Teaching college microeconomics: Online vs. traditional classroom instruction

Cynthia McCarty
Jacksonville State University

Doris Bennett
Jacksonville State University

Shawn Carter
Jacksonville State University

ABSTRACT

The use of online course offerings in college has grown sharply in recent years. Previous research, while limited, is inconclusive in determining expected student performance in online versus a traditional lecture format. This paper focuses specifically on student performance in introductory microeconomics classes, analyzing learning differences between those in online and traditional lecture classes. In addition to comparing overall performances, the researchers tested further to determine if gender, ethnicity, major, and levels of achievement and aptitude are factors in explaining differences in performance between lecture and online classes. They then studied the differences between the groups within lecture and online classes to determine if there was a gap in performance due to gender, ethnicity, major, effort, or aptitude. One objective for this study is to better predict student performance in online versus traditional lecture course formats.

Keywords: Online learning, Traditional lecture, Microeconomics, Performance, Effort, Gender, Ethnicity, Aptitude

INTRODUCTION

The number of US college students enrolled in at least one online college class has increased from 1.6 million in fall 2002 to 6.1 million in fall 2010, roughly an increase of about 19% per year. Over the same time period, the student body has only increased by about 2% per year. In the fall of 2011, five hundred sixty thousand more US undergraduates took online courses compared to the fall of 2010, with 31% of all higher education students taking at least one online course during their college career (Allen and Seaman, 2011). For the 2007-08 school year the National Center for Education Statistics reported that 24% of business students had taken at least one online course, compared with 20% of all US undergraduates (Radford and Weko, 2011). Online course instruction is expected to continue its growth, even if the pace slows from its previous robust levels.

The data for this study came from four Jacksonville State University (JSU) principles of microeconomics sections, two online and two traditional lectures, taught by the same professor using the same textbook. Intermediate algebra is the only prerequisite for the course. JSU currently has a total enrollment of approximately 9500 students, with 8200 undergraduates, of which 850 are business students. The average annual growth in online student enrollment from 2005 to 2011 was 14%, while the average annual student population growth was only slightly more than 1%. JSU's student population is diverse, with about 53% white, 37% African-American and the rest coming from Hispanic, Asian, or Native American heritage. Most are also first-generation college students.

Previous research offers mixed conclusions as to whether student performance in online business and economics courses is as good as that achieved in traditional lecture courses. In most of that research, students' grades in online and lecture classes were compared, but the studies rarely differentiated students by characteristics such as ethnicity, age, effort, and aptitude. The concern with this method is that studying the overall outcome may hide the costs to certain segments of the overall student population. Some divisions of students may suffer with the widespread adoption of online courses. This paper expands the research to determine if major, gender, age, ethnicity, and levels of achievement and aptitude are factors in explaining differences in performance between lecture and online classes. In other words, even if there is little difference overall between all students taking online and traditional classes, will one or more groups of students be affected significantly if online courses replace traditional lecture ones?

LITERATURE REVIEW

Online undergraduate students tend to have certain characteristics. Older, working, financially independent, public college students have been more likely to take online course than their counterparts (Radford and Weko, 2011). This agrees with findings from an older survey of economics departments, which reported that many of those enrolling in online economics courses are non-traditional students, such as working adults and those not seeking degrees (Coates and Humphreys, 2003). Brown and Liedholm (2002) found that those taking online principles of microeconomics courses had higher ACT scores, more college experience, longer work schedules, and fewer reported study hours than traditional students in lecture sections. Shoemaker and Navarro (2000) determined that the online students in their Introduction to Macroeconomics courses were less likely to have taken previous economics courses and had

higher GPAs than their traditional macroeconomics students. Keri (2003) also noted age as a factor in the course decision, finding that online economics students tend to be older, with an average age of twenty-eight.

The evidence on how undergraduate economics students perform and the pertinent factors affecting performance in online versus traditional courses has been inconclusive. Navarro (2000) analyzed roughly 50 colleges which together had offered over 100 internet economics courses. He found that lack of student motivation and little self-direction were major factors contributing to poor grades in online internet economics classes. Keri (2003) found that end-of-semester grades for online economics courses were positively correlated with years in college. Brown and Liedholm (2002) found that although women scored significantly lower than men in traditional microeconomics courses, there was not a significant difference in how each performed in online courses. Overall, they found traditional students scored higher than those taking the online courses**.** They recognized that the traditional students did significantly better on the more complex subject matter, but not on basic conceptual questions. In contrast, Shoemaker and Navarro (2000) found that internet principles of macroeconomics students scored significantly higher than traditional students. They also noted that gender, ethnicity, class level, and previous economics courses taken made no statistical difference.

Figlio, Rush, and Yin (2010) did an experiment at a selective university where roughly 1400 students were randomly assigned to either online or live lecture sections of a large introductory microeconomics class. The only difference between the two modes was the delivery of the lectures. Some students viewed the lectures in person, while the online students viewed the videotaped lectures on the internet. They found that for all students, the average test score was higher for the live instruction students. More interestingly, they found that the test scores for Hispanic students, male students, low ability (low ACT), and low-achievers (based on prior GPA) were dramatically higher in the live instruction section.

Howsen and Lile (2008) compared outcomes in several principles of macroeconomics classes. Although the same instructor, same tests, same time limits for tests, and same room were used for the online and traditional classes, the online students scored almost one letter grade lower than the traditional students. They concluded that older, female, white, strong math students with high ACT scores did significantly better, regardless of the method of course delivery.

Wilson and Allen (2011) studied four online and traditional management classes at a historically black school, finding that online students had a higher withdrawal rate and a higher failure rate. Another trend pertinent to online students was that they also frequently missed assignment deadlines. They determined that GPA was the major factor in student performance for both online and traditional classes.

Calafiore and Damianov (2011) found that higher GPAs and more hours spent online positively influence grades in online courses. Two separate studies by Tseng et al. (2010) and Damianov et al. (2009) also agree that more time online corresponds with higher grades, although Damianov et al. stress that even with extra effort the B student is unlikely to earn an A unless he also has a higher GPA. McGlone (2011) suggests that since older students tend to prefer online courses, colleges should structure the online courses by offering self-paced deadlines with computer skill instruction, as needed.

In reviewing an MBA microeconomics course, taught both online and traditionally, Bennett, McCarty, and Carter (2011) found that the benefits of online classes are not shared equally among all types of students. For example, the difference between the final grades of

high and low achievers (as measured by their GPA) was significantly larger for the online students as compared to the traditional students, suggesting that those students with lower GPAs need to carefully consider taking online economics courses when a traditional course is an option.

METHODOLOGY AND RESULTS

Student learning was measured by the final average grade in the course. Factors hypothesized to influence the final grade were: type of instruction, online or traditional lecture, ethnicity, gender, GPA, ACT, age, and whether the student was an undergraduate business or non-business major. To measure the effect of ethnicity, since the sample of 101 students is relatively small, the authors divided the sample into non-minority students, who are white, and minority students, most of whom are African American, but which also includes some Hispanic and Asian American students. The students' ACT scores are indicators of their overall aptitude and ability. The GPA measures how much effort a student has put into his or her studies.

Descriptive statistics for the variables used in this analysis of online and in-class instruction are indicated in Table 1 (Appendix). The means and standard deviations for the combined sample and then for the sample separated into online and in-class instruction were calculated. A t-test for differences in the means between the lecture and online classes was performed, and the p-value, or significance level, for the difference in means is reported in the last column.

The final average score in the online classes was slightly higher, 0.31 points, than the average score for the lecture sections, but the difference was not significant. Like Shoemaker and Navarro (2000) this study found that the GPA average of the online students was higher than the average for the lecture students and significant at the 0.047 level. In agreement with Brown and Liedholm (2002) it was found that students in the online sections had higher ACT scores, but the difference was not significant. Students in the online class were approximately 2 years older, and the difference was significant at the 0.007 level. Keri (2003) also found that online students were older; however, the average age of the online students in this paper was almost 23 years, considerably younger than the average age of 28 in Keri's sample.

Table 2 (Appendix) indicates the final grade averages by gender for the combined sample and for both types of instruction separately.

Although the difference was not significant, in the entire sample the average score for the women was higher than the average score for the men, a result which is contrary to most previous research. The women had a higher average than the men in the lecture classes, but the men had higher averages online. The women did better in the lecture sections compared to the online. The opposite was true for the men, who scored higher online than in the lecture classes. None of the differences based on gender were significant, however. It is interesting to note that the mix between men and women in the entire sample is balanced, 51 percent women and 49 percent men. However, when the sample is divided into type of instruction, almost twice as many women, 67 percent, were enrolled in the online classes as men, 33 percent. The differences in proportions between the entire sample and the online classes were significant at the 0.062 level. Since there were only 15 men in the online portion of the sample, their average score is most likely not representative of the performance of men in general in online courses.

Both minorities and non-minorities had higher averages in the lecture than in the online classes, but the difference was not significant. The differences between minority and non-

minority performance in the combined sample and in each type of instruction were significant, with non-minorities having higher averages in each case. The gap was wider in the online classes where non-minorities averaged 9.29 points higher than the minority students. This supports the findings of Figlio, Rush, and Yin (2010) who found that minority students did not perform as well with online instruction as in traditional classes.

As a group, non-majors had higher averages online; however, majors had higher averages in class. These differences were not significant. In the lecture classes, the majors' average was higher, 76, compared to 72.81 for the non-majors, but the difference was not significant. For the online classes, the non-majors' average, 77.67, was significantly higher than the majors' average of 70.

To test the effect of student effort on performance, the authors of this paper divided the students based on GPA into three categories, approximately equal in number: low achievers, students in the lowest one-third of the sample with GPAs less than 2.45; medium achievers, with GPAs from 2.45 to 3.01; and the top one-third of the sample with GPAs above 3.01. Then they tested the performance of the 34 low achievers, those with GPAs of less than 2.45, against that of the 35 high achievers, students with GPAs of more than 3.01. Both groups performed slightly better in the lecture class compared to the online class, but the differences were not significant. However, for the sample as a whole and within each type of instruction, both lecture and online, the high achievers averages were significantly higher than the averages for the low achievers. In their research for principles of macroeconomics, Howsen and Lile (2008) found similar results for students with higher ACT scores.

To determine the effect of aptitude, the students were divided into three levels based on the ACT scores of the entire sample. The 38 students with ACT scores of 18 or less were in the low aptitude group. Students with ACT scores of 19 and 20 were in the middle group. The 32 students with ACT scores of 22 or more were classified as high aptitude. The scores of both low and high aptitude students were slightly higher in the online class, but the difference was not significant. Within the lecture classes, however, the high aptitude students scored 12.31 points higher than the low aptitude students, significant at the 0.001 level. In the online classes the difference between the high and low aptitude groups was larger, 13.44 points, significant at the 0.006 level.

The descriptive statistics revealed that although the online students did have higher average ACT scores, the difference was not significant. However, the online students were significantly older by an average of 2 years, and they had significantly higher GPAs. The tests of means for different student characteristics showed no significant differences for men and women. This research found significant differences between minority and non-minority students, between low and high achievers, and between low and high aptitude students in both the lecture and online instruction. These differences were larger in the online classes between the minority and non-minority students and the low and high aptitude students. The fact that the gap in scores was larger in the online classes may indicate that minorities and low aptitude students are not well-served by online classes.

SUMMARY AND CONCLUSIONS

The research revealed that for the combined sample, including both methods of instruction, non-minorities, high achievers, and high aptitude students had significantly higher average scores than minorities, low achievers, and low aptitude students. Although women and

non-majors had higher scores than men and business majors, the difference was not significant. With respect to the different methods of instruction, men, non-business majors, and both low and high aptitude students had scores that were slightly higher in the online sections than in the lecture sections. Women, business majors, minorities, non-minorities, and both low and high achievers had better scores in the lecture sections. None of the differences based on method of instruction was significant for any of the groups. However, when the differences in performance for each group within each method of instruction were compared, the authors found that in both lecture and online classes, non-minorities, high aptitude students, and high achievers significantly outperformed minorities, low aptitude students, and low achievers. In addition, the difference was significantly larger for the minorities in the online class, 9.29 points lower, compared to the lecture class. The difference between high and low aptitude was also larger, 13.44 points, in the online classes.

Based on minority versus non-minority status and aptitude levels, this study found that the difference between the lower and higher groups is larger in the online classes, perhaps implying that this method of instruction may widen the gap between the two groups. If this is the case, schools may need to evaluate the effectiveness of online classes considering the possibility that they may further widen the gap between the low and high aptitude and minority and non-minority students.

Citing research claiming that student performance in online courses is equal or better in quality than lecture courses, academic administrators have embraced online learning as a cost-saver equivalent, especially with the decreases in government funding for education. Although further testing on the impact of ethnicity, aptitude, and achievement levels should be conducted in other courses and at other universities before definite conclusions are drawn, this research in undergraduate principles of microeconomics suggests that the benefits of online education are not shared equally among all students. If this proves to be the case in other courses and at other institutions, then the substitution of online for lecture classes may not be justified.

REFERENCES

Allen, I. Elaine and Jeff Seaman. 2011. "Going the Distance: Online Education in the United States, 2011." Babson Survey Research Group. The Sloan Consortium.

Allen, I. Elaine & J. Seaman. 2010. "Class Differences: Online Education in the United States, 2010." Babson Survey Research Group. The Sloan Consortium.

Bennett, D., C. McCarty, S. Carter. 2011. "Teaching Graduate Economics Online vs. Traditional Classroom Instruction." *Journal for Economic Educators,* 11(2), 1-11.

Bennett, D., G. Padgham, C. McCarty and S. Carter. 2007. "Teaching Principles of Economics: Internet vs. Traditional Classroom Instruction." *Journal of Economics and Economic Education Research,* 8(1).

Brown, B. & C. Liedholm. 2002. Can Web Courses Replace the Classroom in Principles of Microeconomics? *American Economic Review, 92*(2), 444-448.

Calafiore, P., D Damianov. 2011. "The Effect of Time Spent Online on Student Achievement in Online Economics and Finance Courses." *The Journal of Economic Education*, 42(3), 209-223.

Coates, D. & B. Humphreys. 2003. "An Inventory of Learning at a Distance in Economics." *Social Science Computer Review.* 21(2): 196-207.

Damianov, D., L Kupczynski, P. Calafiore, E. Damianova, G. Soydemir, E. Gonzalez. 2009.

"Time Spent Online and Student Performance in Online Business Courses: A Multinomial Logit Analysis." *Journal of Economics and Finance Education,* 8(2): 11-22.

Figlio, D., M. Rush and L. Yin. 2010. "Is it Live or Is It Internet? Experimental Estimates of the Effects of Online Instruction on Student Learning." National Bureau of Economic Research Working Paper 16089, June 2010.

Howsen, R., S. Lile. 2008. "A Comparison of Course Delivery Methods: An Exercise in Experimental Economics." *Journal of Economics and Finance Education,* 7(1), 21-28.

Keri, G. 2003. "Relationships of Web-Based Economics Students' Learning Styles, Grades and Class Levels. *National Social Science Journal, 21*(1), 34-41.

McCarty, C., G. Padgham & D. Bennett. 2006. "Determinants of Student Achievement in Principles of Economics." *Journal for Economics Educators*, *6*(2), Fall 2006.

McGlone, J. 2011. "Adult Learning Styles and On-Line Educational Preference." *Research in Higher Education Journal,* 12.

Navarro, P. 2000. "Economics in the Cyberclassroom." *Journal of Economic Perspectives, 14*(2), 119-132.

Radford, A. and T. Weko. 2011. "Learning at a Distance: Undergraduate Enrollment in Distance Education Courses and Degree Programs, *Stats in Brief*, NCES 2012-154, National Center for Education Statistics.

Shoemaker, J. & P. Navarro. 2000. "Policy Issues in the Teaching of Economics in Cyberspace: Research Design, Course Design, and Research Results." *Contemporary Economic Policy, 18*(3), 359-366.

Tseng, K, C. Yuan, S. Chu, C Yuan. 2010. "Traditional versus Online Courses, Efforts, and Learning Performance." *The Journal of Human Resource and Adult Learning* 6(1): 115-121.

Wilson, D. and D Allen. 2011. "Success Rates of Online Versus Traditional College Students." *Research in Higher Education Journal,* 14, 4-12.

APPENDIX

TABLE 1: Descriptive Statistics by Course and Type of Instruction

	All Classes	Lecture	Online	Difference between means p-value
Final Average	74.61 (12.4)	74.47 (11.21)	74.78 (13.98)	0.901
GPA	2.74 (0.60)	2.63 (0.581)	2.87 (0.608)	0.047
ACT	20.18 (3.92)	19.89 (3.30)	20.61 (4.55)	0.362
Age	21.6 (3.74)	20.7 (3.14)	22.7 (4.11)	0.007
Number of Observations	101	55	46	

Values in parentheses are standard deviations.

TABLE 2: Final Averages by Gender and Type of Instruction

	All Classes	Lecture	Online	Difference between means lecture vs online p-value
Women	75.25 (12.97) n=52	77.33 (11.68) n=21	73.84 (13.78) n=31	0.345
Men	73.94 (11.9) n=49	72.71 (10.7) n=34	76.73 (14.23) n=15	0.279
Difference between means women vs men p-value	0.60	0.138	0.513	

Values in parentheses are standard deviations.

TABLE 3: Final Averages by Ethnicity and Type of Instruction

	All Classes	Lecture	Online	Difference between means lecture vs online p-value
Minority	68.48 (12.9) n=31	68.80 (9.59) n=19	67.92 (17.36) n=12	0.85
Non-minority	77.33 (11.27) n=70	77.44 (10.95) n=36	77.21 (11.73) n=34	0.93
Difference between means minority vs non-minority p-values	0.0008	0.0057	0.04	

TABLE 4: Averages by Major and Type of Instruction

	All Classes	Lecture	Online	Differences between means lecture vs online p-value
Non-Majors	75.26 (12.41) n=56	72.81 (10.5) n=26	77.67 (13.5) n=30	0.143
Majors	73.77 (12.8) n=45	76.01 (11.9) n=29	70.00 (13.7) n=16	0.177
Differences between means majors vs non-majors p-value	0.55	0.301	0.052	

TABLE 5: Averages by Level of Achievement and Type of Instruction

	All Classes	Lecture	Online	Differences between means lecture vs online p-value
Low Achievers	66.97 (10.68) n=34	67.27 (10.63) n=22	66.42 (11.22) n=12	0.87
High Achievers	81.97 (11.4) n=35	84 (8.03) n=14	80.62 (13.23) n=21	0.39
Differences between means low vs high achievers	0.00003	0.0001	0.003	

TABLE 6: Averages by Aptitude and Type of Instruction

	All Classes	Lecture	Online	Differences between means lecture vs online p-values
Low Aptitude	68.5 (11.6) n=38	68 (9.8) n=19	69 (13.5) n=19	0.80
High Aptitude	81.38 (11.62) n=32	80.31 (9.7) n=16	82.44 (13.5)	0.61
Differences between means low vs high aptitude p-values	0.0006	0.001	0.006	