TEACHING PRINCIPLES OF ECONOMICS: INTERNET VS. TRADITIONAL CLASSROOM INSTRUCTION

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ABSTRACT

Although still in its infancy, the use of the internet as a means to teach college courses, including economics, is growing. Previous research concerning the level of student learning in economics courses via the internet versus a traditional classroom has been scant and inconclusive.

This paper explores the factors that influence student performance in both principles of macroeconomics and principles of microeconomics and compares student achievement in courses taken in traditional classroom settings with those done via the internet. We provide a brief summary of the relevant literature, a description and statistical analysis of our data, and a discussion of our findings. Future ideas for research are noted.

INTRODUCTION

This paper seeks to determine how student performance in college principles of macroeconomics and microeconomics courses is affected when the course is taken via the internet rather than in a traditional classroom setting. Factors used to evaluate student performance are: the final average percentage grade for students completing principles of economics courses at our university during 2005, traditional versus online class structure, gender, age, GPA, ACT or SAT scores, and previously taken economics courses. From analysis of these variables, we will draw

conclusions that will help economics instructors and advisors to better meet the needs of students who have both internet and traditional classroom options available to them.

Our university, Jacksonville State University, began offering internet principles of economics courses in the fall of 1999. Based primarily on anecdotal evidence, where many of the pertinent professors had noted the immaturity and lack of self-discipline of our sophomores (those who usually take the principles courses), we hypothesized that those students registered for an internet economics course would perform worse that those in a traditional setting. The three economics professors who taught principles courses during 2005 participated in this study. The sample consisted of 498 students, with 406 from the traditional courses and 92 in the internet courses. The final course average grade, expressed as a percentage, was used to measure the student's learning.

Multiple choice tests are the primary means used to assess learning and determine grades for both the internet and traditional economics courses. When the same professor teaches both an internet and traditional course in a semester, the tests used in both classes are identical. Internet course tests are proctored by university-sanctioned educators. Internet students receive the same amount of time to complete the tests as those who are in the traditional courses.

A concise review of the literature on student achievement from web-based economics courses will be followed by a summary of the key characteristics of the students in the microeconomics and macroeconomics online and traditional classes. Next, we describe our methodology and the results. Last, we offer some possible explanations of our findings and propose some areas for future research.

LITERATURE REVIEW

Research on the performance of students taking internet, or online, principles of economics courses is relatively scarce to this point, probably due to the relative infancy of this course option. Navarro (2000) analyzed roughly 50 colleges which together had offered over 100 internet economics courses. He found that principles of microeconomics and macroeconomics accounted for about 70% of all economics internet courses, but that these accounted for only a very small percent of the total university economics courses offered. One source of concern among both college administrators and faculty was that the introduction of internet classes would impair the role of traditional classes. Navarro found otherwise: instead of

moving traditional students into internet courses, the internet courses have expanded the market scope and pool of students.

Online economics students tend to have certain characteristics. Brown and Liedholm (2002) found that those taking internet principles of microeconomics courses had higher ACT scores, more college experience, longer work schedules, and fewer reported study hours than traditional students. 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) noted that online economics students tend to be older, with the average age at 28.

The evidence on student's achievement and the pertinent factors affecting performance in internet versus traditional courses has been inconclusive. A significant number of the respondents to Navarro's (2000) survey stated that those students performing the worst in internet economics courses were those who lacked motivation and self-direction. Gabe Keri (2003) found that end-of-semester grades for online economics courses were positively correlated with years in college, with juniors performing much better than freshmen and with sensational learners (those who tend to be cavalier about work and need stimulation in their learning environment) scoring significantly worse in internet courses. Brown and Liedholm (2002) found that although women did worse in traditional microeconomics courses, they performed equally well with men in online courses. Overall, they found traditional students scored better than those taking the online course, the difference being that traditional students did significantly better on the most complex material, but the same as online students on the basic concepts. In their review of MBA Managerial Economics and Statistics courses, Anstine and Skidmore (2005) found that average test scores from online and traditional courses were similar, but that when they did an OLS regression, controlling for such factors as pretest scores, entrance exam scores, math background, GPA, gender, age, and reported study hours, online students scored significantly lower than did traditional students. However, when they did separate regressions for the two courses, the difference was significant only for the statistics class. Shoemaker and Navarro (2000) found that the internet principles of macroeconomics students scored significantly better than the traditional students. They also noted that gender, ethnicity, class level, and previous economics courses taken made no statistical difference.

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 in-class, student gender, age, GPA, ACT score, and whether the student had taken a previous economics course. Since most research has shown that men outperform women in principles of economics (Anderson, Benjamin, and Fuss1994; Ballard and Johnson 2005; Becker 1997; Dynan and Rouse 1997; Greene 1997, Ziegert 2000), we hypothesized that the final average for men would be higher than the final average for women. ACT is an indication of student ability. GPA measures how much effort a student has put into his or her studies. Age, GPA, ACT, and having taken a previous economics course are expected to have a positive effect on performance.

Descriptive statistics for the variables used in our analysis of online and in-class instruction are given in Table 1. The mean and standard deviation were calculated for the combined sample, and then for the sample separated into micro and macro classes. A t-test for differences in means was used to test for significant differences between the variables in the two different learning environments in each of the three groups.

A simple comparison between final averages in traditional (69.5) and online (69.3) instruction in all principles courses revealed no significant difference in the final average for the combined group of 498 principles students. When the large group was separated into micro and macro classes, we found significant differences between the students' final averages in the traditional and online classes. Students in the traditional micro classes had a final average of 67.1, compared to 60.2 for the students who took the course online. In the macro classes, however, the online students outperformed those in traditional classes. The online students' average (81.2) was significantly higher than the in-class students (71.6).

Both courses and types of instruction had a higher proportion of women than men. The micro online classes had a significantly higher percentage of women than the traditional classes. These proportions reflect the gender composition for the whole University, which is 59% female and 41% male. The students in the online classes were all significantly older than the students in the traditional classes. The average age in traditional classes was 22.4 years; in online classes, 26.7 years.

Table 1: Descriptive Statistics by Course and Type of Instruction

	Both Inclass	Both Online	Micro Inclass	Micro Online	Macro Inclass	Macro Online
Final average	69.5	69.3	67.1*	60.2*	71.6***	81.2***
	(21.2)	(27)	(22.4)	(31.7)	(19.7)	(11.2)
Men	43.8%	37%	45.7%*	32.7%*	42.2%	42.5%
Women	56.2%	63%	54.3%*	67.3%*	57.8%	57.5%
Age	22.4***	26.7***	22.3***	26.7***	22.5***	26.9***
	(4.4)	(8.5)	(4.8)	(8.2)	(4.0)	(9.0)
GPA	2.62	2.69	2.58	2.57	2.65*	2.86*
	(.66)	(.67)	(.68)	(.68)	(.65)	(.63)
ACT	20.1	20.6	20.3	20.5	20	20.7
	(4.0)	(3.7)	(3.9)	(4.2)	(3.5)	(3.7)
Previous Economics Course	39.7%	34.8%	46.3%	46.1%	51.8%*	37.5%*
Number of Observations	406	92	188	52	218	40

* significant at 10%
*** significant at 1%

GPA was significantly higher for online students in macro; however, it was 0.01 points lower for the online micro students. ACT was higher, but not significantly, for all online classes. A significantly higher percentage of students in the traditional classes in macro had had a previous economics course.

Table 2 contains summary statistics for the final grade average by gender for the micro and macro courses for both types of instruction.

Table 2: Final Averages by Gender and Type of Instruction				
	Micro Inclass	Micro Online	Macro Inclass	Macro Online
Women	69.8*	61.1	73.9**	81.5
	(18.4)	(30.3)	(17)	(10.6)
	n=102	n=35	n=126	n=23
Men	63.9	58.2	68.5	80.9
	(26.2)	(35.2)	(22.8)	(12.3)
	n=86	n=17	n=92	n=17
* Significant at 10% ** Significant at 5%				

Contrary to most previous research, we found that women outperformed men in both courses and in both types of instruction. Women's final averages were significantly higher than those of men in traditional classes of both micro and macro. In the online sections women's averages were higher, but the difference was not statistically significant.

The empirical model used in ordinary least squares estimation is:

GRADE = f(GPA, ACT, AGE, GEN, OL, PREV, MICRO, PROF)

The variables are defined as:

GRADE	Student's final grade average for the course
GPA	Student's overall grade point average
ACT	Student's score on the American College Test
AGE	Student's age
GEN	Dummy variable equal to1 if student is male.
OL	Dummy variable for type of instruction equal to1 if the class is online.
PREV	Dummy variable equal to 1 if student had a previous economics course.
MICRO	Dummy variable equal to 1 if the course is microeconomics.
PROF	Dummy variable for the different professors 1,2, and 3.

Regression results for the combined sample, including both micro and macro courses are in Table 3.

Table 3: Regression Results for All Principles Courses

Variable	Coefficient	p-value	VIF
Constant	11.52	0.61	
GPA	19.44	0.00	1.2
ACT	0.21	0.34	1.2
AGE	0.15	0.31	1.1
GEN	- 1.17	0.47	1.1
OL	- 5.33	0.06	2.1
PREV	0.62	0.71	1.1
MICRO	-13.59	0.00	3.1
PF1	13.34	0.00	2.5
PF2	9.73	0.01	4.7
$R^2 = 42.4\%$ n = 495			

GPA had a very significant positive coefficient. The dummy variable for micro was significant and negative, indicating that class averages were lower in micro, in general, than in macro. The dummy variable for online classes was negative and significant (6%). Indicator variables for professors 1 and 2 were positive and significant.

Regression results for the micro traditional and online classes are shown in Table 4.

GPA was positive and very significant for the micro classes. The coefficient for the online classes was negative and significant at 10 percent.

Regression results for macro are shown in Table 5.

Table 4: Regression Results for Micro			
Variable	Coefficient	p-value	VIF
Constant	11.76	0.22	
GPA	21.22	0.00	1.2
ACT	0.10	0.77	1.2
AGE	0.09	0.69	1.2
GEN	-2.19	0.42	1.1
OL	-5.98	0.10	1.4
PREV	-2.58	0.38	1.1
PF2	-3.70	0.22	1.3
R^2 = 39% n = 240			

Table 5: Regression Results for Macro			
Variable	Coefficient	p-value	VIF
Constant	25.15	0.00	
GPA	17.66	0.00	1.2
ACT	0.22	0.42	1.1
AGE	0.16	0.36	1.1
GEN	- 0.95	0.61	1.0
OL	- 4.17	0.28	2.4
PREV	3.05	0.09	1.0
PF3	-10.76	0.01	2.3
R^2 = 43.4% n = 258			

GPA was again positive and highly significant, and the dummy variable for one teacher, professor 3, was negative and significant. In the macro classes, having a previous economics course had a significant, positive effect.

In each of the three regressions, GPA was consistently positive and highly significant, indicating that student effort is an important determinant of performance in principles of economics. The indicator variable for the online classes was negative in all three regressions and significant for the combined group and for the micro classes. The coefficient for micro was negative and significant in the combined regression. Several of the indicator variables for the different professors were significant. The coefficient for professor 1 in micro was positive and significant and larger than the positive coefficient for professor 2. The coefficient for professor 3 in macro was negative and significant. This may be due to differences in types of tests given by the different teachers. Professor 3's tests were fill-in-the-blank and multiple choice, while professor 2's tests were multiple choice. Professor 1's tests were 60% multiple choice and 40% problems. Professor 3's students' scores may have been lower, because with fill-in-the-blank, there is no chance for partial credit. With professor 2's multiple choice questions, there is no chance for partial credit, however, there is a 25% chance of guessing the correct answer. Perhaps Professor 1's students had higher averages because they had the advantage of the possibility of partial credit on the problems.

SUMMARY AND CONCLUSIONS

At first glance, our results indicated no difference in students' performance in traditional and online classes for the entire sample. On further examination of the data separated by course, we found significant differences in student achievement in traditional and online classes. In both the simple descriptive statistics and the regressions we found that students performed better in micro in traditional classes. The average final grade for the in-class sections, 67.1, was significantly higher at the 10% level than the average for the online classes, 60.2. In the micro regression the indicator variable for the online classes (-5.976) predicts that online students score almost 6 points less than micro students in class. The difference was significant at the 10% level. This result is consistent with those of Brown and Liedholm (2002) who found that students in traditional micro courses scored better than those taking the course online.

Conversely, students in macro online course had final averages (81.2) significantly higher at the 1% level than students who took the course in a traditional

class (71.6). This difference was significant at the 1% level. Shoemaker and Navarro (2000) had similar results. The difference in performance between the two courses in the different environments may be due to a combination of factors. Because micro is more quantitative, it is more difficult for students who struggle with math. The method of course numbering at our university may also contribute to the higher macro averages. Although at JSU micro and macro may be taken in any order, students generally take micro first, perhaps because the course number is EC 221 and macro is EC 222. The indicator variable for having taken a previous economics course was positive and significant for the macro regression.

Contrary to most previous research (Anderson, Benjamin, and Fuss1994; Ballard and Johnson 2005; Becker 1997; Dynan and Rouse 1997; Greene 1997, Ziegert 2000), women outperformed men in both courses and both methods of instruction. The differences in final averages for women (73.9) and men (68.5) in the traditional macro classes were significant at the 5% level; in micro, the difference between women (69.8) and men (63.9) was significant at the 10% level. This result may be due to matching instructor and student gender. Research by Ballard and Johnson (2005), Jensen and Owen (2001), Dynan and Rouse (1997), and McCarty, Padgham, and Bennett (2006) suggests that matching student and teacher gender enhances learning. In our sample two of the three professors are female, so female students were more likely to match the gender of the professor, which may account for their higher scores.

Although the only significant difference in GPA was in the macro sections; the students in the online course had significantly higher GPAs than the in-class students. The coefficient of GPA was positive and highly significant in all of the regressions. This indicates that effort has an important impact on performance in economics. As Keri (2003) found, students in the online sections in our sample were significantly older than those in the traditional classes.

Our research represents a first attempt to quantitatively compare online with traditional instruction in economics classes at JSU. In order to control for as many variables as possible, analysis should be conducted for the same professor teaching the same course in the same semester with the same tests in the online and traditional classes. However, these restrictions applied at our university would limit sample size. In future research, other factors that might affect student learning should be examined. For example, math background, class rank, work schedules, ethnicity, income, and personality type may all have an impact on student performance.

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