

COMPARING LEARNING OUTCOMES ON FACE-TO-FACE AND ONLINE TEACHING PLATFORMS: EVIDENCE FROM MAJOR FIELD TEST SCORES

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ABSTRACT

Online instruction is becoming an increasingly popular course delivery system. This paper examines performance outcomes of finance students receiving face-to-face instruction versus online instruction. We compare the Educational Testing Service Major Field Test (ETS) finance sub-scores of students enrolled in online sections of Principles of Finance with those enrolled in face to face sections over a three-semester period. Results show no evidence of performance differences between online and face to face students.

JEL: A20, A22

KEYWORDS: ETS, Online versus Face-to-Face Courses, Educational Testing Service Major Field Exam

INTRODUCTION

Many universities provide online and face-to-face (F2F) versions of the same courses. These dual course delivery systems allow students to self-select the teaching approach that most suits their learning style and accommodates their geographic preferences, working schedules and family schedules. Growth in online courses has been substantial. Approximately 5.8 million students enrolled in at least one distance learning course in the fall of 2014. This figure represents a 3.9 percent increase from 2013 figures (Friedman, 2016).

A considerable body of research compares online and face-to-face teaching methods. For the most part, the research finds little difference between the performance of students in online versus face to face courses. Nevertheless, this area warrants further research. Since its inception, online course delivery has been refined in a variety of ways. These refinements include vast improvements to the technology and improved security for testing. Given the constant improvements in online teaching tools, new examinations of the performance of online versus face to face courses make a valuable contribution to the extant literature.

This paper provides additional evidence on the efficacy of face-to-face versus online teaching platforms. We examine business student performance from a U.S. regional Midwestern university with three campuses and total enrollment of approximately 10,000 graduate and undergraduate students. Undergraduate students in the Business College can choose from ten different majors to earn the B.S. degree: Accounting, General Business, Entrepreneurship, Financial Management and Financial Planning, Hospitality Management, Information Systems, Marketing, Management and Supply Chain Management. One of the core requirements for all majors is Principles of Finance. This course has the reputation of being particularly difficult for students with D, F and drop rates as high as 40%.

With the increased student demand for online courses across the curriculum and rumors that online courses were easier and more susceptible to cheating, the finance faculty were concerned that online delivery might affect the integrity of the Principles course and degrade learning outcomes in an important core course. In other words, is there any difference in student learning between online and face to face delivery methods?

The remainder of the paper is organized as follows. In the next section, we provide a review of the extant literature. The paper continues with discussion of the data and methodology used to test our propositions. Next, we present the results of the study. The paper closes with some concluding comments and suggestions for future research.

LITERATURE REVIEW

Pringle and Michel (2007) conduct a survey of 138 universities to determine assessment practices utilized by business schools. Their results show that more than one third of universities used the Educational Testing Service Major Field Test (ETS).

Terry, Mills Rosa and Sollosy (2009) examine the performance of business students on the ETS. Their findings reveal that counting student performance on the ETS as a part of the capstone course grade significantly increases performance on the exam. They find that completing the course online does not impact ETS scores earned. The evidence also shows that, gender, transfer student status and international student classification do not significantly impact ETS scores earned.

Bagamery, Lasik and Nixon (2005) examine determinants of success of ETS exams. They specifically focus on an undergraduate multisite business program. Their results reveal that gender, grade point average and having taken the SAT score predict ETS exam scores. However, on campus or off campus course location did not significantly impact scores. Further, they found that age, transfer status and major did not explain exam scores.

Conteras, Badu, Chen and Adrian (2011) examine student performance on the ETS exam for 352 students at a U.S. state university. Their results show systematic differences in test scores based on major. Finance majors earned the highest scores while management majors earned the lowest scores. They also find that student age, and gender explain exam performance. Males earn higher scores as do older students.

Mason, Coleman, Steagall and Gallo (2011) argue that ETS field exams provide little new information than is already contained in standard university evaluation systems such as grades. They examine performance of 873 students at one university. Their results show that a simple model using GPA, SAT and demographic variables predicts the ETS score with regressions producing R^2 values of more than 58 percent. They argue the opportunity costs associated with administering the exam may exceed \$30,000 per year and does not produce a value corresponding to the cost.

Zhu (2012) finds cultural differences in student performance and satisfaction in online courses. He compares the satisfaction of Chinese and Flemish students in an online course. Results show the Chinese group was more satisfied with the equal contribution by group members and found the online learning environment to be new and exciting. He finds that Flemish students spent more time working on the project and were more satisfied with final product.

Paechter and Maier (2010), survey 2,916 students from Australian universities. Their results show that students prefer different teaching modalities depending upon the topic being taught. Students prefer online elements for the dissemination of information. However, they prefer fact-to-face learning when learners must agree on a shared meaning or develop a joint solution.

Huan, Chou, Chen and Owen (2010) utilize an Online Learning Readiness Scale (OLRS), to evaluate the preparation of Taiwan undergraduate students. The scale utilizes five dimensions to assess student readiness. Gender did not impact any of the dimensions. However higher GPA students were more prepared for online education. Higher GPA students showed higher readiness in online communication self-efficacy, self-directed learning, learning control and learning motivation.

Xu and Jaggars (2010) examine about 500,000 courses taken by 40,000 Washington State community and technical college students. Their results show all types of students experience reduced performance in online versus face-to-face classes. The largest performance gaps occurred among younger students, males, Black students and those with lower grade point averages. After controlling for individual and peer characteristics, students in social sciences and applied professions, including business, continued to demonstrate a significant performance gap. This finding suggests that the usefulness of online teaching approaches might vary by discipline.

DiRienzo and Lilly (2014) examine the performance of 120 business students in face-to-face and online learning formats. Their results show that student performance on both basic and complex assignments do not differ based on course delivery method. However, they find some evidence of differences based on business discipline of courses taken. They find that students view the class to be equally difficult regardless of course delivery method.

DATA AND METHODOLOGY

We collected data for ten classes over a three-semester period Fall 2009 through Fall 2010. All data were collected from a single university. During this period all business administration majors were required to take a Principles of Finance course. Students usually complete the course in the junior year. The ETS Major Field Test for Business is administered as an exit exam in the Policy capstone course, usually the last course taken. The ETS Major Field Test consists of questions from nine areas of business including: Accounting, Economics, Management, Quantitative Business Analysis, Finance, Marketing, Legal and Social Environment, Information Systems, and International Business.

ETS provides large-sample normed total scores for the entire test and sub-scores for each business area to participating schools. Detailed information about the exam can be obtained from the Educational Testing Service website (www.ets.org/mft). We believe that the finance sub-scores were the most objective performance measure available to us and would be an unbiased metric for our comparison. There were 293 students enrolled in our sample classes but because students could complete the Principles course a year or more before taking the capstone, we only had ETS scores for 93 students at the time the College decided to drop the MFT as the exit test. Thus, our sample represents 31.7 percent of the population. Students were classified as face-to-face or online based on University enrollment records for the Principles of Finance course. We conduct t-tests on differences in performance between the two groups. We also complete a regressions on the total and sub-scores to further identify determinants of ETS score outcomes.

Table 1 shows the average and median scores comparison between the entire ETS participating institution population and our Principles of Finance classes sample. Total sample data are reported as well as data segregated by online and face-to-face delivery systems.

Table 2 shows the distribution of major area of study among test takers. The table shows the number of sample observations for each major. In addition, the data is segregated by instruction method. Accounting majors represent the largest contingent with twelve students taking the online course and eleven students taking the face-to-face course. Other popular majors include management, marketing, general business and hospitality management. The sample includes only two observations each for financial management

and financial planning majors. Thus, the results presented here primarily reflect the performance of non-finance majors.

Table 1: Summary Statistics

	ETS Total Score Average	ETS Total Score Median	ETS Finance Sub-score Average	ETS Finance Sub-score Median
ETS All Schools	150.3	151	42.4	42
Our School	150.1	148	47.3	44
Online Sample	151	151.5	46.6	44
F2F Sample	149.3	147	47.9	44

This table shows summary statistics for the Educational Testing Service Major Field Test (ETS MFT) and the sample school. The sample includes 93 students across three semesters.

Table 2: Distribution of Students to Each Platform by Major

Major	Online	Face to Face	Total
Accounting	12	11	23
General Business	9	4	13
Entrepreneurship	2	1	3
Financial Management	0	2	2
Financial Planning	0	2	2
Hospitality Management	3	8	11
Information Systems	4	4	8
Marketing	5	5	10
Management	9	10	19
Supply Chain Management	0	2	2
Total	44	49	93

This table shows sample distribution data. Figures in each cell indicate the number of students in the sample enrolled in the Principles of Finance course in either Online or Face to Face sections.

RESULTS

Table 3 shows results of t-tests between the face-to face (F2F) group and the online group (OL) for the Educational Testing Service Major Field Test (ETS) finance sub-scores. Our primary hypothesis is that F2F students will outperform online students on the Major Field Test, but we examine the data with and without directional priors. Table 3: Finance Sub-scores Comparison for Face to Face versus Online Teaching

	F2F	OL
Mean	47.90	46.57
Variance	325.47	342.72
Observations	49.00	44.00
Pooled Variance	333.62	
Hypothesized Mean Difference	0.00	
t Stat	0.35	
P(T<=t) one-tail	0.36	
t Critical one-tail	1.66	
P(T<=t) two-tail	0.73	
t Critical two-tail	1.99	

This table shows results of two-sample t-tests for differences in means. The test is conducted assuming the samples have equal variance. The variable of interest is the Educational Testing Service Major Field Test (ETS) finance subscore. F2F signifies the group of students who received face-to-face instruction. OL signifies the group of students who received online instruction.

Results are similar both with and without directional priors. The p values are low and insignificant for both the 1 and 2 tailed tests. An informal survey of finance instructors at the University suggested their priors

were finance sub-scores for F2F would be significantly higher than online. Thus, we have no evidence of a difference in exit exam scores for F2F versus OL courses.

Table 4 shows results of t-tests between the Face to Face (F2F) group and the online group (OL) for the ETS for overall scores. Similar to the finance sub-scores results; results here are similar both with and without directional priors. The p values are low and insignificant for both the 1 and 2 tailed tests.

Table 4: Total Score Comparison for Face to Face versus Online Teaching

	<i>F2F</i>	<i>OL</i>
Mean	149.33	151.05
Variance	158.35	190.18
Observations	49.00	44.00
Pooled Variance	173.39	
Hypothesized Mean Difference	0.00	
t Stat	-0.63	
P(T<=t) one-tail	0.27	
t Critical one-tail	1.66	
P(T<=t) two-tail	0.53	
t Critical two-tail	1.99	

This table shows results of two-sample t-tests for differences in means. The test is conducted assuming the samples have equal variance. The variable of interest is the Educational Testing Service Major Field Test (ETS) total score. F2F signifies the group of students who received face-to-face instruction. OL signifies the group of students who received online instruction.

To further examine the data, we conduct regression analysis. The regression includes explanatory variables for grade point average (GPA), the number of online courses taken by the student to date (#OLPREV) and the student’s online GPA (OLGPA). The analysis also includes dummy variables for course delivery method (1= Online) and gender (1=Male). We include a series of dummy variables for major with 1 indicating the student is a major and 0 indicating otherwise. We code the majors: Business Administration (BADM), Entrepreneurship (ENTR), Financial Management (FINM), Financial Planning (FINP), Hospitality Management (HTM), Information Systems (IS), Management (MGMT), Marketing (MKT), and Supply Chain Management (SCM). We also include a dummy variable indicating if the student is a transfer from another school (1=transfer). Equation 1 shows the full model.

$$ETS\ Score = \alpha + B_1(GPA) + B_2(Online\ DV) + B_3(Gender\ DV) + B_4 \dots \dots B_{12}(Major) + B_{13}(Transfer) + B_{14}(\#Online\ Courses) + B_{15}(Online\ GPA) \tag{1}$$

Table 5 shows the regression results for the full model run against the ETS total scores. Significant explanatory variables at the 5% level for the ETS Total Scores are GPA, gender and the majors HTM and MGMT both being significantly negative. The intercept represents the score of a female accounting major since the accounting major dummy is excluded to avoid overidentifying the model. Males on average scored 6.14 points higher than the intercept. Hospitality management and management majors produce significantly lower scores. The online variable is not significant. This model results in an Adjusted $R^2 = 0.10$.

Table 6 shows regression results for the full model when the dependent variable is the ETS finance sub-score. Gender and the majors BADM, IS and MGMT are significant at the .05 level, but GPA is no longer significant when considering the sub-scores. Again online is not significant. Adjusted $R^2 = 0.18$.

Variance inflation factors of the explanatory variables do not suggest a multicollinearity problem as all are well under five. But as a further check we run regressions on the ETS sub-scores with a reduced set of

explanatory variables. The direct test of our question is specified by the model:

$$ETS\ sub - score = \alpha + \beta_1 OL. \tag{2}$$

This model of course doesn't control for any other variables. The t statistic is -0.35 and the model $R^2 = 0$.

Table 5: Full-Model Regression on ETS Score

	Coefficient Estimates	t Statistics
Intercept	136.34	13.53***
GPA	7.54	2.16**
OL	-1.25	-.39
Gender	6.14	2.08**
BADM	-4.98	-1.14
ENTR	9.55	1.23
FINM	7.58	.81
FINP	-13.49	-1.40
HTM	-9.92	-2.11**
IS	-5.27	-1.01
MGMT	-9.07	-2.34**
MKT	-1.65	-.35
SCM	-14.35	-1.54
TRAN	1.57	.54
# PREV OL	.82	.90
OLGPA	-3.45	-1.50
$R^2=.10$		
No. of observations = 93		

This table shows the regression results when the ETS Total Score is the dependent variable and the full set of regressor variables GPA, number of online courses taken previously, online GPA and dummy variables for gender, online, and transfers. Specifically, the estimated equation is: $ETS\ Score = \alpha + B_1(GPA) + B_2(Online\ DV) + B_3(Gender\ DV) + B_4 \dots B_{12}(Major) + B_{13}(Transfer) + B_{14}(\#Online\ Courses) + B_{15}(Online\ GPA)$. ***, **, * denotes significance at the .01, .05 and .10 levels respectively.

Our priors are that grade point average should be significantly related to the finance sub-scores and so we add GPA to the model:

$$ETS\ sub - score = \alpha + \beta_1 OL + \beta_2(GPA) \tag{3}$$

The t statistics are not significant; -0.01 for OL and -0.34 for GPA. $R^2 = 0$.

If we add gender to the model:

$$ETS\ sub - score = \alpha + \beta_1 OL + \beta_2(GPA) + \beta_3(Gender) \tag{4}$$

Gender is positive and significant at the 0.01 level. Model $R^2 = .072$

When we perform regressions with all other combinations of variables adding #Online Courses, Online GPA and Transfer, only Gender is significant and R^2 is reduced below .072. The online variable is not significant in any of the regressions we perform.

Comparison of regressions on the ETS sub-scores shows that while none of the models had high explanatory power, as expected, the full model had the highest R^2 . All the models show gender as significantly positive. Specifically, male scores are significantly higher on the ETS Total Score and the Finance Sub-score than female scores.

When the effect of majors is included a male, entrepreneurship major is predicted to score 31 points higher than the referent female accounting student. Female general business, management, information systems

and supply chain management majors scores is predicted to be between 14 and 24 points lower than the referent female accounting student.

The gender effect is stronger in the finance sub-score results than the total scores. Strangely, hospitality management students score significantly lower on the total score but not on the finance sub-scores.

Table 6: Regression Full Model on ETS Sub-scores

	Coefficient Estimates	t Statistics
Intercept	50.24	3.68***
GPA	-2.00	-.42
OL	-1.40	-.32
Gender	12.49	3.13***
BADM	-13.50	-2.29**
ENTR	18.59	1.76*
FINM	10.52	.83
FINP	-16.08	-1.23
HTM	-9.49	-1.49
IS	-15.17	-2.15**
MGMT	-15.26	-2.91***
MKT	-4.64	-.72
SCM	-23.79	-1.88*
TRAN	2.73	.69
# PREV OL	.58	.47
OLGPA	1.07	.34
$R^2 = .18$		
No. of observations = 93		

*This table shows the regression results when the ETS Sub-score Score is the dependent variable and the full set of regressor variables GPA, number of online courses taken previously, online GPA and dummy variables for gender, online, and transfers. The estimated equation equals: $ETS\ Sub - score = \alpha + B_1(GPA) + B_2(Online\ DV) + B_3(Gender\ DV) + B_4 \dots B_{12}(Major) + B_{13}(Transfer) + B_{14}(\#Online\ Courses) + B_{15}(Online\ GPA)$. ***, **, * denotes significance at the .01, .05 and .10 levels respectively.*

CONCLUDING COMMENTS

This paper compares the performance of students who take the introductory finance course in an online versus face-to-face format, at regional state university in the Midwestern United States. Specifically, we compare the mean scores on the ETS finance sub-scores for a sample of 93 students from a Midwestern university who took the course either face-to-face or online. We find no significant difference between the mean scores of the two groups suggesting the delivery method does not significantly impact the learning outcomes.

We also tried to control for the effect of other variables including grade point average, gender, transfer status, major, online courses taken and online grade point average.

This study is limited as it examines students from only one university for one year. Moreover, the sample size was drastically reduced from what it could have been had the College not decided to discontinue the exit test. The obvious conclusion that can be drawn from this research is it doesn't appear that students who took the Principles course online performed significantly worse on a large sample standardized test accepted at schools large and small around the country as indicative of proficiency in the field. Therefore, whatever faculty priors concerning the efficacy of online delivery were, they seem to be disproven. Moreover, our results are consistent with the literature suggesting no difference between learning outcomes between the two delivery methods as found in the literature referenced previously.

However, this study raises some questions for further research. Is the ETS test the best instrument to use as a proficiency indicator? Does it align well with course learning objectives? How do you measure qualitative differences between online and face-to-face classes? It seems online education is here to stay and growing. Examining the impact of new technologies like Zoom for synchronous class experience and Respondus

monitor and lockdown browser to ensure, as much as possible, that we know who is actually taking the test, should help everyone feel more comfortable that e-learning is comparable to in-seat courses. We utilized GPA and other variables to control for student quality. However, these measures might not adequately capture finer qualities that distinguish students. Further studies might utilize additional control variables to improve our understanding.

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