

## The effect of PBL and film showing, frequent quizzes and lecture-based method on short-term performance of dentistry students

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### ABSTRACT

**Background:** Advocates have proposed that frequent testing increases the effectiveness of instruction by encouraging learners to study and review more often. It has also been argued that in this way, student errors can be identified and corrected earlier and good performance can be recognized, leading to more positive attitudes toward learning process. In problem-based learning (PBL), medical students reportedly take a more active role in learning and have better recall than students in a conventional learning environment. The hypothetical benefits of a PBL and student-based environment and use of films in the class are the development of self-learning and problem-solving skills and enhancement of knowledge and motivation.

**Purpose:** To examine the effect of combination of PBL method and film showing on the short-term performance of dentistry students and to compare it with lecture-based method and frequent quizzes.

**Methods:** All students of 3 years (from 2000 till 2002) that had theoretical endodontic course (part 1) participated in this descriptive-analytic study. The scores of final examinations of this course were obtained from their files. Data were analyzed by SPSS software & ANOVA.

**Results:** The results showed that by changing the way of learning (PBL and film showing) in 2001, there was a statistical difference between scores of the students of 2000 and 2001. Also there was a statistical difference with the students' scores in 2002- the group with frequent quizzes.

**Conclusion:** The variables such as changing the way of learning, using different methods in teaching, showing scientific films in class or, as a whole, active learning have significant effects on the results of final examination.

**Key Words:** PBL, lecture based method, education, frequent quizzes

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### Introduction

The influence of frequent examination and quiz administration on learning and knowledge retention has been evaluated in a variety of disciplines ranging from secondary schools to post-graduation (1,2). It has also been argued that student errors can be identified and corrected earlier and that good performance can be recognized, leading to more positive attitudes toward the learning process (2). Research also indicates an improvement in students' attitude toward learning (1,2) and a more consistent pattern of studying among students when frequent examinations are utilized. However, educational research provides evidence that feedback interventions, including quizzes and exams, do not

always enhance learner's performance and in fact may produce negative effects (3).

In problem based learning (PBL), medical students reportedly take a more active role in learning and have better recall than students in a conventional learning environment. The hypothetical benefits of a PBL course are the development of self-learning and problem solving skills and enhancement of knowledge and motivation. Additional benefits of PBL in academic training that are postulated but have not been yet shown objectively include: a) development of interpersonal skills and cooperation, b) development of reasoning skills and efficient synthesis of information, c) development of skills in applying basic science knowledge in clinical settings, and d) increased

experience in using various information resources (4,5).

PBL was introduced into the basic science curriculum for the students body in 1985 at Harvard Dentistry and Medical Schools with three educational objectives: 1) to develop a flexible knowledge base that has both depth and breadth; 2) to develop an understanding of, and sensitivity to, the world of the patient; and 3) to develop the knowledge acquisition skills necessary to become a life long learner. The interpersonal skills and attitudes that underline effective learning and thinking were acknowledged to be as important as the specific knowledge acquired.

On the basis of educational technology, scientific films can improve learning process. The purpose of our study is to examine the effect of combination of PBL method and film showing, compared to lecture-based or frequent quizzes, on short-term performance of dentistry students.

## Materials & Methods

The investigation was based on the performance of 3 groups of forth-year dentistry students (55 persons) in a theoretical course of Endodontics. All students of 3 years (from 2000 till 2002) participated in this descriptive analytic study.

The course consisted of one-hour class sessions per week over a sixteen week period, for a total of 16 class hours and one hour for the mid-semester examination. Course content included history, access, cleaning and shaping, obturation, diagnosis, and materials. Questions of the course exams in all 3 years were the same and were developed as to test multiple levels of cognitive processing, e.g. knowledge comprehension, application, analysis and evaluation.

The first group was taught with traditional lecture – based method. In the second group (quiz group or QG), the class was informed that they would be given a brief quiz at the beginning of each class, with questions based on the reading assignments and lecture material from the preceding class session. The format of the quiz questions were the same as the mid-semester and final examinations, i.e. a multiple choice question with one correct answer and three distracters; however, the same questions were not used again on the examinations. Quiz questions tested several levels of performance from knowledge of facts to problem solving. The quizzes were graded and returned to the students, with the correct answers indicated, before the next class session.

In the third group, students were taught with a combination of methods: PBL and 3 educational films. Each film explained a different Endodontic subject for 15 minutes. For PBL, six to eight students were gathered as a tutorial group and read the problems of a real dental case, developed a problem list and a number of hypotheses, discussed diagnosis and treatment plans and searched areas where their knowledge was lacking. A tutor was typically a faculty member who participates in the group by asking guiding questions and facilitating group discussion.

For increasing the reliability, we also compared the masculo-facial surgery course in these 3 years that was taught lecture-based. It was emphasized that class attendance was mandatory for all students.

At the end of the courses, final examination was taken. The final grade was measured as an unweighted average of mid-semester and final exam scores. All groups took the same examinations. At this point in the curriculum, the students had not had any clinical experience in Endodontics, so reinforcement in a clinical setting was not an issue for the students' performance in the exams or quizzes. The final scores of groups were gathered. Statistical analysis was based on group means (mean $\pm$  SD). ANOVA and Tokey HSD post hoc test were performed to quantify the significance of differences between groups. The significance level was established a priori at  $p=0.05$ .

## Results

55 students participated in this study. Among them, 20 were male and 35 were female. Scores of the final examinations were significantly higher among students in the second group (quiz group) [ $P<0.001$ ] and the third group (combination method of teaching) [ $P<0.000$ ], compared to the first group (Tables 1 & 2); However, there was no statistical difference between second and third groups, although the third group's scores were much better than the second one.

There was also no statistical difference between males and females in each group or among the scores of surgical courses in 3 groups (Table 2).

Attendance for each group was measured by the average percent of students who attended each class session. Attendance among the quiz group was 95 percent, while it was 75% in the first group.

**TABLE 1.** Descriptive statistics for students' final scores in Endodontic and masculofacial surgery courses in 3 groups

Group	Endodontics	Masculofacial Surgery
Group I No. of students (2000)	19	19
Mean±SD	12.4±2.4	12.3±2.4
Group II No. of students (2001)	17	17
Mean±SD	14.8±1.7	12.4±2.3
Group III No. of students (2002)	19	19
Mean±SD	16.2±1.6	13.4±2.1

**TABLE 2.** Analytic statistics for mean comparison in 3 groups

Dependent Variable	(I) group (J) group	Mean difference	95% CI		p-Value
			Lower border	Upper border	
Endo	2000				
	2001	-2.4	-3.4	-.8	.001
	2002	-3.7	-5.1	-2.3	.000
	2001				
Surgery	2000				
	2001	-0.7	-1.4	1.7	.995
	2002	-1.5	-3.2	.1	.07
	2001				
	2002	-1.5	-3.2	.2	.103
	2002				

## Discussion

Students of the third group showed significantly higher scores and received more positive comments regarding their communication skills than students in other two groups.

This is consistent with previous research. Smits et al showed that the hypothetical benefits of PBL are the development of self-learning and problem-solving skills to enhance knowledge retention and motivations (6, 7). Faculty examiners argue that in PBL or combination method, students show a high level of subject understanding, of confidence in their oral presentations, and of discussion with peers (8). Tutorial discussions integrate knowledge from previous learning blocks and reinforce communication and interpersonal skills.

The differences in scores between groups were not due to dissimilarities among the students or among the examiners. First, the same entrance exam (konkour) was used for accepting the students for the classes of 2000-2002. Second, the preparation and design of the exam questions were practically constant in these years. Third, examiners or teachers for the classes were the same.

The educational films which were shown in the class helped the students to understand the subjects better, and prevented their boredom.

The significantly better performance of quiz group (2001) indicates that preparing for daily quizzes has a positive effect in the short term. This is consistent with previous research. Gilleard reported that students demonstrated greater retention of material when tested more often (9). Rao et al showed a more consistent pattern of studying among students who were required to complete tests everyday (1). The beneficial effects of frequent testing have been attributed to the stimulation of the students to rehearse newly learned information in order to retrieve it when answering questions. Such practice strengthens the connection between stimuli and response, and slows the normal decay of memory.

Attendances were higher among the quiz group. This is not unexpected because they wanted to get familiar with the questions of final exams by the quizzes. It has been reported that grades are strong motivating forces for students and that many professional students study only for the tests.

It can be concluded that using combination of methods especially PBL and showing educational films in classes for teaching different subjects, can improve the results of final examinations; also, administration of frequent quizzes contributes to significantly greater achievements on examinations given during and at the end of the course. It also leads to improved attendance, and a more favorable attitude toward course content and instructor. However these effects are short-lived; reports in the medical and dental education literature indicate that significant loss of knowledge in some disciplines is common at periods of three to twenty four months after the conclusion of instruction, especially in areas that are not reinforced by clinical experience. This is the field that needs further researches.

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