

LEVELING THE PLAYING FIELD: CAN STUDENTS SUCCEED IN HIGHLY TECHNICAL BUSINESS COURSES DELIVERED ONLINE?

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ABSTRACT

Questions arise regarding course delivery formats as universities seek to meet demands for course flexibility while maintaining a quality curriculum. This

longitudinal study considers face-to-face and online delivery formats in a highly technical, upper-level business course. The course and instructor are constant across all years. The instructor maintains a similar learning environment across the delivery formats by codifying all lectures in their entirety. We control for age, gender, and ethnicity. Initially we ask: Will students in the face-to-face format perform better than those in the online format? We expand our investigation to include consideration of the impact of GPA, previous accounting course work, course load and previous course-type experience. Interestingly, our results indicate that although delivery format does not impact the students' learning success, GPA does. We find that student GPA is the most consistent student success indicator across both delivery formats. Our study suggests that students who possess the learning skills needed to achieve good grade performance are better able to adapt those skills to differing delivery methods.

Key words: OnLine, Face to Face, Grade Point Average, Course Grade

Data availability: Data are available upon request from the first author

INTRODUCTION

Universities and institutions of higher learning continue to face more demanding budget constraints. In searching for ways to reduce costs while increasing potential revenues, many institutions have explored the feasibility of offering online courses as a supplement or replacement for traditional classroom courses. In view of this move towards offering more variety in course delivery formats, there has been much discussion in the literature and amongst faculty as to the pedagogical value of online courses. There are two juxtaposed views: one supporting traditional classroom delivery as superior and the other advocating online education as the top delivery format. The characteristics of both delivery modalities certainly provide a plethora of considerations from the cost/revenue perspective. However, the primary question remains: does one delivery modality offer students a more effective learning environment than the other?

There is a considerable literature base hosting the intellectual conversation debating online (OL) vs. face-to-face (F2F) course delivery. One area in need of further research is the consideration of the delivery format impact on student performance in highly technical, upper-level business courses. Our research undertakes a longitudinal study of an upper level accounting course offered to a diverse urban student population. We eliminate the mitigating effects of different instructors and different courses which may have confounded previous studies. Our longitudinal study considers comparative results of student success based on grade performance in the same course delivered both F2F and OL by the same instructor over a four year time period. The instructor focused on providing OL students the same quality of content as that presented to F2F students by

transcribing the entire lecture series exactly as delivered in the classroom, including humorous comments, illustrations, and examples. By codifying the lecture material into written documents easily accessible by online students, the instructor created explicit knowledge from his personal tacit knowledge. After controlling for age, gender and ethnicity based on previous studies (Bressler et al., 2006; Brinkerhoff and Koroghlanian, 2005; Friday, et al., 2006; Guru-Ghavana and Flanagan, 2012), we find that overall there is no significant difference in the grade performance between the OL and the F2F delivery format. Interestingly, we also find that the same common predictors of student performance one might use in a F2F course (GPA, course load, and previous experience with the type of course) are relevant to understanding student performance in the OL format. This paper is organized as follows: Section 2 reviews the relevant literature and develops our hypotheses, Section 3 discusses our results, and Section 4 provides our conclusions and considerations for further research.

BACKGROUND AND HYPOTHESES

A well-established literature base exists regarding distance education in general and online (or web-based) instruction in particular. Dichotomous theories and results remain regarding the efficacy of online coursework. From one perspective, educational theorists suggest that the modality of delivery is not a significant determinant of learning outcomes (Clark 1983, 2001). Based on the cognitive approach to educational theory which considers learning to be accomplished through the internal processes of insight, thinking, memory and perception (Craik and Lockhart, 1972; Ertmer and Newby, 1993), this school of thought considers content and instructional strategy to be the underpinnings leading to student achievement. Cognitivists argue that in the presence of effective content and instructional design, the form of delivery will not affect student achievement or learning outcomes (see Bernard, et al, 2004).

From the opposing view, the constructivist theories consider differing learning environments to have the potential to create fundamentally different educational processes. Constructivists consider learners to be interactive with their learning environment in such a way that the environment itself becomes part of the learning structure, creating the particular reality in which the learning occurs. Learners actively construct their knowledge through their learning reality of which the learning environment is an intrinsic and inseparable part (Cooper, 1993; Walther, 1996). From this perspective, the modality of delivery becomes an inherently influential factor to the learner outcomes and student achievement. It is argued that online delivery directly affects student achievement because learners access materials and construct meta-cognitive activities differently than they would in other learning environments (Merrill and Galbraith, 2010).

The online delivery debate includes a wide variety of perspectives extending beyond the discussion of educational theorists. On the one hand, it is argued that online delivery is a better format because it encourages deeper cognitive processing and provides format flexibility. It is thought that the online environment requires students to engage more with the text and other virtual source material as the teacher role shifts from instructor to facilitator (Carrol and Burke, 2010). The

flexibility of use and the student-centered perspective of the online class may lead to improved instructional effectiveness, particularly with the more versatile and tech-savvy “virtual Generation” students (Daymont et al., 2011). Fortune et al., (2006) find that students who choose online courses prefer a more flexible learning environment. Expanding Kock’s (2005) compensatory adaptation model, Daymont et al., (2011) suggest that students choose the flexibility of online courses even though they believe that greater self-discipline is required to complete the course successfully. These students who self-select into online courses compensate for the greater self-discipline by putting more effort into time-management. Additionally, research has found “virtual Generation” learning styles to be more consistent with online learning (Proserpio and Gioia, 2007) and that students tend to be more actively engaged in online courses (Hiltz and Shea, 2005). The implication of this research base is that online courses will lead to better student performance.

On the other hand, there are substantial research findings regarding highly technical courses taught in business schools. Several studies found that students perform better in these types of courses when the delivery is the traditional classroom format (Brown and Liedholm, 2004; Terry et al., 2003). Additionally, there are numerous studies that find “no significant difference” in student performance when comparing online delivery to the traditional classroom environment (see meta-analyses Merrill and Galbraith, 2010; Sitzmann et. al, 2006). Kock’s (2005) compensatory adaptation model concludes that the limitations placed on learning through any new environment will be overcome through compensating adaptation as learners continue to engage in the new environment. Thus the process of engaging in any learning environment itself will eventually nullify the advantage of a specific environment. As online education has become more common, the unique characteristics of online delivery may impact the learner outcomes less and less as learners adapt and compensate for these differences in the learning environment (Daymont et al., 2011). The variety of research findings continues to invigorate further research to better clarify and expand what we know about online education.

In this study, we compare student performance over a four-year period in an upper-level undergraduate online accounting course and a matching traditional classroom course. The validity of prior research has been criticized because of lack of control over course content, instructional design, and potential confounding of results through considering courses taught by different instructors (Merrill and Galbraith, 2010). To address these issues, we consider online and traditional classroom sections of the same course, taught by the same instructor, holding content and instructional strategy consistent across all sections studied. Results of the Brown and Liedholm (2004) study as well as the Terry et al. (2003) study suggest that the highly technical nature of the upper-level accounting course will negatively affect student performance in the online delivery format. We hypothesize:

- H1: Students in the traditional classroom delivery format will perform better overall than students in the online delivery format.

However, in that we have controlled for the most problematic confounding issues of content, instructional design, and common instructor across the research design, we anticipate that a general predictor of student performance (grade point average) will function as expected in both the online and traditional classroom delivery formats. We hypothesize:

H2: Students who have higher grade point average prior to taking the online (classroom) delivery format will perform better in the online (classroom) delivery format.

Flexibility and convenience are the most common reasons students take online courses (Bocchi et al., 2004; Hiltz and Shea, 2005). There is concern that students perceive online courses as easier and less demanding. This perspective combined with the flexibility and convenience offered by online coursework may lead students to take more courses than they would otherwise. Course overloading may lead to lower student performance in the online delivery format. We hypothesize:

H3: Students who take fewer courses at the same time as the online course will perform better in the online delivery format.

Structuration theory postulates that social systems develop through the use and reuse of structural rules and resources (Macintosh and Scapens, 1991). Adaptive structuration theory (AST) (Poole and DeSanctis, 1990. p. 179) defines structures as the rules and resources used to initiate and sustain a social entity, such as a group. Different communication environments incorporate different structures that facilitate the communication process. As groups work in differing communication environments, group members adapt to the various communication rules and resources and incorporate these structures into their work repertoires. AST applies to online delivery formats in that the class as a whole acts as a group and incorporates the structural rules and resources into the communication process of the online class. As students become more familiar with the online delivery format, they perform better in online courses. Compensatory adaptation theory (Kock, 2005) also implies that as students become more accustomed to the online class environment, they adapt and compensate to diminish negative effects of the delivery format on performance. We hypothesize:

H4: Students who have completed prior online course(s) prior to taking the current online delivery format course will perform better in the online delivery format.

Prior research suggests that age, gender, and ethnicity may have significant effects on course grade when considering delivery formats. Bressler et al. (2006) conclude that age and ethnicity are important factors to student success in the online delivery format. Using course grade as the measure for student success, their results indicate that younger students performed better than older students

and that Caucasian students performed better than students from other ethnic backgrounds in online accounting courses. Brinkerhoff and Koroghlanian (2005) find that age is significantly related to a variety of computer skills commonly used by students in online courses, such as navigating web pages, engaging in discussion boards, and attaching files to links. Guru-Ghavana and Flanagan (2012) report a highly significant gender impact on student performance in the online delivery format. In a longitudinal study of OL versus F2F delivery formats using course grades as the performance measure, Friday, et al. (2006) find that women significantly outperform men in upper-level management courses delivered online. To further understand student performance in the OL versus F2F delivery environments, we include age, gender, and ethnicity as control variables based on prior research.

SAMPLE AND EMPIRICAL RESULTS

We hand-collected our data from a highly technical, upper-level accounting (ULA) course delivered both in the traditional F2F and OL methods each spring semester between 2006 and 2009. The university is an urban university. The accounting major in the College of Business is the largest academic program in the university. Caucasian, African American, and Hispanic students make up equal parts of 90 percent of the university student body with Asian and international students representing the remaining 10 percent. The ethnicity of students in the accounting program reflects that of the university. Student ages range from traditional 18 year old freshmen to older students in their 60s.

The ULA course from which our sample was drawn included both F2F and OL sections. All students in all sections, including the OL delivery sections, were local to the university campus. All students had access to the instructor through email and regularly scheduled office hours for face-to-face meetings. OL students also had the opportunity to meet with the instructor during chat sessions scheduled as virtual office hours.

The F2F sections were delivered in the standard lecture format. The OL sections were designed to be fully online and used a common web-based course delivery software for students to view course materials and communicate. Inside the OL course website, email and chat were provided for student-to-student and student-to-instructor interactions. The OL students seldom used the chat and email features offered on the OL course website. The standard university email system was the primary platform used for communication between the OL students and the instructor. As a control measure, all of the course exams were administered synchronously to the OL students, who were required to take the ULA course exams at a specified time in a predetermined location on the university campus. The OL course exams were electronically administered through the OL course website at the required locations.

To address the issues of lack of control and the potential for confounding results, (Merrill and Galbraith, 2010), all sections of the ULA course in our sample were taught by the same instructor over the four-year time frame, using the same textbook, notes, and exams. Our full sample includes 210 students, out of which 90 students were in the F2F sections and 120 in the OL sections. For each student, we gathered his/her performance, proxy by the course grade, sections attended (i.e. F2F vs. OL). We collected pre-course cumulative GPA, pre-course accounting hours, concurrent course load, and pre-course online hours data to extend our study into areas beyond the extant literature. The sample selection data and variable descriptions are listed in Table 1.

TABLE 1

Sample Selection and Variable Description

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Totals</u>
2006	24	33	57
2007	23	35	58
2008	22	35	57
2009	30	33	63
Less withdrawals or incompletes	(9)	(16)	<u>(25)</u>
Total Sample			<u><u>210</u></u>

Variable Descriptions

Dependent Variable

Grade Discrete ordinal variable: students’ grade for the course, F, D, C, B, A corresponds to 0, 1, 2, 3, 4

Main Variables

GPA (PreGPA) Student’s cumulative GPA before taking the course
 AccHrs Student’s accounting course hours before taking this course
 CourseLoad (Cload) Student’s concurrent course load when taking this course
 Pre-online (PreHrs) Student’s on-line credit hours before taking this course, use for online sample

Control Variables

Method Method = 1 if the course is online
 Age Student’s Age
 Gender Male = 1, Female = 0
 Black* Black = 1 if student’s race is African American
 Hispanic Hispanic = 1 if student’s race is Hispanic
 Asian Asian = 1 if student’s race is Asian
 International International = 1 if student is originally from a foreign country
 Native Native = if student is American Indian or Alaskan or Pacific Islander

* The reference category is Caucasian (Student’s race is Caucasian). The Coefficient for these variables indicate the marginal difference in the dependent variable for other races.

TABLE 2
Descriptive Statistics

Panel A: Main Variables Distribution

<u>Variable</u>	<u>N</u>	<u>Mean</u>	<u>Std Dev</u>	<u>Q1</u>	<u>Median</u>	<u>Q3</u>
Grade	210	2.39	1.07	2.00	2.00	3.00
GPA	181	3.05	0.62	2.60	3.00	3.50
AcctHrs	210	14.83	9.64	6.00	15.00	24.00
CourseLoad	210	10.86	3.71	9.00	12.00	12.00
Pre-online	120	3.62	2.81	2.00	3.00	5.00

Panel B: Control Variables Distribution

<u>Variable</u>	<u>N</u>	<u>Mean</u>	<u>Std Dev</u>
Method	210	0.57	0.50
Age	210	29.60	7.21
Gender	210	0.60	0.49
Black	210	0.18	0.39
Hispanic	210	0.30	0.46
Asian	210	0.21	0.41
International	210	0.05	0.21
Native	210	0.00	0.07

Table 2 reports the descriptive statistics of our sample. On average, students earned 2.39 out of 4 points for the ULA course. However, their pre-course cumulative GPA is 3.05, indicating the ULA course is more challenging than other courses they had taken. Based on the data (pre-course accounting hours mean 14.83 with 3 credit hours per accounting course), students had taken approximately 5 accounting courses before they took the ULA course. Students on average took 3.5 other courses at the same time while taking the ULA course. The pre-online variable mean is 3.62, suggesting students generally had at least one online course experience before taking the ULA course. The mean of students' age is 29.60, indicating our students are non-traditional students. Many of the students worked full-time jobs while taking the ULA course. Slightly more male students took the ULA course than female students. In addition, a majority of our sample are Caucasian and Hispanic students. Since our data is across a four-year time frame, we further decompose our sample into four sub-year groups to obtain sharper insights regarding F2F and OL students along the time-trend.

Table 3 Panel A shows there is no significant difference in the grade between F2F and OL students except for year 2008, when F2F students performed better than OL students. Similarly, there is no difference in gender, pre-course cumulative GPA, and pre-course accounting credit hours

TABLE 3**Comparisons Between Face to Face and Online Across Years***Panel A: Comparison of Grade by Year*

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
2006	2.61	2.48	0.13	0.67
2007	1.95	2.13	-0.18	0.52
2008	2.86	2.26	0.60	0.04
2009	2.64	2.25	0.39	0.18

Panel B: Comparison of Gender by Year

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
2006	0.71	0.67	0.04	0.78
2007	0.59	0.63	-0.04	0.76
2008	0.54	0.53	0.01	0.92
2009	0.64	0.48	0.16	0.25

Panel C: Comparison of Age by Year

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
2006	29.23	29.58	-0.35	0.88
2007	28.27	28.70	-0.43	0.80
2008	28.22	29.31	-1.09	0.52
2009	29.32	33.66	-4.34	0.04

Panel D: Comparison of PreGPA by Year

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
2006	3.02	3.03	-0.01	0.95
2007	2.94	3.01	-0.07	0.72
2008	3.14	2.99	0.15	0.45
2009	3.16	3.09	0.07	0.70

Panel E: Comparison of PreHrs by Year

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
2006	15.57	17.80	-2.23	0.42
2007	16.90	13.50	3.40	0.22
2008	13.22	14.25	-1.03	0.68
2009	14.28	13.11	1.17	0.67

Panel F: Comparison of Cload by Year

<u>Year</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
2006	12.28	9.19	3.09	0.001
2007	12.54	11.20	1.34	0.16
2008	13.22	9.37	3.85	0.000
2009	11.52	9.11	2.41	0.019

between F2F and OL students. The exceptions are age and course load. Panel C suggests younger students tended to take the F2F section during year 2009, and Panel F reports F2F students generally took more concurrent courses than OL students while taking the ULA course. We lack information on how many of these concurrent courses are OL (F2F) sections. One possibility is F2F (OL) students take the ULA course F2F and other courses OL (F2F). Another possibility is that there are fewer F2F students employed in full-time jobs than OL students while taking the ULA course. In sum, our sample of F2F and OL students seem to come substantially from the same population, which alleviates the self-selection concerns that other confounding factors could contaminate their performance.

Next, we form further subsamples by ranking our key variables to release the homogeneity of variance assumptions. In Table 4 Panel A, we divide our sample students into 5 groups based on their pre-course GPA ranking and compare their grades in the ULA course. There is no difference in performance between F2F and OL sections. Panel B finds similar results when we rank the students according to their age. Panel C shows among students who take more concurrent courses (i.e., the group with the 3rd lowest course load), F2F students had better grades than the OL students; yet, there is no difference in grade for the other groups with different levels of course load. Finally, considering groups partitioned by various pre-course accounting credit hours, Panel D suggests there is no difference in course grade between F2F and OL sections, except for the middle-level group. In that group, F2F students received a slightly higher grade than OL students. After controlling for various confounding variables, our analyses suggest the F2F and OL students perform similarly overall.

In Table 5, we conduct more rigorous analyses using linear regression. Our dependent variable is the student's grade from this course. The results for the full sample, which includes 210 students, indicate that pre-course GPA significantly relates to a student's performance in the ULA course. This finding is consistent with Bressler et al., (2006), who find that higher GPAs result in a higher success rate in the online environment. In that GPA is generally interpreted as a predictor of a student success rate in F2F courses, this supports our argument that predictors for OL courses are similar to those for F2F courses. In addition, we find age negatively impacts the student's grade in the ULA course: the older students tend to have lower grades. For the F2F subsample, the pre-course cumulative GPA still remains the significant variable to determine the student's grade although ethnicity weakly explains it. More specifically, Asian students tend to perform better in the F2F section. Moreover, for the OL subsample, the only factor influencing a student's grade is the pre-course cumulative GPA. In sum, our results provide that the modality of a course has little impact on students' performance as long as the course is carefully designed. The single factor that matters the most for students' grades is their cumulative GPA.

TABLE 4

Comparisons Between Face to Face and Online Across PreGPA

Panel A: Comparison of Grade by PreGPA Groups

<u>PreGPA Group</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
Lowest PreGPA	1.71	1.24	0.47	0.14
2 nd Lowest PreGPA	2.25	2.05	0.20	0.49
3 rd Lowest PreGPA	2.28	2.10	0.18	0.58
4 th Lowest PreGPA	2.56	2.76	-0.20	0.44
Highest PreGPA	3.50	3.32	0.18	0.39

Panel B: Comparison of Grade by Age Groups

<u>Age Group</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
Youngest	2.63	2.30	0.33	0.27
2 nd Youngest	2.58	2.35	0.23	0.55
3 rd Youngest	2.31	2.22	0.09	0.85
4 th Youngest	2.50	2.28	0.22	0.42
5 th Youngest	2.47	2.30	0.17	0.66

Panel C: Comparison of Grade by Cloud Groups

<u>Cloud Group</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
Lowest	2.86	2.71	0.15	0.76
2 nd Lowest	2.38	2.29	0.09	0.78
3 rd Lowest	2.41	1.93	0.48	0.05
4 th Lowest	2.65	2.33	0.32	0.32

Panel D: Comparison of Grade by Prehrs Groups

<u>Prehrs Group</u>	<u>F2F</u>	<u>Online</u>	<u>Diff (Mean)</u>	<u>P-value</u>
Least	2.69	2.43	0.26	0.54
2 nd Least	2.05	2.50	-0.45	0.21
3 rd Least	2.69	2.09	0.60	0.02
4 th Least	2.55	2.15	0.40	0.28
5 th Least	2.67	2.36	0.31	0.39

LIMITATIONS

The historical nature of our data and the composition of the student population are limitations to our study. Our data covers the years 2006 through 2009. OL course delivery has become more familiar to students during the ensuing years. There is no indication in our study that familiarity with online delivery methods significantly impacts grade performance. Additionally, the student population is predominantly an equally distributed mix of Caucasian, Hispanic, and African-American students, without significant representation of Asian and other ethnic groups. We include

TABLE 5

Regression: Grade = Method Dummy + Main Variables + Control Variables

Variables	Regression Coefficient / T-value		
	Full Sample	Face to Face Sample	Online Sample
Method Dummy	-1.1872 -1.38		
GPA	<u>1.0124</u> *** 9.52	<u>0.8060</u> *** 4.55	<u>1.1018</u> *** 7.70
Accthrs	0.0007 0.08	0.0170 1.23	-0.0058 -0.52
Courseload	-0.0114 -0.58	0.0319 0.80	-0.0183 -0.73
Age	<u>-0.0181</u> ** -1.91	-0.0199 -1.33	-0.0112 -0.85
Gender	0.1793 1.33	0.1996 0.89	0.1604 0.91
Black	0.0112 0.04	0.2686 0.49	0.1142 0.27
Hispanic	0.1338 0.47	0.4124 0.82	0.1096 0.28
Asian	0.4090 1.36	<u>0.8781</u> * 1.71	0.1771 0.44
International	-0.3129 -0.98	-0.6516 -1.20	-0.0016 0.00
Native	-0.3929 -0.45		
Year Dummy	Yes	Yes	Yes
Observations	210	90	120
Adjusted R ²	38.23%	32.16%	40.31%

***, **, * denote 0.01, 0.05, and 0.10 significance levels, respectively, using a two-tail test

ethnicity as a control variable to address the potential impact of our student population composition on the study results.

CONCLUSION

In our data analysis, we first determined that our student population basically had the same characteristics over the four year data collection period. The one deviation was that classroom students tend to enroll in more courses than online students in a semester. There is no indication that different delivery modes impact student grades. The GPA performance indicator was consistent regardless of whether students took the ULA course F2F or OL. Our other main variables: previous accounting course work, course load, and previous course-type experience were all generally consistent for grade performance across both F2F and OL delivery formats. After subjecting our longitudinal data to thorough analysis, we find GPA to be the most consistent indicator for student grade performance in the ULA course regardless of delivery modality. We draw the conclusion that students with historically good grades will likely do better academically disregarding whether they participate in a F2F or OL course offering.

Does our result answer the primary question of clarifying the best learning environment based on delivery format? Perhaps, in some ways, it does. Finding similar predictors for student success across the two delivery modalities allows us to further investigate what leads to that success. The question of delivery modalities may be less important than the underlying question of what leads to overall student performance. Holding the confounding variables constant (same course content, same instructor, and codifying the tacit knowledge base into explicit knowledge accessible by OL students), we find that students who have developed the skills leading to good grade performance are able to adapt those skills across divergent learning environments. We suggest the primary question for future research is not which course delivery format is better, but rather how to better assist students in developing the skills necessary to succeed in highly technical, upper-level business courses.

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