, and in the experimental group was 3.4±1.69 and 7.6±1.63, respectively (Table 1).

Table 1: Mean of pretest and post test scores in case and control groups.

Group		Mean	SD
Control	Pretest	3.25	1.41
	Post test	8.15	1.59
Case	Pretest	3.4	1.69
	Post test	7.6	1.63

Paired t-test was used to compare the pre-test and post-test scores in the control and experimental groups. There was a significant correlation between pre-test and post-test scores in both experimental and control groups (P≤0.001, P≤0.001, respectively). Independent t-test was used to compare the pre-test score between the control and experimental groups and the post-test score between these groups. There was no significant relationship between the pre-test scores as well as the post-test scores in the two groups (P> 0.05) (Table 2).

Table 2: Comparing the mean of pretest and post test scores in case and control groups

Groups	Statistical test	t	df	P-value	test
Control	Pretest post test	9.56	19	0.001	Paired t-test
Case	Pretest post test	7.49	19	0.001	Paired t-test
Case Control	pretest	0.3	36.75	0.76	Independent t-test
Case Control	Post test	1.63	37.08	0.11	Independent t-test

Discussion

The aim of this study was to compare the effect of multimedia and lecture teaching methods on learning the color recognition and beauty course in dental students of Guilan University. The results showed that there was a significant correlation between pre-test and post-test scores in both experimental and control groups. Each educational method has a dramatic effect on student learning. Different studies indicate a close relationship between the learner's cognitive abilities and their skills in applying cognitive strategies for learning and studying knowledge acquisition, and points to the possibility of increasing these abilities through education (7). In recent years, a large amount of educational research has focused on the role of learners and the impact of education and effective cognitive processes on learning (8). In this study, regardless of the educational method, the level of learning was increased in both case

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and control groups after the training. But on the other hand, there was no significant correlation between the pre-test scores in the case and control groups and post-test scores in both groups. This means that this study showed that not only education by using multimedia and e-learning did not have the advantage of the usual method of lecture, but the post-test grades of the group trained in the traditional way (lecture) were higher than the post-test scores of the case group (training using multimedia). The results of this study are contrary to the results of some research in the field of multimedia and e-learning; In other words, in some studies, e-learning has had a greater impact on learner learning than traditional methods (3, 9-11). Maggio et al., in their study on the use of interactive media in dental morphology education, concluded that the use of media had a greater impact on dental students' learning compared to traditional methods. Moreover, they found that interactive learning of students was also enhanced by multimedia (2). Miller et al., in a study on the effects of tobacco and alcohol modules for dental students, found that the modules significantly improved the knowledge of dental students about alcohol and tobacco consumption as much as alcohol screening methods(10).

In a study by Luffingham in relation to computer-assisted learning in orthodontics, the average scores of the computer-user group were higher than that of the tutorial group, but there was no statistically significant relationship between the mean scores of the two groups(9). The researcher believes that the results of this study are inconsistent with other studies, perhaps because of the emerging use of electronic methods at the time of the study, differences in the Subjects and number of study groups; perhaps, if this method were initially Pilot and then aimed at researching the units under study, different results would be obtained with the greater familiarity among the students.

The above suggests that e-learning has been used since the 1980s to teach diagnostic and therapeutic methods in dentistry. It is claimed that this method increases the level of educa-

tion, comprehension and memorizing compared to traditional methods; however, the evidence is still unclear about the effectiveness of this method(12). In a study by Amanloo with the aim of evaluating and identifying the strengths and weaknesses of the web-based teaching in mycology, it was shown that there was no significant difference between the students of the e-learning group and the control group regarding the amount of learning and success at the end of the course(13). Rosenberg et al. obtained contradictory results in a study of computer-aided learning in teaching orthodontics (14). Clark et al. did not find any significant difference between the lecture and the e-learning methods(15). In another study, the effectiveness of the teaching method with the educational content of computer graphics animation and the method of lecture was similar in learning of dental morphology (4). Al-Jewair et al. found that more studies are needed to conclude the effectiveness of computer-assisted learning in in orthodontics education (12). The researcher believes that observing these results may be due to less interaction with the student and less time spent in teaching, which is of great importance and needs attention because one of the keys to successful learning is the effective interaction between teacher and student. It can solve student problems and lead to more effective and better learning.

Considering the insufficient evidence that the use of computerized teaching methods is more effective than the lecture method, it seems that the combination of two methods of lecture and computer-assisted education is more suitable for teaching students. In a study on the effects of 3D multimedia systems on the performance of junior dentistry students in pre-clinical practice, Jian Hu and colleagues concluded that the use of 3D multimedia systems could be complementary to traditional education and allows students to understand more about theoretical issues, especially dental morphology. They suggested that many positive effects in student learning will be created if the correct integration of computer and traditional methods in teaching

dentistry students is made (16). The results of the study by Bogacki et al. indicated that the effects of e-learning and traditional education on the learning of dental students were the same, and they proposed a combination of two methods by organizing interactive class meetings using electronic methods instead of the lecture method. They mentioned the advantages of using the combination method as more interaction between the teacher and the student, speed up the student progress, and the cost-effectiveness of this method in the teaching of dental morphology (4). Blended learning is the combination of face-to-face learning with technology-based features; combining these two learning leads to the promotion of traditional learning (17). In other studies, the importance of blended learning and its impact on learning has been mentioned (18-20). It should be noted that face-to-face learning and e-learning each have their own unique advantages and disadvantages, and if used together they can have a great effect on student learning.

Of course, it should also be noted that the increasing interest in the use of online information resources, the electronic medical record systems, electronic prescribing and virtual reality, and the emphasis on independent learning, all indicate the inevitability of using computers and technology for teaching students. The use of e-learning, especially interactive media, is an evolution from traditional education to new ways of teaching and learning.

Conclusion

In this study, changes in the educational curriculum of dentistry were introduced using e-learning method to teach the color recognition and esthetic course. Using this method will increase the interaction between students and also improve their independent learning. On the other hand, educational multimedia makes it easy for students to access educational content and can read and review the content of classroom lessons at an appropriate time, and if provided through LMS, they will be able to study the subject at any time and place that has access to the Internet. Considering the inevitable use of technology and computers in teaching students and as well as the strengths and weaknesses of electronic methods and lectures in the classroom, it is suggested to use a combination of electronic methods and lectures for teaching students.

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