Lecturing versus self-study in a first year Engineering Technology course.

Bob Lahidji, Ph.D.,CMfgE

Eastern Michigan University
Ypsilanti, MI. 48197
734-487-2040
bob.lahidji@emich.edu

Abstract

This experiment compares the degree of learning and comprehension between lecturing and self-studying methods of educating. The result of this experiment is reported and a comparison between the two methods of learning is examined.

I. Introduction

Currently, the majority of teaching is done in a traditional format: lecturing. With the advent of the Internet and the explosion of information that is now available, "should lecturing still be the most prominent teaching method?"

Lecturing as a teaching method has been around since ancient times, and it is still the most common method of teaching. However, the world around us has changed in many ways in the past decades such as the explosion of information that can be partially attributed to technological advances in the field of electronic media. The electronic medium is the newest methods of delivering knowledge in today's educational environment. However, still a great deal of teaching is done by lecture, which causes students to become passive learners[1]. The Willcoxson study concluded that the lecture, as a traditional form of instruction, can provide means to transfer knowledge and information to the learners, and students in the study were found to "approach lectures with the desire to learn." but students shown little enthusiasm for the lectures[2].

II. Purpose

The purpose of this study is to report the findings of the comparison between two different teaching approaches, lecture versus self-studying. The results of this study will provide a guideline for the implementation of an appropriate teaching method.

III. Hypothesis

The general hypothesis for this study is as follows:
There exist differences between the experimental group (self-study) and the control group (lectured) in their performance as measured by their grades. Moreover, the classical lecturing method of learning would prove more suitable and consequently result in higher grades than that of the self-studying group for the freshmen and sophomore students.

IV. Limitation of study

Grades in exams may not directly represent the students' retention, comprehension of the subject matter or the learning method. In addition, students in the experimental group (self-study group) volunteered.

V. The population and subject

The population is students enrolled in an introductory course. Students are divided in two groups; the same topic is assigned to both groups. The subject taught is part of an Engineering Materials course. The students in this introductory course are composed of freshmen and sophomores. One group was lectured and the other group was asked to work independently and /or as a group. In addition, as part of the experiment, a pre-test was given to both groups to measure their base knowledge in the subject areas. The experimental group was encouraged to use the Internet, library, and other means to conduct their research on the assigned topics. Both groups were challenged to their utmost in this course with the understanding that there is a balance between challenging students and their not succeeding in a subject[3].

After a period of time of two weeks, both groups were given a similar exam on the assigned subjects, and the final results were analyzed to compare the two different teaching strategies.

VI. Methodology

From twenty-two students in the class, eleven participated in the experimental group and the other eleven students participated in the control group. The experimental group was the self-studying group and the control group attended lecture. First, a pre-test was designed and administered to both groups. The test covered chapter eight of the textbook, which dealt with composite materials. According to the literature it is important to gage the students' base knowledge of the subject matter. Furthermore, research supports that students' prior knowledge of the subject matter is a major factor in their understanding and association of new knowlege[4]. Next, the students were advised of their responsibilities, and the chapter related to composites from the textbook was assigned to both groups. The experimental group was advised to study the materials in the textbook as well as other means of information, such as: the Internet, library, etc. The time frame to complete the assignment was two weeks for both groups. Meanwhile, the control group attended class regularly. In doing this, they were lectured and participated in class

discussions. Also, both groups of students were encouraged to visit with me at any point to seek help in the related subject matter. After two weeks all students returned to the classroom for the review session covering the chapter, and they were also told that they should be ready for their exam during our next meeting. The day of the exam, the students were given two exams. The first exam was identical to the pre-test. The second exam was a comprehensive examination of the subject matter, composite materials, and contained all new questions. By convention, the first exam was called the post- exam and the later exam was called the comprehensive exam.

VII. The Analysis of Data

A t-test was used to make a comparison between the control and the experimental groups. According to Dublin, a t-distribution is more suitable for small samples. He also noted that when the sample size changes, the distribution under the curve changes[5].

Pre-test

The purpose of the pre-test was to measure the student's prior knowledge of the subject matter. The result of the t-test shows that there was not a significant difference between the two groups (Table 1).

Pre-test

Groups	*Mean*	*Standard of Divisions*	*t-test* α= .05 level of significance
Experimental Group (self-study	9.90	4.08	$\lvert -.6 \rvert \geq 2.72$ **No significant difference**
Control Group (lectured)	10.45	2.87	

Table 1

Post-test

The post- test was used to analyze the students' progress/gain as measured by their grades after the two-week period. Importantly, the post-test was identical to the pre-test. This serves as a simple way to measure the students' progress. The t-test did not show a significant difference between the two groups (Table 2).

Post-test

Groups	Mean	Standard of Divisions	t-test α= .05 level of significance
Experimental Group (self-study	15.9	3.23	$\lvert -1.37 \rvert \geq 2.55$ **No significant difference**
Control Group (lectured)	17.27	3.40	

Table 2

After further examinations of the data, both groups of students demonstrated a significant gain in knowledge. Table 3 and Table 4 represent the result of the t-test as they pertain to the pre-test and post-test for the experimental and control groups respectively.

Experimental Group

Tests	Mean	Standard of Divisions	t-test α= .05 level of significance
Pre-test	9.90	4.08	$\lvert -6 \rvert \geq 2.85$ **Significant difference**
Post-test	15.90	3.230	

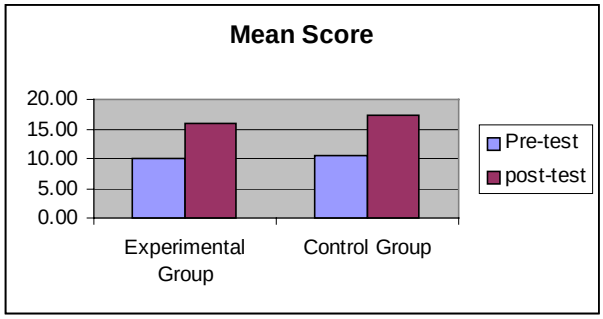
Table 3

Control Group

Tests	Mean	Standard of Divisions	t-test α= .05 level of significance
Pre-test	10.54	2.87	$\lvert -6.73 \rvert \geq 2.44$ **Significant difference**
Post-test	17.27	3.40	

Table 4

Graph 1 illustrates gain in knowledge as measured by students pre-test scores and post-test scores within the experimental group (self-study) and the control group.(lectured).



Graph 1

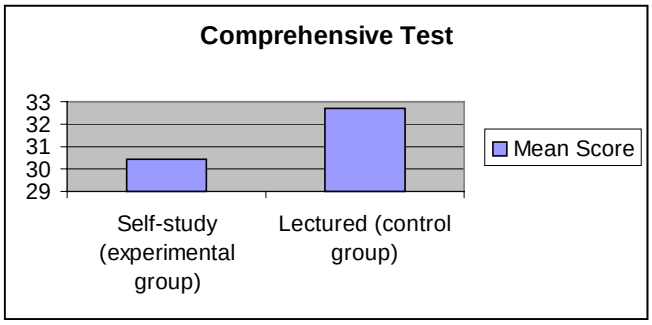
The results of the t-test, as revealed in Table 5, refute the tenability of the hypothesis. This suggests that, at α=. 05 level of significance, there does not exist a significant difference between the self-study and lectured groups as measured by their grades obtained in their comprehensive test over the composite materials.

Comprehensive test

Groups	*Mean*	*Standard of Divisions*	*t-test* α= .05 *level of significance*
Experimental Group (self-study	30.45	7.07	$\lvert -2.30 \rvert \geq 4.64$ **No significant difference**
Control Group (lectured)	32.72	4.71	

Table 5

Graph 2 illustrates the mean scores of the comprehensive test between the self-study (experimental group) and lectured (control group).



Graph 2

VIII. Conclusions

Although the results of this study did not provide a clear answer to the question of: "should lecturing still be the most prominent teaching method?" they did prove valuable in another manner. Primarily, before conducting this study I had the notion that the implementation of only either lecturing or self-studying is not enough for effective learning. I have observed that lecture or self-study is not the answer to the best method of teaching and learning. Each technique has its positive and negative aspects. Therefore, either approach should be supported by other techniques, such as, teachers as a facilitator, and the interactive learning. The students should be encouraged to become proactive learners rather than passive learners. Thus, many styles of teaching and learning must be combined for the most complete gain of knowledge.

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Dr. Bob Lahidji is an associate professor in the Industrial Technology Program at Eastern Michigan University. His primary interest and expertise are in the area of manufacturing process and CNC/CAM. Dr. Lahidji has been involved with manufacturing firms as a consultant in the area of improving manufacturing processes. He has written numerous articles and is the co-author of the textbook "Maximize SURFCAM".