

A COMPARISON OF TRADITIONAL, WEB-BASED, AND INTERNET-ASSISTED LEARNING

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ABSTRACT

This paper reports the results of an experiment that was conducted to attempt to investigate the impact of delivery mode on students' learning. Multiple sections of a *Principles of MIS* course were used to deliver the same content to similar groups of students using different modes of delivery. The course was delivered to three sections; one section was a traditional instructor-led lecture, the second was a Web-enhanced lecture, and the third was a totally asynchronous course available on demand via the Web. Students' subject knowledge was measured with a pretest which was administered to all three sections. The students' learning was measured with a comprehensive examination covering the same issues as the pretest. Student scores on both the pretest and posttest were compared; the cumulative means for the three sections were compared seeking indications that the mode of delivery had an impact on learning, and if so, which mode was most effective. The preliminary statistical analysis suggests that the delivery mode had very limited impact on student performance.

Keywords: distance education, on-line instruction, web-assisted learning

Introduction

Alternative methods of delivery of courses in higher education have been a topic of debate and research in recent years. The growth of the Internet and the development of instructional supporting tools have encouraged many institutions to experiment with delivery of courses that are no longer based upon the "sage on the stage" methods that have been in use for decades. While students may find it more convenient to attend a virtual lecture via the Internet, the question that educators must continually ask is "are the students learning as much or more in an internet class as they would in a traditional lecture?" This study will explore the question of how

learning differs depending upon the delivery media, or do students learn more in an instructor-led lecture than in a pure internet or internet supported environment?

LITERATURE REVIEW

Thirunarayanan and Perez-Prado (2001) found that students in a traditional class performed better than students in an on-line course. In their study they reported the performance of students in two classes, one Web-enabled using WebCT, and the other a traditional lecture in an elementary education program in a state university. A pretest and posttest were used for both classes as a surrogate for learning achievement. The means of the tests for both groups were compared. The test indicated that the students in the traditional course performed much better than those in the Web-based course.

Jones et al (2004) compared the performance of students in traditional lecture class with the performance of students enrolled in a Web-based course. The course studied was the required telecommunications management course in the information systems major. This study used a pretest – posttest approach to compare the effectiveness of the two delivery methods. Statistically there was no difference found in the performance of the students; however, one interesting result was noted: in the instructor led course 23% of the students dropped the lecture course while only 10% of the students dropped the Web-based course.

Landry et al (2006) investigated student perceptions of Web Enhanced Instruction (using Blackboard). The software, Blackboard, provided students with course documents, lecture notes, announcements and quizzes. The study used the Technology Acceptance Model (TAM) was created by Davis (1989) based upon seminal work by Fishbein and Ajzen's (1975) theory of reasoned action. "Briefly this theory states that one's behavior and the intent to behave is a function of one's attitude toward the behavior and their perceptions about the behavior," (Landry et al, p. 89). Behavior, in this case the use of Web enhancements for a course, will be used in direct correlation to the perceived usefulness in the mind of the user. This study, using both graduate and undergraduate business students in a public university found a similar result as previous TAM investigations, that is the greater the perceived ease of use, the more readily the technology was adopted by the students.

Mintu-Wimsatt (2001) examined student evaluations of a required MBA course that was offered as a traditional instructor led lecture and as a Web-based course. The marketing management course was offered by an AACSB accredited, regional state university located near a major metropolitan city. The study found that the mode of instruction did not impact the grade performance of the students. While student evaluations were relatively equivalent for both modes, there was evidence that there was some preference for the Web-based course over the traditional lecture.

COURSE DESCRIPTION

The course that was studied was offered during the first summer semester in a regional, state university. *Management Information Systems* is a required course for all business majors. It is a traditional three hour (one semester) course. The course provides a managerial overview of information technology, business applications of information technology and management of

information technology. Three sections of the course were offered. Enrollment in each section was controlled by the department chair to insure that self-selection biases were avoided. The instructor used the same syllabus, identical quizzes and assignments, and very similar exams in all three sections. All three sections were given the same pretest to assess entry level of knowledge, and all three sections were given the same comprehensive final examination; the final examination was administered by the testing center to all sections simultaneously. Only the test scores of students who completed both the pretest and remained in the class through the final examination are included in this study.

Instructor-led delivery

Thirty students were enrolled in this section. Twenty five (25) students completed both the pretest and posttest. The mean score of the pretest was 61.40% correct; the minimum score was 26% and the maximum score was 74%. The mean score of the comprehensive final exam was 74.46%, the minimum score was 64% and the maximum was 86%. The average increase was 13.46%.

Web-enhanced delivery

In the Web-enhanced course, all course materials were available on-line; these included the syllabus, lecture notes, assignments and announcements. The class was provided with a dedicated on-line discussion group. Twenty-nine of the thirty-five students that enrolled in this section completed the course. The mean score of the pretest was 63.03% correct; the minimum score was 48% and the maximum score was 76%. The mean score of the comprehensive final exam was 78.59%, the minimum score was 60% and the maximum was 95%. The average increase was 15.56%.

On-line delivery

The on-line course was delivered in a totally asynchronous mode. Lectures were recorded and were available for student access at anytime following the completion of the pretest. Each lecture was based upon a chapter, and each chapter had to be completed before the student was allowed to move to the next chapter. Once a chapter was completed, the lectures were available for review until the final examination was completed. The final examination was available in a testing center at a specified date and time. The mean score of the pretest was 60.50% correct; the minimum score was 38% and the maximum score was 80%. The mean score of the comprehensive final exam was 77.09%, the minimum score was 58% and the maximum was 95%. The average increase was 16.59%. The comparative results for the three sections are presented in Table 1.

Table 1 – Improvement of test scores, Posttest vs. Pretest

	Pretest	Posttest	Net change
Instructor-led lecture	61.40	74.46	13.46
Web-enhanced lecture	63.03	78.59	15.56
Internet-based	60.50	77.09	16.59

RESULTS

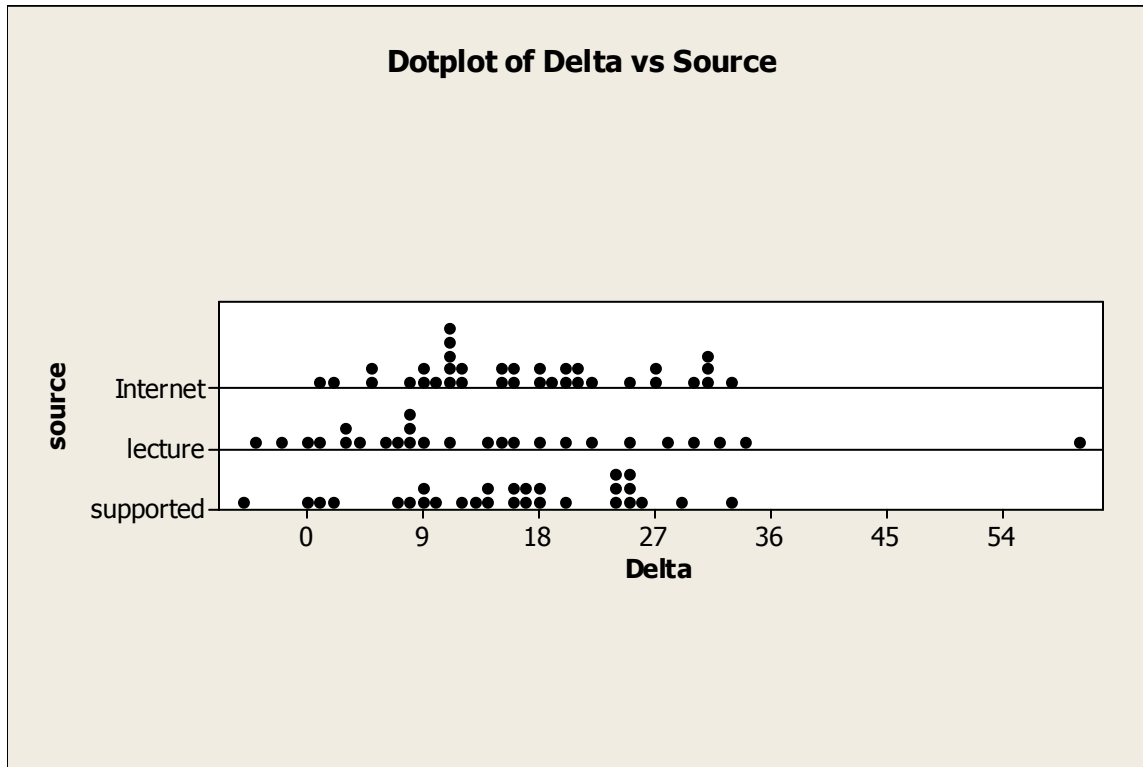


Figure 1 – Plot of change from pretest to posttest

For the purpose of this study, the following terminology has been used: the Dependent Variable is “**Delta**” which is found by subtracting pretest score from posttest score. Observations without posttest scores were removed; these observations were the result of students failing to complete the course. The Independent Variable is “**Source**” which has three levels: Internet (on-line) lecture (instructor-led), and supported (web-enhanced).

There appears to be a severe outlier in the lecture group of students. There are several negative improvements. The data don’t seem to cluster very much. However, in spite of these apparent anomalies, the analysis was continued. To facilitate understanding the differences in the treatments, additional non-parametric tests will be conducted. The samples will also be modified to remove outliers and other problematic observations in order to allow for the identification of significant differences in the results obtained in the differing types of classes.

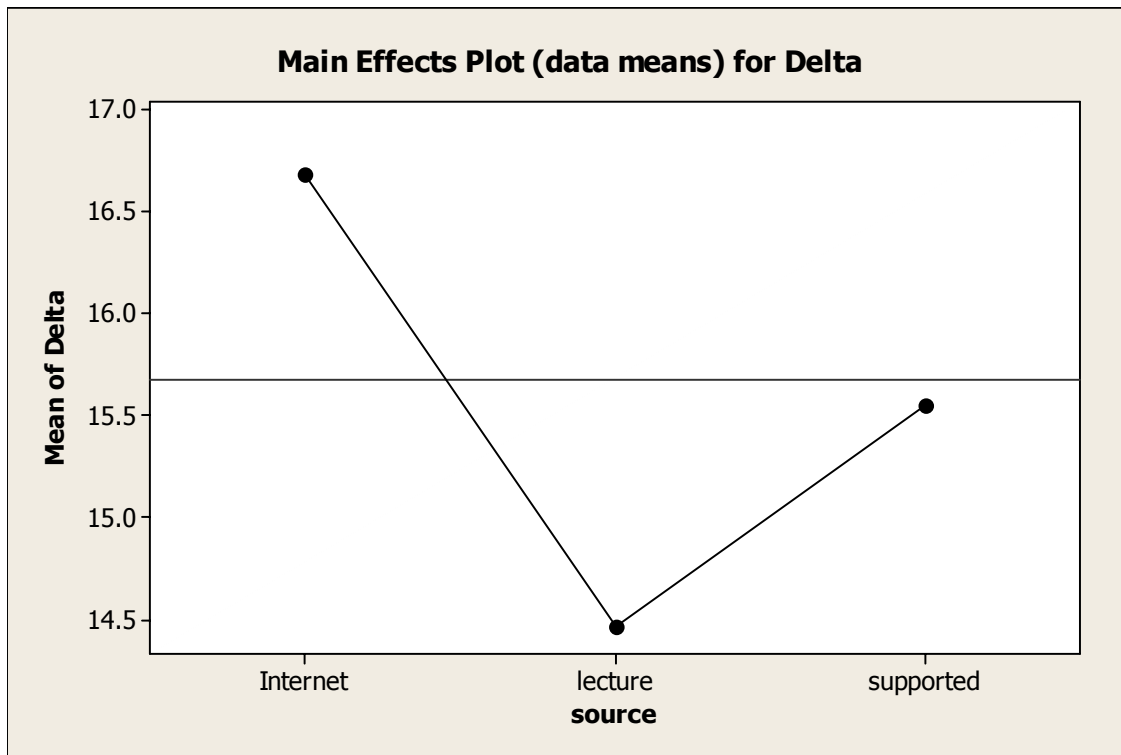


Figure 2 – Mean Improvement per Group

This plot shows the means of the improvements. In tabular form the underlying statistics are:

Variable	source	N	N*	Mean	SE Mean	StDev	Minimum	Median	Maximum
Delta	Internet	35	0	16.69	1.48	8.78	1.00	16.00	33.00
	lecture	26	0	14.46	2.79	14.24	-4.00	10.00	60.00
	supported	29	0	15.55	1.73	9.34	-5.00	16.00	33.00

The Anderson-Darling test was performed to confirm the normality of the test score distributions. There was insignificant evidence to reject the null hypothesis of normality; however, due to a single outlier in the paired comparisons of pretest versus posttest scores in the instructor-led section, the p-value suggests that caution should be used.

The Levine test for equality of variances was used to compare the variances of the three sections improvement in test scores. There was insignificant statistical evidence to reject the hypothesis of equality of variance. This would suggest that the performance of the three sections was similar.

The ANOVA output was as follows:

Source	DF	SS	MS	F	P
source	2	74	37	0.32	0.727
Error	87	10135	116		
Total	89	10210			

S = 10.79 $R^2 = 0.73\%$ R^2 (adjusted) = 0.00%

There is insufficient evidence to reject the null hypothesis that the treatment means are the same. The R^2 statistic reveals little practical advantage gained by knowing the level of “source,” i.e. Internet, lecture, or web-supported.

CONCLUSIONS AND LIMITATIONS

Initial statistical analysis would suggest that student performance was very similar regardless of delivery mode of instruction. While it was anticipated that either the traditional lecture scores or the totally internet-based students would product statistically significant differences in performance, the preliminary analysis did not support this presumption. Several studies have sought to prove (or disprove) the quality of asynchronous instruction, in this study the students in the Internet-based class did better than the students in the traditional lecture, but not as well as the students in the Web-enhanced course.

There are several limitations to this study. Among the limitations is the relatively small sample size of less than 100 subjects with a maximum of 35 in any category. Also, the study would be stronger if the same students could have been tested in multiple courses over multiple semesters. The decision was made to conduct the experiment during a summer session in order to better secure both the examinations and to attempt to limit potential contact between students in the various sections; students in the summer session may not be typical of the university’s student demographics. Also the results should not be used to generalize about all students or other courses, which may not be homogeneous when compared to this study.

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