

A Longitudinal Comparison of Online Versus Traditional Instruction

Suzanne C. Wagner

Niagara University
Niagara University, NY14109 USA
scwagner@niagara.edu

Sheryl J. Garippo

Niagara University
Niagara University, NY14109 USA
sgarippo@niagara.edu

Petter Lovaas

Niagara University
Niagara University, NY14109 USA
plovaas@niagara.edu

Abstract

This article presents a longitudinal comparison of online versus traditional instructional delivery methods. Significant research had been conducted comparing online and traditional courses. However, there is no consensus regarding student performance considering the two instructional methods. Additionally, previous studies have focused on a limited number of courses or a short time period. This research study involves a single introductory business application software course, delivered as a traditional course and as an online course, offered over a period of ten years. The course was taught by the same instructor using the same criteria and standards across all classes, however, new versions of the software were utilized. Student performance was analyzed across 30 sections of the course from the years 2001 to 2010. Results indicate that there was no significant difference in student performance between the two modes of course delivery.

Key Words: Longitudinal Study; Online course; Web-based instruction; Traditional course delivery; Business application software

Introduction

Colleges and universities are promoting growth in online course offerings in an attempt to combat economic and enrollment decline. The promotion and growth of online education suggests that online courses are equivalent or superior to traditional on campus courses in terms of improved student access, increased rate of degree completion, lowered costs, and appeal to non-traditional students (Allen & Seaman, 2007). While students often have the choice of taking a class in a traditional way or in an online environment, it cannot be assumed that online courses can replace traditional course offerings without an investigation of the similarities and differences between the modalities. Studies of online learning versus traditional classroom learning have focused on many aspects of learning including the effectiveness of technology (Schenker, 2007), knowledge transfer (Hansen, 2008), and student engagement, learning, and satisfaction (Rabe-Hemp, Woollen, & Humiston, 2009). Studies of online courses have provided insight into the use and effects of technological innovations such as interactive software usage for e-learning (Pena-Sanchez, 2009) and the creation of interactive learning environments (Everson & Garfiel, 2008). Research has also considered the evaluation of information technology integration in traditional courses (Christou & Dinov, 2010).

Literature Survey

As universities continue to add online courses to their curriculum and course offerings, the question arises as to the extent to which students learn in online courses versus traditional courses. While student learning is difficult to measure, student performance in a course is considered to be one measure of a students' ability to achieve the learning outcomes defined for a course. In a comparison of course delivery methods, several studies found no differences in course performance when comparing those of traditional instruction to online instruction ([Utts, Sommer, Acredolo, Maher, & Matthews, 2003](#); [Ward,](#)

2004; Schenker, 2007; [Zieffler, Garfield, Alt, Dupuis, Holleque, & Chang, 2008](#)). Conversely, some studies indicated the opposite (Rabe-Hemp, Woollen, & Humiston, 2009). Hansen (2008) found that online and traditional courses differ in applied learning and, ultimately, knowledge transfer. Hybrid instructional methods have also been investigated in comparison to traditional approaches ([Utts et al., 2003](#); [Ward, 2004](#); Thompson, Knavel, & Ross, 2008; Toth, Amrein-Beardsley, & Foulger, 2010; Vernadakis, Antoniou, Giannousi, Zetou, Kioumourtzoglou, & Efthimis, 2011). Hybrid instruction was found to be superior to traditional approaches for undergraduate students (Vernadakis, Antoniou, Giannousi, Zetou, Kioumourtzoglou, & Efthimis, 2011).

Differences also exist in the use of measures of course performance. Student surveys, course evaluations and student learning outcomes have been used (Everson & Garfiel, 2008), however, student performance has primarily been measured via exam scores ([Utts et al., 2003](#); Bude, Van De Wiel, Imbos, Candel, Broers, & Berger, 2007) and final grades (Syler, Cegielski, Oswald, & Rainer Jr., 2006; Pena-Sanchez, 2009).

Methods

In an effort to measure the difference in student performance in online versus traditional instruction over time, this study analyzed student performance in a single course offered in multiple sections by the same instructor over several academic years. The method of instruction for the course consisted of eleven online sections of the course offerings and nineteen traditional sections of the course offerings from 2001 to 2010. The instructor was the same for all of the traditional and online sections of the course. Additionally, all course syllabi, course assignments, and course exams were developed by the instructor using the same criteria and standards. Grading was done by the same instructor for all sections.

The course was an introductory course in the use of business application software (word processing, spreadsheets, and databases) offered to undergraduate students. New versions of the software were incorporated into the courses as they became available; however, the course content remained relatively the same. Performance measures for the study were the final percentage and course letter grade received by each student. Since the resulting letter grade was based on the final grade percentage, the final grade percentage was analyzed for this study.

Based on the review of the literature and the presumption that online courses can substitute for traditional courses, it is expected that student performance will be the same for the online courses and the traditional courses.

Results

Course data were collected for 624 students in 30 sections from the fall 2001 to spring 2010 semesters. Students who received a W or an R, as a result of withdrawing or resigning from the course (18 students) were deleted from the data so as not to skew the results. There were 606 students in the final data set.

The sample was made up of 289 (47.7%) males and 317 (52.3%) females. Males received an average grade of 86.9% and females averaged 89.2% (Table 1). An independent samples t-test indicated no significant difference (significance level .057) in student performance between males and females for all courses (Table 2).

The nineteen traditional sections of the course comprised 71.8% (435 students) of the data set and the eleven online sections of the course contained 28.2% (171 students). Students in online classes had average grades of 86.6% versus 88.7% in traditional classes (Table 3). No significant difference (independent sample t-test; significance level .118) in student performance was found between students in the online classes and students in the traditional classes (Table 4).

Discussion

As identified in the results section, no significant difference was found in student performance in online and traditional classes. However, further investigation of the data indicated that males had lower average grades in the online course (84.2%) than in traditional classes (87.7%). When looking at the female students, statistics show the average grade percentage for the online sections was 88.1% compared to 89.7% in the traditional classes. Because of these initial results, a two-way analysis of variance was performed (Table 5) which found no interaction between course delivery method and gender ($R^2 = .012$). However, a gender main effect ($F = 4.905$, significance level .027) was found. The independent samples t-test showed no difference in males and females, but the level of significance of the equality of means fell just beyond the 95% confidence level at 0.057. Therefore, when analyzing the data with gender and course delivery factored together, there was a gender effect on student performance. This

result, combined with the finding of lower average grades for males in the online courses, suggests that there may be a gender difference in student performance in the online courses.

Table 1: Group Statistics (Sex and Final Grade Percentage)

Sex	N	Final Grade Percentage Mean	Std. Deviation	Std. Error Mean
Male	289	86.9107	15.37241	.90426
Female	317	89.1636	13.70708	.76987

Table 2: Independent Samples Test (Sex and Final Grade Percentage)

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.545	.111	-1.907	604	.057	-2.25284	1.18134	-4.57286	.06719
Equal variances not assumed			-1.897	579.388	.058	-2.25284	1.18759	-4.58535	.07968

Table 3: Group Statistics (Course Format and Final Grade Percentage)

Format	N	Final Grade Percentage Mean	Std. Deviation	Std. Error Mean
Online	171	86.6140	17.19354	1.31482
Traditional	435	88.6691	13.35640	.64039

Table 4: *Independent Samples Test (Course Format and Final Grade Percentage)*

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	1.561	.212	-1.566	604	.118	-2.05505	1.31230	-4.63227	.52218
Equal variances not assumed			-1.405	254.610	.161	-2.05505	1.46248	-4.93515	.82506

Table 5: *Tests of Between-Subjects Effects*
Dependent Variable: Percent

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1567.802 ^a	3	522.601	2.484	.060
Intercept	3610119.062	1	3610119.062	17162.750	.000
Sex	1031.652	1	1031.652	4.905	.027
Format	756.631	1	756.631	3.597	.058
Sex * Format	119.297	1	119.297	.567	.452
Error	126628.405	602	210.346		
Total	4830577.828	606			
Corrected Total	128196.207	605			

a. R Squared = .012 (Adjusted R Squared = .007)

Conclusions

Based on the research results, it appears that today's students are able to succeed in an introductory business applications course in an online format or a traditional format. If online students are given the proper materials (online lecture notes, multimedia presentations, clear instructions, reasonable assignments, a quality textbook, and access to an instructor via website or e-mail), they appear to do as well as those students who engage in a traditional classroom using the same materials guided by an instructor. Although statistically, males and females appear to have no difference in performance across the course offerings, there is an indication that males may not perform as well as females in online courses. Further research should be conducted to investigate the extent of gender differences that may occur in online and hybrid course delivery methods.

When comparing online courses to traditional courses, academic integrity in the online courses is often a concern. Since students are not directly supervised when completing their assignments and exams, there is a greater opportunity to utilize other resources in the online course structure such as getting outside help on assignments and exams or looking up concepts during a closed-book exam. Based on the results of this study, it does not appear that online students are any more likely to garner unauthorized

assistance on their assignments at least to the extent that doing so would create a difference in student performance. If students were violating academic integrity, students in the online courses would be more likely to earn "perfect scores," as they have the opportunity to get outside assistance with their work without the knowledge of the instructor, or even to have a computer expert complete their assignments for them. This does not appear to be the case, as reflected in the final course percentages indicating student performance in the course.

Presenting a longitudinal analysis of online courses versus traditional courses advances the field of research conducted on the comparison between these course delivery methods. Additionally, this study supports several findings showing the similarities in online and traditional course offerings. There are limitations to this study such as the use of a single dependent measure of performance. Further investigation in this area may focus on the impact of other objective assessments such as assignments, projects and exams. The course subject matter may also influence the outcome in the study since the course content was computer related. However, as younger members of society become further integrated into the use of technological communication tools, the questions about presenting materials in online formats will likely diminish.

References

- Allen, I. E., & Seaman, J. (2007). *Online Nation: Five Years of Growth in Online Learning*. Needham, MA: Sloan Consortium.
- Bude, L., Van De Wiel, M. W., Imbos, T., Candel, M. J., Broers, N. J., & Berger, M. P. (2007). Students' Achievements in a Statistics Course in Relation to Motivational Aspects and Study Behavior. *Statistics Education Research Journal*, 6 (1), 5-21.
- Christou, N., & Dinov, I. D. (2010). A Study of Students' Learning Styles, Discipline Attitudes and Knowledge Acquisition in Technology-Enhanced Probability and Statistics Education. *MERLOT Journal of Online Learning and Teaching*, 6 (3), 546-572.
- Everson, M. G., & Garfiel, J. (2008). An Innovative Approach to Teaching Online Statistics Courses. *Technology Innovations in Statistics Education*, 2 (1), 1-18.
- Hansen, D. E. (2008). Knowledge Transfer in Online Learning Environments. *Journal of Marketing Education*, 30 (2), 93-105.
- Pena-Sanchez, R. (2009). Interactive Software Usage for E-Learning of Business Statistics. *Competitiveness Review*, 19 (5), 391-397.
- Rabe-Hemp, C., Woollen, S., & Humiston, G. (2009). A Comparative Analysis of Student Engagement, Learning and Satisfaction in Lecture Hall and Online Learning Settings. *Quarterly Review of Distance Education*, 10 (2), 207-218.
- Schenker, J. D. (2007). *The effectiveness of technology use in higher education: A meta-analysis using hierarchical linear modeling*. Kent State University.
- Syler, R. A., Cegielski, C. G., Oswald, S. L., & Rainer Jr., R. K. (2006). Examining Drivers of Course Performance: An Exploratory Examination of an Introductory CIS Application Course. *Decision Sciences Journal of Innovative Education*, 4 (1), 51-65.
- Thompson, J., Knavel, A., & Ross, D. (2008). Online or On Campus? *Technology, Colleges & Community Worldwide Online Conference*, (pp. 122-132).
- Toth, M., Amrein-Beardsley, A., & Foulger, T. S. (2010). Changing Delivery Methods, Changing Practices: Exploring Instructional Practices in Face-to-Face and Hybrid Courses. *MERLOT Journal of Online Learning and Teaching*, 6
- Utts, J., Sommer, B., Acredolo, C., Maher, M. W., & Matthews, H. R. (2003). A Study Comparing Traditional and Hybrid Internet-Based Instruction in Introductory Statistics Classes. *Journal of Statistics Education [Online]*, 11 (3), www.amstat.org/publications/jse/v11n3/utts.html.
- Vernadakis, N., Antoniou, P., Giannousi, M., Zetou, E., Kioumourtzoglou, & Efthimis. (2011). Comparing hybrid learning with traditional approaches on learning the Microsoft Office Power Point 2003 program in tertiary education. *Computers & Education*, 56 (1), 188-199.
- Ward, B. (2004). The Best of Both Worlds: A Hybrid Statistics Course. *Journal of Statistics Education [Online]*, 12 (3), www.amstat.org/publications/jse/v12n3/ward.html.

Zieffler, A., Garfield, J., Alt, S., Dupuis, D., Holleque, K., & Chang, B. (2008). What Does Research Suggest About the Teaching and Learning of Introductory Statistics at the College Level? A Review of the Literature. *Journal of Statistics Education [Online]*, 16 (2), www.amstat.org/publications/jse/v16n2/zieffler.html.

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