

STUDENT PERFORMANCE COMPARISON BETWEEN FACE-TO-FACE AND ONLINE INSTRUCTIONAL DELIVERY MODALITIES

A Case Study Using an Upper-level Operations Management Course

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Abstract

An analysis of 144 students at an AACSB-accredited university explores the impact of the instructional delivery mode used on students' course performance. A comparison of students' performance as measured by the average of examination grades earned is analyzed to determine the impact (or lack of it) of face-to-face versus online instructional delivery modes, holding all other variables constant.

Introduction

Universities are facing shrinking enrollment of “traditional-student” populations (18-year old, full-time, residential students who expect face-to-face instruction) for a myriad of reasons. This fact coupled with federal and state funding reductions and potential (or real) competition posed by for-profit online universities, could be some of the reasons attributed to the increase in the number of online course and degree offerings occurring in higher education. Or perhaps it could be simpler than that, and it is just a reflection of the predilection of “millennials” (Internet-natives) for the virtual world in all of its manifestations. The fact is that no matter what the causes, the online mode of instructional delivery has moved beyond a stage where it can no longer be dismissed as a passing “fad” and has become part of the instructional modalities offered by institutions of higher education. This situation has prompted a division among faculty: those who praise the qualities of online instructional delivery, and those who at best do not see many benefits, or worse, vilify it in its entirety.

This paper describes an attempt to reach a conclusion using a simple, yet elegant approach to this issue following Occam's razor test. Several authors have used very contrived statistical procedures with all sorts of proxy-variables to attempt to determine satisfaction by students, attainment of learning outcomes, etc. See the reference list at the end of this paper for a sample of these studies. This case study attempts to keep all variables constant without resorting to artificial variables which raise the spectrum of lack of reliability and/or validity (both internal and external). Students achieve learning outcomes as measured by assessments given in class by instructors; these levels of achievement become translated into final letter grades at the end of the semester. This paper uses such measures of students' performance – the average of examination grades to test the independence of instructional delivery modality and students' academic performance in an upper-level Operations Management course.

Background

The course analyzed for this case study is a fourth year, second semester, mandatory core course at a School of Business accredited by AACSB™ in a large metropolitan area. The School of Business at this unidentified state university has had the AACSB™ accreditation since the early 1990s. The analysis includes only sections of the same course taught by the same instructor in both modalities: face-to-face and online. The instructor is certified to teach online by two external agencies (LERN™ and Quality Matters™) and one certification process internal to the university. The Learning Management System used is Blackboard™ and the instructor has access to instructional designers who hold terminal degrees in their discipline. The instructor has over thirty years of experience in higher education, and was among the early adopters of online instruction technologies since the

early 1990s. The curriculum content is identical for both instructional modalities (face-to-face vs. online), the assessment system is identical for both modalities in terms of content and frequency of evaluation, the learning outcomes are identical for both modalities, and the number of contact hours (lectures as well as office hours) with students are similar.

Methodology

The test of independence between two variables using Chi-Square (X^2) method was used. The rationale was to determine if the instructional delivery modality (face-to-face vs. online) affected the average examination grade distribution received by students during the course. The average of examination grades of 144 students were compiled from past records for the same upper-level Operations Management course taught by a single instructor. Four categories of grades were created: 1) Top performers who received average examination grades of A, A- and B+; 2) Solid performers who received average examination grades of B and B-; 3) Satisfactory performers who received average examination grades of C+ and C; and 4) Students who did not meet the minimum assessment requirements and received average examination grades of C-, D+, D, D- and F. The fourth category lumped all the grades that resulted in a “no passing” outcome. The grades of “I” (incomplete), and “W” (course/semester withdrawal) were removed from the analysis to control for extraneous variables that resulted on those grades. Attention was given to ensure that the expected frequencies (F_e) were at a level of 5 or larger for reliability purposes of the statistical method chosen. It is apparent from looking at the percentage difference between the observed and the expected frequencies, that there was very little deviation between them. Table 1 below shows all the computations done for this analysis, the null and alternative hypotheses, the level of significance ($\alpha = 5\%$), the degrees of freedom, and the conclusion. Since the $X^2_{\text{statistic}}$ was larger than the $X^2_{\text{critical-value}}$ at $\alpha = 5\%$ with 3 degrees of freedom, we conclude that there is no statistical basis to reject the null hypothesis. We must continue to assume independence between delivery mode and average of examination grades.

Results

The average of the examinations given to the traditional face-to-face and online groups directly represent the level of academic achievement attained as measured by the course learning outcomes. The course contents for both, face-to-face and online groups, were identical, as were the learning outcomes, the assessment used, the timing and duration of the assessments given, and the course pre-requisites completed by the students in both groups. Furthermore, the frequency and quality of instruction, as well as the number of contact hours (which included lecture time, hands-on exercises, and consultation time with instructor) were similar for both groups. The Chi Square (X^2) statistical analysis shows there was no discernible difference in academic performance between the face-to-face and online groups. These findings should be interpreted within the following context: the instructor has many years of teaching experience using both modalities successfully; the instructor holds three certifications as an online instructor; and the instructor has had the assistance of qualified instructional designers in adapting this course to the online environment.

Combined F _o	Delivery Mode		Total	Combined F _e	Delivery Mode		Total
	F2F	Online			F2F	Online	
A,A-,B+	20	42	62	17.22	44.78	62	
B,B-	7	22	29	8.06	20.94	29	
C+,C	6	13	19	5.28	13.72	19	
C-,D+,D,D-,F	7	27	34	9.44	24.56	34	
	40	104	144	40.00	104.00	144	

Cells	F _o	F _e	F _o -F _e	(F _o -F _e) ²	(F _o -F _e) ² /F _e
(1,1)	20	17.222	2.778	7.716	0.448
(1,2)	42	44.778	-2.778	7.716	0.172
(2,1)	7	8.056	-1.056	1.114	0.138
(2,2)	22	20.944	1.056	1.114	0.053
(3,1)	6	5.278	0.722	0.522	0.099
(3,2)	13	13.722	-0.722	0.522	0.038
(4,1)	7	9.444	-2.444	5.975	0.633
(4,2)	27	24.556	2.444	5.975	0.243
Sum	144	144.000			1.825 = $\chi^2_{\text{statistic}}$

H₀: Independence between Delivery Mode and Grades

H₁: Dependence between Delivery Mode and Grades

$\alpha = 5\%$

D. of Freedom = 3

$\chi^2_{\text{critical value}} = 7.815$

Conclusion: Since $\chi^2_{\text{statistic}}$ is less than $\chi^2_{\text{critical value}}$, do NOT reject H₀

Table 1. Chi-Square (X²) Test of independence between two variables.

References

- Linda K. Carter, and Tisha L. N. Emerson, "In-Class vs. Online Experiments: Is There a Difference?", *Journal of Economic Education* vol. 43, no. 1, 2012, pp. 4-18.
- Clement C. Chen, Keith T. Jones, and Keith A. Moreland, "Online Accounting Education versus In-Class Delivery: Does Course Level Matter?", *Issues In Accounting Education* vol. 28, no. 1, 2013, pp. 1-16.
- Thomas Daymont, and Gary Blau, "Deciding Between Traditional and Online Formats: Exploring the Role of Learning Advantages, Flexibility, and Compensatory Adaptation", *Journal of Behavioral & Applied Management* vol. 12, no. 2, 2011, pp. 156-175.
- David Figlio, Mark Rush, and Yin Lu, "Is It Live or Is It Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning", *Journal of Labor Economics* vol. 31, no. 4, 2013, pp. 763-784.
- Jennifer L. Flanagan, "Online Versus Face-To-Face Instruction: Analysis of Gender and Course Format in Undergraduate Business Statistics Courses", *Academy of Business Research Journal* vol. 2, 2012, pp. 89-98.
- Ganesh Gopala, Audhesh Paswan, and Sun Qin, "Are Face-to-Face Classes More Effective Than Online Classes? An Empirical Examination", *Marketing Education Review* vol. 25, no. 2, 2015, pp. 67-81.
- Namsook Jahng, Don Krug, and Zuo Chen Zhang, "Student Achievement in Online Distance Education Compared to Face-to-Face Education", *European Journal of Open, Distance and E-Learning* vol. 1, 2007, pg. 19.

Susan Evans Jennings, and Marsha L. Bayless, "Online vs. Traditional Instruction: A Comparison of Student Success", *Delta Pi Epsilon Journal* vol. 45, no. 3, 2003, pp. 183-190.

Scott D. Johnson, Steven R. Aragon, Najmuddin Shaik, and Nilda Palma-Rivas, "Comparative Analysis of Learner Satisfaction and Learning Outcomes in Online and Face-to-Face Learning Environments", *Journal of Interactive Learning Research* vol. 11, no. 1, 2000, pp. 29-49.

David K. Larson, and Chung-Hsien Sung, "Comparing Student Performance: Online versus Blended versus Face-to-Face", *Journal of Asynchronous Learning Networks* vol. 13, no. 1, 2009, pp. 31-42.

Jessica J. Summers, Alexander Waigandt, Tiffany A. Whittaker, "A Comparison of Student Achievement and Satisfaction in an Online Versus a Traditional Face-to-Face Statistics Class", *Innovative Higher Education* vol. 29, no. 3, 2005, pp. 233-250.