A Comparison of Exam Scores Between Fully Online and Lecture Supplement Sections

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Abstract – At the University of Southern Mississippi, the author taught Statics and Strength of Materials as both Fully Online and Lecture Supplement sections. The Lecture Supplement sections utilized the same online material as the Fully Online sections but included optional face-to-face instruction. It was of interest to this instructor whether the mid term and final exam means were different between the Fully Online sections and the Lecture Supplement sections. The t-test was used to determine the significance of the difference between the means at the p=.05 level. Four data sets were evaluated; (1) Statics mid term exam, (2) Statics final exam, (3) Strength of Materials mid term exam, and (4) Strength of Materials final exam. All of the t-test probabilities (0.426, 0.951, 0.458, and 0.323) are above the .05 level indicating that there is no significant difference between the means of the Lecture Supplement and Fully Online exams.

Keywords: Online, face-to-face, t-test

INTRODUCTION

At the University of Southern Mississippi, online courses have become more prevalent and more accepted by students and faculty. The Blackboard online software is no longer an impediment to online teaching and learning. A study of combined online and face-to-face graduate courses found that there was no difference between them in several measures of learning outcomes.[1] However, some differences in learning outcome may occur with less sophisticated undergraduate students. The author taught identical technical material in Lecture Supplement and Fully Online sections. The Lecture Supplement sections utilized the same online material as the Fully Online sections. However, the Lecture Supplement sections had optional meetings of face-to-face instruction for at least half of the scheduled contact time. A combined online and face-to-face teaching philosophy is that on-campus students should have the choice of whether to attend face-to-face class.[2] If the online material is available to all students, convenience of learning and self pacing is an important consideration in the decision of which section to enroll.[3] The self-paced (asynchronous) online material consisted of: (1) information on being successful in online courses including goal setting and time management, (2) recorded audio and sequential images of past in-class lectures including worked problems, (3) weekly assignments including websites showing presentations of the topic, worked problems, video, and applications of the assigned material, (4) On site photographs illustrating the topic.

Two courses, Statics and Strength of Materials, were taught during the fall semester of 2006 and spring semester of 2007 as Lecture Supplement and Fully Online sections. This instructor was interested in whether the exam scores were higher in the Lecture Supplement section than in the Fully Online section of the same course. All exams were proctored. Grades were curved upward if necessary to meet the University guidelines of C (75%) being the average exam score. The raw exam scores (without a curve) were evaluated using two-tailed t-test.[4] The t-test determines the probability that the means of two data sets are significantly different. In this study, a difference in the means of the exam scores is considered to be caused by the advantage of the optional face-to-face lecture sessions for the Lecture Supplement students. Some confounding variables are as follows: The tuition for Fully Online sections is $255 or 24% more than the Lecture Supplement tuition of $205 per semester hour. The out-of-state Fully Online tuition is $333 per semester hour or 62% higher. Fully Online students may be full-time or part time employed. More capable students may select Fully Online courses because they are less intimidated by them. Lecture Supplement students may study together and thus obtain additional help. The Lecture Supplement optional lecture sessions were attended by about half of the enrolled students.

METHODOLOGY

Mid term and Final exams were taken by Statics and Strength of Materials students during the fall semester of 2006 and the spring semester of 2007. The exams in the two semesters were identical except for changes in some of the numerical values in the problems. This allowed the two semesters to be combined for a higher data count. The grading was rigorous with emphasis on the correct answer with partial credit. The exams were graded anonymously using only student ID numbers. The hypothesis tested was as follows: The means of the Lecture Supplement exam scores are not significantly different from the means of the Fully Online exam scores at the p=.05 level. The Lecture Supplement and Fully Online exam scores were evaluated for the following: (1) Statics mid term exam, (2) Statics final exam, (3) Strength of Materials mid term exam, and (4) Strength of Materials final exam. Microsoft's Excel spreadsheet was used to calculate the means of the exam scores and the two-tailed t-test probabilities. For there to be a difference between the Lecture Supplement and Fully Online exam scores, the difference in means must be significantly large. The usual probability criterion for significance is the p= .05 level. At this probability, there is one chance in 20 that the difference between the means of the Lecture Supplement and the Fully Online exam scores occurred by chance. A probability of less than .05 indicates a difference between the means of the Lecture Supplement and Fully Online exam scores that is probably not due to chance.

RESULTS

The table below shows the number of exam scores n, the means (0-100) and the two-tailed t-test probabilities (0-1).

Course	**Statics**					**Strength of Materials**			
Exam	Mid Term	Mid Term	Final	Final		Mid Term	Mid Term	Final	Final
Section	Lecture Supplement	Fully Online	Lecture Supplement	Fully Online		Lecture Supplement	Fully Online	Lecture Supplement	Fully Online
n	51	15	53	16		49	8	51	9
Mean	55.8	49.5	52.5	52.8		51.8	56.8	40.0	48.3
t-test	0.426		0.951			0.458		0.323	

Notice that all of the t-test probabilities (0.426, 0.951, 0.458, and 0.323) are above the .05 level indicating that there is no significant difference between the means of the Lecture Supplement and Fully Online exam scores. The hypothesis that the means of the Lecture Supplement sections are not significantly different from the means of the Fully Online sections at the p=.05 level must be accepted.

CONCLUSIONS

The results indicate that there was no significant difference in any of the exam means between the Lecture Supplement sections and Fully Online sections at the .05 level. The difference the exam means can be attributed to chance. A practical conclusion is that addition of optional face-to-face instruction to a Fully Online course does not significantly improve exam scores.

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