

# **Evaluating Different Methods of Delivering Course Material: An Experiment in Distance Learning Using an Accounting Principles Course**

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## **Abstract**

*The authors assess student satisfaction with distance learning as well as their perceptions of its efficacy by employing a novel, dual approach towards the delivery of course material. Using two sections of an Introduction to Financial Accounting course, students alternate between receiving course instruction through traditional, live-lectures and live lectures captured for viewing over the Internet; in essence, moving from synchronous to asynchronous worlds of learning, and vice-versa.*

## **I. INTRODUCTION**

Academic researchers have investigated many aspects of distance education, with three lines of query offering the greatest insight: (i) Why do students enroll in distance learning courses? (ii) How do they perform in these courses? and (iii) How satisfied are they with their educational experience? In this article the authors concentrate on student satisfaction and perceptions of efficacy, and extend the literature by designing a distance learning experiment utilizing a novel, dual approach towards the delivery of course material. Using two sections of an Introduction to Financial Accounting course, students alternate between receiving course instruction through traditional, live-lectures and live lectures captured for viewing over the Internet; in essence, moving from synchronous to asynchronous worlds of learning, and vice-versa. Thus, the students serve as their own control group, unlike traditional education experiments that employ previous or concurrent control groups, and in so doing, mitigate reactive and self-selection biases. In addition, the dual approach allows us to control for differences in course instructors/teaching style, course materials, and the time period of instruction.

## **II. BACKGROUND**

Russell [1999] hosts a web-based compendium of distance learning research showcasing that in terms of student satisfaction, no significant differential exists between distance learning and its traditional, classroom counterpart. Another study which yields favorable student satisfaction outcomes is Navarro and Shoemaker [2000]. On the other hand, in marketing management courses, Ponzurick et al. [2000] found that students believed distance learning to be the least satisfying and effective method of course delivery.

Methodological criticisms of the scientific literature on distance learning involve (i) the lack of control of extraneous variables; (ii) the lack of randomly selected subjects; (iii) the utilization of instruments which are questionable in terms of their validity and reliability, and (iv) the lack

of control for reactive effects [Phipps and Meristotis, 1998]. Self-selection presents a particularly vexing issue. If sections are designated as distance learning or traditional learning, students will self-select into either section, non-randomizing the sample. To avert this process students would have to be placed into the respective sections, many of who would be upset with being commandeered into the experiment. But suppose only one section was offered and that section alternated in framework from traditional learning to distance learning. Self-selection would be eliminated, and each student would experience both modes of delivery. In essence, the opportunity cost of both delivery systems would be made transparent. This is precisely the approach adopted by Cudmore et al. [2002].

### III. RESEARCH METHOD

The settings in which the authors conducted our within-group experiments were two sections of an Introduction to Financial Accounting course taught during the Fall 2001 session at the Florida Institute of Technology in Melbourne, Florida. For the experimental sections, the only aspect of the class that distinguished it from a regularly offered section was the distance learning components. Both sections of the course covered the same amount of material (12 chapters) from the same textbook (*Accounting, 5<sup>th</sup> edition*, by Horngren, Harrison and Bamber).

The first six chapters were taught in the classroom. The last six chapters were taught alternating between delivery modes (chapter 12 was omitted), with chapters 7, 10, and 11 being delivered on VHS or streamed video on their computer and chapters 8, 9, and 13 being taught in a traditional live lecture for section 1. For section 2, the delivery modes occurred in reverse order. The distance learning segments were taped during a live class in the Spring 2001 semester, edited, and transferred to VHS. These lectures also were compressed for streaming video, and students could watch the lectures on their computers through the Internet using RealPlayer. Lectures delivered live were not available in distance learning mode to the sections experiencing the live lecture.

The professor held *virtual* office hours at designated times to correspond with the material delivered by distance learning mode. During the virtual office hours, students in the appropriate section could, at their option, participate in a synchronous chat on Blackboard; additionally, at a later time, students in the appropriate sections could read the *archived* chat. Students could also post messages to an asynchronous discussion board, and in fact, received participation credit for doing so.

At the beginning and end of the Fall 2001 session, the students were surveyed to obtain their impressions of distance learning and to analyze their learning styles. The attitudes and perceptions survey is designed to gauge the student's overall satisfaction with each delivery mode as well as his/her satisfaction with specific elements that may aid or hinder his/her "learning experience." The responses are measured on a seven-point Likert Scale that ranges from strongly disagree (1) to strongly agree (7). If satisfaction varies between distance learning (DL) and traditional learning (TL), we seek to isolate the factors that contribute to the difference. To do this we compose a generic list of factors that we believe influence "satisfaction." Each variable is analyzed by comparing pre-survey and post-survey responses. We interpret the pre-survey responses as an *ex ante* expectation or prediction, and the post-survey responses as an *ex post* realization. Unexpectedly low scores or high scores can generate meaningful differences in the satisfaction of DL and TL course components.

## IV. RESULTS AND ANALYSIS

The dual delivery nature of the accounting course allows us to construct survey instruments that produce paired comparisons across surveys and paired comparisons within the individual surveys. In order to attain a sufficiently large number of observations, the two sections that employ the dual delivery system were combined into one large sample. Thus, each item from the survey has between 47 and 50 usable observations.

Table 1 reports on a small group of cross-survey paired statements, and includes statistics on the mean scores for the individual surveys, the mean paired difference in scores (post-survey minus pre-survey), and the *p-values* corresponding to the two-tailed t-tests. Table 2 summarizes the relative satisfaction between delivery modes for specific course attributes. To help facilitate the discussion below, the mean paired difference in satisfaction presented in the columns are denoted as follows:

- Col. 1*  $d_{post}$  = post-survey, difference in satisfaction, DL – TL;
- Col. 2*  $d_{pre}$  = pre-survey, difference in satisfaction, DL – TL;
- Col. 3*  $d_{DL}$  = distance learning, difference in satisfaction, post-survey – pre-survey;
- Col. 4*  $d_{TL}$  = traditional learning, difference in satisfaction, post-survey – pre-survey.

The first two columns respectively show post-survey and pre-survey differences in satisfaction between delivery modes, along with corresponding *p-values* in parentheses. Cross-survey comparisons that measure the difference between actual and expected satisfaction for the individual course components comprise the last two columns. The post-survey difference in satisfaction between delivery modes can be defined by the three remaining elements as follows:  $d_{post} = d_{pre} + d_{DL} - d_{TL}$ . The equation states that significant differences in post-survey satisfaction between DL and TL can be ascribed to pre-survey differences in satisfaction ( $d_{pre}$ ) and/or to significant changes in post-survey attitudes toward the individual delivery modes ( $d_{DL}$  and  $d_{TL}$ ). Throughout Table 2, positive values indicate higher than expected satisfaction, while negative values indicate lower than expected satisfaction.

The analysis begins by considering the “overall satisfaction” with this accounting course. Table 1 shows an average per student decrease of 0.58 points ( $p < 0.025$ ) between post and pre-survey tabulations. Thus, the overall satisfaction with this course was significantly lower than what students had anticipated. Further inspection of Table 1 shows that the drop in satisfaction cannot be attributed to changes in attitude toward the course instructor (2a), the idea of distance learning (2b), or nervousness about learning in a new format (2c).

What then is the primary cause of the post-survey drop in overall satisfaction? An examination of Table 2 reveals that student satisfaction with the DL component of the course was significantly lower than its TL counterpart for many of the course attributes (Col. 1). The cumulative effect is a 1.58-point difference in overall satisfaction favoring the TL delivery mode ( $p < 0.01$ ). The students in this sample correctly anticipated a lower level of satisfaction with the DL delivery mode but the actual decrease ( $d_{pre} = -0.98$ ) was more pronounced than expected. Using the information from the last two columns, it appears that the larger spread in “overall satisfaction” between DL and TL is caused by an unexpectedly low satisfaction with the DL delivery mode ( $d_{DL} = -0.60$ ,  $p < 0.05$ ). There is no unexpected difference in satisfaction with respect to the TL delivery mode ( $d_{TL} = 0$ ,  $p = 1.0$ ).

The remainder of this section evaluates the attitudes and perceptions for four groups of course attributes that may account for the relative *dissatisfaction* with DL. Three learning attributes were evaluated in this study, including, the interest level associated with course content, the ease of learning the course material, and the effectiveness in learning the course material. In all three instances, the DL component received significantly lower satisfaction ratings than its TL counterpart (Col. 1). Thus, in relative terms, the DL component of the course was deemed *less interesting* ( $d_{post} = -0.80, p < 0.05$ ), *harder to learn from* ( $d_{post} = -1.86, p < 0.01$ ), and *lowered student effectiveness* ( $d_{post} = -2.06, p < 0.01$ ) in mastering the course material. Col. 2 shows that students were able to partially anticipate the results associated with *ease of learning* ( $d_{pre} = -1.06, p < 0.01$ ) and *effectiveness of learning* ( $d_{pre} = -1.55, p < 0.01$ ). Finally,  $d_{DL}$  is negative and significant for all three learning attributes. As a consequence, the divergence in satisfaction between DL and TL components rises significantly on the post-survey evaluations.

One of the perceived benefits of distance learning is greater flexibility in scheduling. There is, however, a difference between flexibility and efficiency. A more flexible schedule does not infer a more efficient use of time. Both attributes are likely important to students but, a priori, it is not clear which of the two attributes they value more highly. Students did successfully make the distinction between the two concepts. There is no significant difference in satisfaction between pre and post-survey evaluations of the individual learning components ( $d_{DL} = -0.08, p = 0.775$ ;  $d_{TL} = -0.14, p = 0.621$ ); thus, expectations of a more flexible schedule were fully realized. However, students perceived that they were less efficient in their “use of time” during DL components ( $d_{post} = -1.18, p < 0.01$ ); they had predicted no significant difference ( $d_{pre} = 0.20, p = 0.565$ ). The *less efficient use of time* finding is explained by lower post-survey satisfaction with DL components ( $d_{DL} = -1.16, p < 0.01$ ).

Professors at Florida Tech are encouraged to interact with their students and to promote interaction between their students. The perception among the faculty is that interaction enhances a student’s learning experience, and that more interaction is preferable to less. In this study, interaction is evaluated in accordance with the instructor’s accessibility and student dialogue with the instructor and with other students.

In relative terms, both of the dialogue attributes yielded lower post-survey scores for the DL delivery mode. Interestingly, the post-survey difference between the individual delivery modes was *smaller* than expected for the “dialogue with instructor” attribute ( $d_{post} = -0.76, p < 0.05$ ;  $d_{pre} = -1.04, p < 0.01$ ), a finding that is fashioned from a lower than expected level of satisfaction with TL ( $d_{TL} = -0.65, p < 0.01$ ). With respect to “instructor accessibility” there is no significant difference between DL and TL on either survey. But there is evidence that students were unduly pessimistic in their expectation of instructor accessibility for the TL component of the course ( $p < 0.01$ ). Unfortunately, the better than anticipated access to the instructor did not produce a high degree of dialogue.

The last set of attributes focuses on the technological aspects of the course. The post-survey evaluations reveal that students felt relatively less effective in using the available DL technology. Moreover, the gap in perceived effectiveness between DL and TL was larger on the post-survey evaluations than its pre-survey counterpart ( $d_{post} = -1.06, p < 0.01$ ;  $d_{pre} = -0.52, p < 0.05$ ). An unexpectedly high level of effectiveness using the TL technology caused the wider gap on the post-survey ( $d_{TL} = 0.56, p < 0.01$ ). With respect to “comfort in using technology” the post-survey scores were relatively lower for the DL delivery mode ( $d_{post} = -0.60, p < 0.01$ ;  $d_{pre} = -0.44, p < 0.01$ ). What is noteworthy here is that students significantly underestimated their “comfort” for both sets of technology, but with a larger error ascribed to the TL technology ( $d_{DL} = 0.52$ ,

$p < 0.05$ ;  $d_{TL} = 0.68$ ,  $p < 0.01$ ). In sum, the gap in overall satisfaction between delivery modes is partly attributable to higher than expected “effectiveness in using technology” and “comfort in using technology” during TL components of the course.

It would be reasonable to expect that the negative perceptions associated with the distance learning delivery mode would adversely affect student motivation and effort during DL components of the course. Table 1 summarizes perceptions with respect to relative motivation (3a), time spent learning DL component chapters (3b), and relative effort to the traditional over the distance learning component of the accounting class (3c). Students mildly disagreed with the notion that they would be *more* motivated when studying the DL component chapters (mean = 3.34). Their response was even more forceful on the post-survey, which show a mean score of 2.54. Thus, there is a significant ( $p < 0.01$ ) post-survey shift in attitude that implies *less* motivation during DL components. A consequence of this diminished motivation was that students spent relatively less time on DL components; the post-survey mean jumps by 1.22 points ( $p\text{-value} < 0.01$ ).

Finally, we conclude by noting a surprising result. Students expected to exert relatively more effort on TL components of the course (mean = 4.44). This is probably a by-product of their anticipation of a more satisfying learning experience via the TL delivery mode (refer to Table 2, line 1). *Ex post*, students did put forth relatively more effort on TL components, but the 0.32-point increase from pre-survey levels is not statistically significant. In sum, higher than expected relative satisfaction with TL did not produce greater effort relative to the DL components of this accounting course.

## V. REFERENCES

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<b>Table 1 Cross-Survey Paired Samples</b>			
<i>two-sided t-test</i> <sup>a</sup> $p < 0.01$ ; <sup>b</sup> $p < 0.05$	Col. 1 <i>Mean Value</i> <i>Post-Survey</i>	Col. 2 <i>Mean Value</i> <i>Pre-Survey</i>	Col. 3 <i>Mean Paired</i> <i>Difference</i>
1. Overall satisfaction with the accounting course to be high	3.98	4.56	-0.58 (0.025) <sup>b</sup>
2a. Overall rating of the accounting professor to be high	4.70	4.44	0.26 (0.334)
2b. Idea of distance learning is great	3.68	3.96	-0.28 (0.312)
2c. Nervous about learning in a new format like distance learning	2.98	3.84	-0.86 (0.004) <sup>a</sup>
2d. Distance learning component very novel to me	3.28	3.98	-0.70 (0.002) <sup>a</sup>
3a. More motivated when studying the distance learning component chapters	2.54	3.34	-0.80 (0.002) <sup>a</sup>
3b. Spend less time on the distance learning component chapters	4.53	3.31	1.22 (0.001) <sup>a</sup>
3c. Give more effort to the TL over the DL component of the accounting class	4.76	4.44	0.32 (0.300)

<b>Table 2 Relative Satisfaction Between Delivery Modes</b>				
<i>two-sided t-test</i> <sup>a</sup> $p < 0.01$ ; <sup>b</sup> $p < 0.05$ ; <sup>c</sup> $p < 0.10$	Col. 1 <i>DL-TL(Post)</i> <i>(d<sub>post</sub>)</i>	Col. 2 <i>DL-TL (Pre)</i> <i>(d<sub>pre</sub>)</i>	Col. 3 <i>DL Post-Pre</i> <i>(d<sub>DL</sub>)</i>	Col. 4 <i>TL Post-Pre</i> <i>(d<sub>TL</sub>)</i>
1. Overall Satisfaction	-1.58 (0.000) <sup>a</sup>	-0.98 (0.002) <sup>a</sup>	-0.60 (0.044) <sup>b</sup>	0.00 (1.000)
2a. Interest Level	-0.80 (0.033) <sup>a</sup>	0.08 (0.785)	-1.08 (0.002) <sup>a</sup>	-0.20 (0.417)
2b. Ease of Learning	-1.86 (0.000) <sup>a</sup>	-1.06 (0.001) <sup>a</sup>	-0.66 (0.016) <sup>b</sup>	0.14 (0.593)
2c. Effectiveness of Learning	-2.06 (0.000) <sup>a</sup>	-1.55 (0.000) <sup>a</sup>	-0.98 (0.000) <sup>a</sup>	-0.47 (0.090) <sup>c</sup>
3a. Efficient Use of Time	-1.18 (0.009) <sup>a</sup>	0.20 (0.565)	-1.16 (0.001) <sup>a</sup>	0.22 (0.388)
3b. Flexibility of Schedule	1.96 (0.000) <sup>a</sup>	1.90 (0.000) <sup>a</sup>	-0.08 (0.775)	-0.14 (0.621)
4a. Accessibility of Instructor	-0.18 (0.470)	0.16 (0.595)	0.33 (0.218)	0.67 (0.004) <sup>a</sup>
4b. Degree of Dialogue with Instructor	-0.76 (0.034) <sup>b</sup>	-1.04 (0.001) <sup>a</sup>	-0.37 (0.215)	-0.65 (0.005) <sup>a</sup>
4c. Degree of Dialogue with Other Students	-1.39 (0.002) <sup>a</sup>	-0.98 (0.007) <sup>a</sup>	-0.78 (0.022) <sup>b</sup>	-0.37 (0.132)
5a. Effectiveness in Using Technology	-1.06 (0.000) <sup>a</sup>	-0.52 (0.013) <sup>b</sup>	0.02 (0.934)	0.56 (0.009) <sup>a</sup>
5b. Comfort in Using Technology	-0.60 (0.004) <sup>a</sup>	-0.44 (0.002) <sup>a</sup>	0.52 (0.048) <sup>b</sup>	0.68 (0.000) <sup>a</sup>