

Assessment of Medical Students' Knowledge Retention in a Diagnostic Radiology Course: Lecture Attendees versus Absentees

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Abstract

Introduction: To compare class attendees versus absentees in their ability to retain knowledge during a diagnostic radiology course. **Materials and Methods:** This study recruited 146 fourth-year medical students who attended a diagnostic radiology course from February 2004 to June 2004. Eight unit tests were conducted. Questions for each test covered content taught in the prior class. Another examination (which students were not aware of beforehand) was conducted in June, and the questions for this examination included content from all lectures in the course. The class attendance rates were measured separately 6 times during the course. Students who were present on the last of these dates were categorised as attendees (group A students) and those who were absent were categorised as absentees (group B). **Results:** The average class attendance was 76.8% and the lowest attendance was 56.8%. For the unit tests, the average score of group A students (80.7 ± 7.3) was significantly higher than that of the group B students (76.2 ± 8.8) ($P = 0.001$). However, in the unanticipated examination, there was no significant difference in the scores between group A (68.1 ± 10.3 ; range, 36-92) and group B students (65.5 ± 13.5 ; range, 28-88) ($P = 0.19$). Self-learning time was related to the unit test scores ($P = 0.001$) but not to the unanticipated examination scores ($P = 0.27$). **Conclusion:** Students who frequently attend classes or study for longer can retain their knowledge over a short period of time, but there is no difference in knowledge retention between class attendees and absentees at the end of a 4-month course.

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Introduction

Although problem-based learning has been implemented in many medical schools to supplement didactic lectures, traditional didactic lectures and a strictly discipline-oriented approach remain the mainstream teaching method in many medical schools worldwide, especially in Asia.^{1,2} Teaching by didactic lectures can be used to overcome the problems of shortage of teachers and limited space for small group discussions. However, a low class attendance rate has been a major problem.

To improve students' attendance rate, the author has been using "unit" tests in the lectures of a diagnostic radiology course at Taipei Medical University since 2002.³ The attendance rates are significantly higher in the lectures with unit tests than in those without the tests. Survey questionnaires for students indicated that attendees could review class notes more easily than the absentees, and the

average scores for unit tests of the class attendees were higher than those of the absentees.

Most of the medical schools in Taiwan have a 7-year curriculum, which is divided into independent courses in the liberal arts and humanities, basic medical sciences and the clinical sciences. Our medical school offered 28 hours (2 hours per week) of diagnostic radiology for fourth-year medical students in the second semester of 2004.

Knowledge is meaningful when new learning is integrated with prior knowledge and is better retained. In 2004, our radiology course was arranged as subject based didactic lectures as follows: understanding x-ray modalities and magnetic resonance imaging (MRI) for 2 hours; organ-based radiological anatomy and diagnosis (such as gastrointestinal radiology, chest radiology and skeletal radiology) for 18 hours and interventional radiology and ultrasound for 4 hours. Eleven lectures were taught by

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senior radiologists and 1 session was given by a physicist. Problem-based learning for 4 hours was arranged as small group sessions.

In each didactic lecture, teachers were instructed to limit their teaching materials to 60 PowerPoint slides, so that teachers could introduce knowledge with enough time for students to learn. All of these teaching materials were posted on the website or delivered to students for review. A team of students prepared class notes, which were delivered to all students several days (usually no later than 1 week) after each lecture.

To our knowledge, there has been only 1 article reporting knowledge retention in relation to a radiology course,⁴ and there has been no previous research to compare class attendees and absentees in their knowledge retention relating to didactic lectures.

The aim of this study was to compare the ability of class attendees and absentees to retain their knowledge during a diagnostic radiology course.

Materials and Methods

This study recruited 146 fourth-year medical students who attended a diagnostic radiology course from February 2004 to June 2004. A total of 12 didactic lectures, 2 sessions of problem-based learning and 8 unit tests were conducted during this time. The dates for all unit tests were announced to all students at the beginning of the semester and also posted on the website. Multiple-choice questions (average of 10) in each unit test included content taught in the prior class. All unit tests were conducted at the beginning 10 minutes of each lecture. Another examination (students took the examination without prior notice) was conducted in June (4 months from the beginning of the course), consisting of questions including content from all the lectures. In the unanticipated examination, 30% of the questions were exactly the same as those in the prior unit tests, and the rest were new questions.

The final score for each student in the radiology course was given by the average score of all unit tests (80%) and performance in problem-based learning (20%). The scores for problem-based learning were not part of this study. Students were given extra credit if the results of the unanticipated final examination in June were higher than the average score of the unit tests.

Questionnaires for students' feedback were delivered separately 6 times, and collection of these surveys during the class acted as a measurement of the class attendance rates. Four were delivered and collected at the end of lectures with the unit test, and 2 were issued without the test. In 5 of the feedback surveys, students were not required to put their names on the survey forms. The last survey questionnaire was delivered to the class without

prior notice, and students were told to put their names on the survey form. Students who were present for the last survey questionnaire were categorised as attendees (group A); absentees were those who were absent from the class (group B). A questionnaire was sent to the absent students after the class.

The averages of scores for the unit tests and final examination of class attendees and absentees were compared. Data from the questionnaires were compiled and analysed using SPSS 11.0 statistics software.

Results

The average class attendance rate, obtained from the surveys at 4 lectures with unit tests, was 76.8% (72% to 88%) and that obtained at the other 2 survey times, was 61.9% (66% to 58%) ($P < 0.05$). The lowest attendance rate was 58%, which was for the date of the last questionnaire collection, when students' names were on the survey forms.

For all unit tests, the average score for group A students (80.7 ± 7.3) was significantly higher than that for group B students (76.2 ± 8.8) ($P = 0.001$). However, there was no significant difference in the scores of the unanticipated examination between group A (68.1 ± 10.3 ; range, 36-92) and group B students (65.5 ± 13.5 ; range, 28-88) ($P = 0.19$). Between the average unit test score and the score at the unanticipated examination, there was an average reduction of 12.6 points for group A students and 10.7 points for group B students ($P < 0.001$).

Notwithstanding class attendance or absence, most of the students spent 2 to 4 hours weekly in self-learning of radiology (Table 1). Self-learning time was related to the unit test scores ($P = 0.001$), but was not related to the scores of the unanticipated final examination ($P = 0.27$).

In the class with the last survey questionnaire, 85 students were present and 61 were absent. Of those 85 attendees, 62 (73%) responded that they had never been absent from the class in this course and 17 (20%) had been absent at least twice. Of the absentees, more than 27 (52%) had been absent at least twice. However, unreliably, 20 absentees (32%) responded that they had never been absent from the class.

Most of the attendees relied on class notes to prepare for the unit tests, whereas absentees often read textbooks instead. More attendees were interested in learning radiology after the course, in contrast to absentees, who had less interest.

Discussion

In this study, class attendance rates were significantly higher by 15%, in lectures with unit tests than those without the tests. The results were similar to those of our previous

Table 1. Characteristics of Class Attendees/Absentees in a Diagnostic Radiology Course (%)

	<2 (hours)	2-4	4-6	6 or more	
Weekly self-learning time (hours) for radiology	3.7/14	57.3/45.6	35.4/29.8	3.7/10.5	
	0 (time)	1	2	3 or more	
Self assessment of absence in class	73.4/32	6.3/16	11.4/34	8.9/18	
	Textbooks	Class notes	Other references		
Preparation of unit tests	12.3/48.4	76.3/4.1	9.6/17.0		
	Extremely	Very	Fairly	Not	Absolutely not
Learning interest before this course	12.0/6.9	43.4/53.4	41.0/37.9	2.4/1.7	1.2/0
Learning interest after this course	13.3/13.8	53.0/51.7	30.1/29.3	2.4/3.4	1.2/1.7

study (19%).³ There was no difference between attendees and absentees in weekly self-learning time, in contrast to our previous study, which showed that attendees (average, 4.2 hours) studied for longer than absentees (average, 2.9 hours). Most of the class absentees were absent twice or more, and they often read supplementary textbooks rather than relying heavily on class notes. A few absentees responded in the survey in error and led to the interpretation that they were never absent from the class.

Although lectures with tests can improve attendance rates, little attention has been paid to whether teaching material is actually learned or if knowledge retention or loss differed between attendees and absentees. There have been few articles reporting on knowledge retention related to didactic lectures or clinical skill training.

Feigin et al⁴ reported that specific radiological anatomy facts and search techniques were poorly retained by fourth-year medical students. The students had learned about radiographical anatomy of the chest and plain radiography search techniques in first and second year courses and had proved their ability to perform these tasks, but poor outcomes, with a mean test score of 4.47 out of 12, were noted. On the contrary, in terms of resident-prepared conferences, Collins et al⁵ reported that resident testing at 6 months showed knowledge retention levels higher than those of the pretest levels but lower than post-test scores. In surgical skills, Cheifetz and Phang⁶ reported that

knowledge acquired during a continuing education course for surgeons on total meso-rectal excision and rectal cancer management could be retained for 1 year.

In our study, the traditional didactic lecture gave students what they needed to know and the unit test accurately reflected the course content, which was recorded completely in the class notes. Therefore, it is reasonable that class attendees had higher scores than the absentees, especially with the relatively small volume of material to learn and remember for only 1 to 3 weeks.

It is important to evaluate whether the material learned is retained long enough to be applied in clinical practice. Well-organised, coherent information is easier to remember and learn than disjointed collections of facts.⁷ In this study, class absentees obtained their knowledge from textbooks and supplemented it with class notes, resulting in similar knowledge retention to that of the attendees, as assessed by the unanticipated examination. We speculated that students who read class notes supplemented by textbooks could get better organised information and therefore learned the subject more thoroughly than those who relied heavily on class notes alone.

In summary, students who frequently attend classes can retain their knowledge in a short period of time, but there is no difference in knowledge retention of class attendees and absentees at the end of a 4-month radiology course. Therefore, pre-clinical teaching of radiology by didactic lectures should emphasise principles and core knowledge and encourage students to learn thoroughly from textbooks in order to obtain well-organised information for longer knowledge retention.

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