TEACHING NOTE:

DOES THE USE OF COMPUTER-GENERATED SLIDE PRESENTATIONS IN THE CLASSROOM AFFECT STUDENT PERFORMANCE AND INTEREST?

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INTRODUCTION

Due to recent advances in technology, the use of computer-assisted teaching methods in the classroom is a prominent topic in higher education research. Many professors are replacing the more traditional form of teaching, chalk-and-talk, with computer-assisted presentations. The innovations available to professors today include the use of computer-generated slide presentations, computerized tutorials, the Internet, or some combination of two or more of these. Previously, switching from chalk-and-talk to a computer-assisted method required the instructor to spend time preparing slide presentations, finding websites appropriate to the class, and in some cases totally reorganizing the course. In recent years, as more and more textbooks are packaged with computer-generated slides and have websites available for students with links to appropriate sources for additional information or real world applications, these new methods are becoming easier and less costly to use.

Now that the use of computer-assisted instruction is more readily available to the professor, one question remains: how does it affect the student? This paper addresses this issue empirically. To isolate the effects of the many new innovative methods of teaching, this paper concentrates on only one of the innovations: computer-generated slide presentations in the classroom. Four sections of introductory economics taught at one institution were used to conduct the experiment—two taught with no computer-assisted presentations and two taught with the aid of computer-generated slide presentations. The data collected from these classes are used to test whether using slide presentations affects students' performance in the class, students' attitudes towards economics, and/or students' evaluation of the instructor. The experiments, the

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methodologies used to test the hypotheses that there are no effects, and the results of these tests will be discussed in detail following a discussion of the recent research on computer-assisted instruction.

REVIEW OF THE LITERATURE

Recent technological innovations have made it possible for non-technical individuals to make computerized multimedia presentations. These multimedia presentations include the use of color, graphics, sound, and animation [Klinger and Siegel, 1996, 46]. Because computerized multimedia presentations can attract and hold the attention of the viewer, they can be effective instructional tools [Liu and Beamer, 1997, 51]. Pedagogically, computerized multimedia presentations are useful teaching tools because they engage the greatest number of the viewers' senses and spark the viewer's imagination [Liu and Beamer, 1997, 53]. The market leader in computerized multimedia presentations is PowerPoint, part of the Microsoft Office productivity suite. Internationally, PowerPoint controls ninety-three percent of the presentation software market [Lindstrom, 1998, 2]. Using Microsoft technology, some faculty members have attempted to move to a paperless classroom [Navarro, 1998].

Unfortunately, results from a national survey show that most academic economists have not kept pace with the changing instructional methods in higher education [Becker and Watts, 1998, 2]. Teaching economists appear to be lagging behind other disciplines in implementing instructional innovations that engage students more actively in the learning process [Katz and Becker, 1999, 194]. Across different types of courses and different types of schools, half of all instructors spent eighty-three percent or more of their class time in economics courses formally lecturing [Becker and Watts, 1998, 4]. Yet a growing amount of research shows that innovative and active-learning approaches are, at least anecdotally, preferred by students [Becker and Watts, 1998, 7]. Using computer technology in the classroom falls into this category of new instructional methods.

In the recent past, a growing body of literature specifically discusses the use of computers and computerized multimedia presentations in the teaching of economics. As early as 1991, O'Donnell [1991] presented a computerized tutorial to assist in the teaching of a history of economic ideas class. Monson [1995] discusses his experiences utilizing a hypermedia presentation system in an agricultural economics department. Various textbook publishers also include computerized supplements with their introductory economics texts [*Reviews of Economics Software*]. The majority of the economic literature on computer-assisted instruction, however, has focused on using the Internet for teaching. Manning [1996] reports on the successful use of e-mail to increase interaction, discussion, and participation in an introductory economics class. Leuthold [1998] argues for the use of a class homepage as a useful complement to the traditional format of teaching economics. Wright [1999] presents anecdotal evidence from former students and career counselors, that electronic writing assignments have helped his students prepare for the basic collection, analysis, and presentation of data that they are asked to perform following their graduation.

Also using subjective and anecdotal information, Greenlaw [1999] discusses an experiment using a groupware application in an undergraduate economics class. Groupware is the generic term given to network-based software designed to facilitate group activities such as discussions, debates, joint papers, and team projects [*ibid.*, 33]. Distance-learning programs are an example of groupware applications [*ibid.*, 37]. Groupware was developed to allow students to reallocate their time devoted to study. It allows the student to determine the time and place at which he or she studies. Anywhere or at any time a student has access to a campus computer network, the student may be working on class material [*ibid.*, 38]. Given the anecdotal nature of the information developed in the Greenlaw [*ibid.*, 40] study, the only definitive conclusions that may be drawn is the fact that with the use of groupware the instructor's initial workload will be higher as new course materials are prepared.

Navarro and Shoemaker [2000a, 15; 2000b, 359] ask the question, can students learn economics in cyberspace (through distance education) as well as, or better than, in a traditional classroom? Their research was conducted in two studies at the University of California. Navarro and Shoemaker found that students in cyberlearning environments were as happy or happier with their course experience as those students learning economics in a traditional classroom. The only areas where students expressed displeasure with cyberlearning were in (1) student-to-student interactions and (2) technical difficulty caused by computer problems [Navarro and Shoemaker, 2000b, 364]. In general, Navarro and Shoemaker [2000a, 28] argue that cyberlearning should use multimedia lectures that simulate the classroom experience, provide an active threaded electronic bulletin board, have online discussion groups, and provide electronic testing with instant feedback.

Daniel [1999, 163] argues that the World Wide Web represents one of the greatest changes in structure and distribution of computer-assisted instructional software to date. He states that computer-assisted instruction should coach students interactively through the stages of a problem until the solution to the problem can be fully understood. Software should provide open and flexible tools for experimenting with economic concepts. He stresses that the computer is an ideal medium for presenting graphical models because it can build models sequentially while providing a written or audio explanation of the process [*ibid.*, 166]. In his article, he describes one very specific Web-based software package that may be used in the teaching of microeconomics. The software he describes is entitled oo_Micro!. The title of the software stands for object-oriented microeconomics [*ibid.*, 168].

One of the best articles in the economic literature involving computer-assisted teaching is by Agarwal and Day [1998]. They report the results from classroom experiments conducted at the University of Central Florida that tested the influence of Internet use on economic education. What is unique about the article and the experiment conducted is that the authors provide statistical evidence of student performance to test whether these measures are affected by the use of the Internet [Agarwal and Day, 1998, 100]. Their analysis and testing is actually three-fold in nature. They follow the model developed in the literature that suggests that Internet use may have an impact on economic education in multiple areas: (1) student learning and retention of concepts, (2) student perceptions of instructor effectiveness, and (3) attitudes

toward economics. Their experiments were conducted with two graduate microeconomics classes and two undergraduate macroeconomics classes. For both the microeconomics and macroeconomics classes, one section acted as a test group and the other section acted as a control group. The distinction between test and control group was randomly determined. In addition, student characteristics such as age, grade point average, gender, and race were also considered [*ibid.*, 101].

The Internet tools used by Agarwal and Day included a subset of core tools available on the Internet: e-mail, discussion lists, World Wide Web information access, and World Wide Web data retrieval [*ibid.*, 102]. In terms of results, Internet use was a significant variable with respect to student knowledge of economics as measured by the Test of Understanding College Economics III (TUCE III). Alternatively, course grades (also a measure of student knowledge of economics) were little different between groups in a traditional class and those in an Internet-intensive course [*ibid.*, 103 and 106]. Using a standardized course evaluation developed by the State University of Florida System, teacher evaluations of effectiveness were higher for those students who had been part of a class that used the Internet in the instructional process [*ibid.*, 106-107]. Student attitudes toward economics were tested by Agarwal [*ibid.*, 104] using a pre- and post-course attitudes toward economics test developed by the National Council on Economic Education. In their experiments, Agarwal and Day found that Internet use did not seem to change undergraduate attitudes toward economics. Graduate students, however, showed improvements in their attitudes toward economics when they received instruction through the Internet as opposed to a more traditional format.

In a similar article, Hagen, Edwards, and Brown [1997] have considered the relationship between the use of classroom technology and students' satisfaction, participation, and performance. Though the courses considered for their study are not economics courses, the courses were in the related field of strategic management [Hagen, Edwards, and Brown, 1997, 59]. The authors examined three hypotheses specifically:

> H1: Students exposed to a certain technology (an overhead projector connected with computers and visual aids) in classroom presentations will report higher levels of satisfaction than those exposed to traditional lectures without the technology.
>
> H2: Students exposed to that technology in classroom presentations will report higher levels of participation than those exposed to traditional lectures without the technology.
>
> H3: Students exposed to that technology in classroom presentations will achieve higher levels of performance than those exposed to traditional lectures without the technology. [*ibid.*, 58-59]

The data generated by the authors support the three hypotheses [*ibid.*, 63]. The results indicate that the use of technology in classroom presentations positively affected the students' satisfaction, participation, and performance.

The summer 1999 issue of the *Journal of Economic Education* is devoted to a discussion of technology and the teaching of undergraduate economics. The papers in this issue were originally presented at a conference on "Advancing the Integration of New Technologies into the Undergraduate Teaching of Economics" held at the University of Pittsburgh in the spring of 1998 [Katz and Becker, 1999, 194]. The two most note-worthy articles are provided by Parks [1999] and Stone [1999]. Parks [1999, 200-209] recounts the successes and failures he has experienced in the last four years in a macroeconomics principles class that he teaches using computer-assisted instruction, including e-mail, Web pages, and PowerPoint presentations.

On a similar note, Stone makes suggestions for using multimedia instructional methods: "Another advantage of computer-based lecture notes is incorporation of active and collaborative learning exercises, which help in preventing student attention lag and in enhancing learning" [1999, 267-77]

The studies, both anecdotal and empirical, rarely find learnining declines when instructors use computer technology [Sosin, 1998, 121]. The World Wide Web is obviously useful for providing up-to-date economic information and data [*ibid.*, 124]. If technology is to be used in the classroom, however, it should be an integral part of the course without it requiring significant commitments of time by both students and faculty that subtract from the economics material presented [*ibid.*, 137].

METHODOLOGY AND RESULTS

Experiment

This study is based on four sections of introductory economics[1] taught at a small liberal arts college: two taught in the spring semester of 1999 and two taught in the fall semester of 1999. All four sections were taught by the same instructor, which eliminates the effect different instructors might have on student performance. The downside of this is that the results might depend on the teaching style of this particular instructor and therefore, the same experiment with a different instructor might yield different results. In addition, using only one instructor might lead to a selection bias if a particular type of student is attracted to this instructor's classes. The students in these sections, however, had no prior information about the method of teaching to be used before registering for the class. Each semester one of the sections was taught with the aid of slide presentations generated in PowerPoint, and the other section taught without PowerPoint to serve as the control group. The PowerPoint and control groups were approximately the same size: 35 and 34 students, respectively. Students were not allowed to change classes once the semester began. Only the students who completed the classes are included in the statistical analyses that follow. For the PowerPoint classes, a total of four students withdrew before the final exam, and for the control classes, a total of six students withdrew before the final exam. Excluding these students might bias the results on student performance because these students withdrew from the class due to low grades.

In the spring 1999 semester, the class that was exposed to PowerPoint met at 8:20 AM and the control group had class at 9:45 AM. These were reversed in the fall

TABLE 1
Student Characteristics in Control and PowerPoint Groups

Characteristic	Control Group Mean	SE	Powerpoint Group Mean	SE	P-value
ACT	25.23	0.6682	25.06	0.5739	0.9750
FEMALE	0.4412	0.0851	0.6571	0.0802	0.0718[a]
FRESHMAN	0.7353	0.0757	0.6286	0.0817	0.3422
HIGH SCHOOL ECONOMICS	0.7647	0.0727	0.8571	0.0592	0.3270

The p-value is the probability of a Type I Error when testing the hypothesis that the means or proportions of the control and PowerPoint groups are equal. a designates statistical significance at the 10 percent level

1999 semester: the PowerPoint class was taught at 9:45 AM and the control class was at 8:20 AM. Each class met for seventy-five minutes two days a week. The same textbook and exams were used in both the PowerPoint and control groups. The PowerPoint slides were developed by the instructor and followed the notes used in the control group. The slides included graphics, animation, and transitional sounds to make them attractive to the students. In addition to the PowerPoint slides, the instructor used the chalkboard to illustrate the graphical analyses.

Data on student characteristics that might affect performance, attitudes, or instructor evaluation were collected for both the control group and the PowerPoint group. These characteristics included ACT scores[2], gender, classification, and exposure to economics in high school. The means or proportions and standard errors of these characteristics for both groups as well as the p-value from a test for a difference in the average or proportions for these characteristics between groups are presented in Table 1. The students in the two groups appear to be homogeneous except in terms of the proportion female: the PowerPoint group had a larger percentage of women.

Measurement of the Effects on Students

We use three different measures to analyze how using PowerPoint in the classroom affects students. The first effect examined is student performance as measured by the student's grade in the class. The students' final grades are represented by the percentage of the points they received throughout the semester. These grades were based on three 100-point tests throughout the semester plus a 100-point final exam for a total of 400 points for all four sections. Individual characteristics are also included in the analysis to account for other variables that might affect student performance. The characteristics include ACT scores, gender, student classification, and previous exposure to economics as measured by whether the student had an economics class in high school.[3]

The second possible effect on students is how student attitudes towards economics changed during the course of the semester. Surveys developed by the National Council on Economic Education [Soper and Walstad, 1983] were administered the first day of class and again the last day of class. The survey includes fourteen questions concerning the student's attitude towards economics, six of which represent negative attitudes and the other eight positive attitudes towards economics. The responses are on a five-point Likert scale and the change in student attitudes are measured by the differences in the pre- and post-course survey responses.

The final possible effect of the PowerPoint presentations considered is the effect on student evaluations of the instructor. Student evaluations are done anonymously at the end of the semester. Students answer six questions that directly relate to the effectiveness of the instructor in teaching the course, which might be affected by a change in teaching method. The responses to these six questions are the focal point for determining if PowerPoint presentations affected student evaluation of the instructor. These responses are also recorded on a five-point Likert scale.

Empirical Tests and Results

The first hypothesis being testing is that the PowerPoint presentations do not affect student grades. To test this hypothesis, regression analysis is used with the student's grade as the dependent variable, following the technique employed by Agarwal and Day [1998][4]. The student's grade is measured as the percentage of the total points the student received throughout the semester. The explanatory variables included in the regression include the following:[5]

ACT = the student's composite score on the ACT test.
POWERPOINT = 1 for the PowerPoint group, 0 for the control group.
FEMALE = gender variable equal to 1 for females, 0 for males.
FRESHMAN = student classification variable equal to 1 for freshmen, 0 otherwise.
HSECON = 1 if student had economics in high school, 0 otherwise.
8AM = 1 if the student was in 8:20 classes, 0 for those in 9:45 classes.

This model is fairly typical of the equations used in the economics education literature.[6] Previous research in this area indicates that *ACT* and *HSECON* would have positive effects and *FRESHMAN* would have a negative effect. The effect of gender is unpredictable. Studies using multiple choice questions as the testing mechanism have found that male students generally perform better while some evidence has been found that females do better on essay questions, [Siegfried, 1979; Lumsden and Scott, 1987; and Ferber, Birnbaum, and Green, 1983]. Because the exams used in this analysis were a combination of multiple choice and essays it is unclear which gender would be expected to perform better.

If using PowerPoint presentations leads to better student performance, the coefficient on *POWERPOINT* is expected to be positive. It is unknown how the time at which the class was taken affects student performance. It was included for two reasons: (1) Students who prefer later classes might have had to take the earlier class due to time conflicts in their schedule and they might not perform as well earlier in the morning.[7] Alternatively, students who enjoy the earlier classes might perform better at the earlier hour. (2) Absences are also typically more prevalent in the earlier

TABLE 2
Regression Results for Student Grades

Variable	Estimated Coefficient	P-value
Constant	32.26	0.0033[a]
ACT	1.71	0.0000[a]
POWERPOINT	0.66	0.8165
FEMALE	3.65	0.2065
FRESHMAN	-0.17	0.9540
HSECON	-2.62	0.4846
8AM	-2.50	0.3630
R-squared	25.03	
F Statistic	4.78	0.0005[a]
Number of observations	69.00	

a. Statistically significant at the 1 percent level.

classes and this could affect student performance. Class attendance is not controlled for in any other way and this variable might help control for absences.

The results of this regression are in Table 2. *FRESHMAN*, *8AM*, and *HSECON* all have negative coefficients, but the coefficients are not significant. *ACT*, *FEMALE*, and *POWERPOINT* have positive effects, but *ACT* is the only significant variable. Thus, using PowerPoint presentations in class has no effect on student performance for these data.

The second set of hypotheses to be tested are that the use of PowerPoint presentations have no effects on student attitudes toward economics as measured by the responses on the administered surveys. The responses on the pre- and post-course surveys were used to measure the change in a student's attitudes over the course of the semester. Two-tailed t-tests for the difference in the average change are conducted to test the hypothesis that the average change in attitudes is the same for both groups. The results of these t-tests for all fourteen questions are presented in Table 3.

If the PowerPoint group's attitudes improved more than the control group's attitudes, the differences should be positive for the statements that reflect positive attitudes towards economics and negative for the statements that reflect negative attitudes. This is true for only six of the fourteen statements and when it is true the difference is not significant. In only one case is there a significant difference and in that case, the statement "I would be willing to attend a lecture by an economist," the change in attitude is greater for the control group than for the PowerPoint group. This means the average response of the students in the control group increased during the course of the semester more than did the average response for the students in the PowerPoint group. So it appears that the use PowerPoint presentations does not improve student attitudes about economics.

The last set of hypotheses to be tested concerns the differences between the PowerPoint group and the control group in terms of instructor evaluations by the students. These tests were conducted for the fall 1999 sections only because instructor evaluations were not available for spring 1999. The number of observations is

TABLE 3
Changes in Attitudes towards Economics

Statement	Difference	P-value
POSITIVE STATEMENTS		
I enjoy reading articles about economic topics.	0.1765	0.4054
Economics is easy for me to understand.	-0.1571	0.5564
I enjoy economics.	0.2092	0.4203
On occasion I read an unassigned book in economics.	-0.2277	0.1712
I would be willing to attend a lecture by an economist.	-0.3445	0.0387[a]
Economics is one of my favorite subjects.	0.0059	0.9814
I use economic concepts to analyze situations.	0.0605	0.8138
Economics is practical.	-0.0235	0.9078
NEGATIVE STATEMENTS		
I hate economics.	-0.0067	0.9774
Economics is dull.	-0.1201	0.6221
Studying economics is a waste of time.	0.1168	0.2069
Economics is one of my most dreaded subjects.	0.1370	0.5385
Economics is a very difficult subject for me.	0.0748	0.7717
Economic ideas are dumb.	0.0252	0.9046

These differences refer to the differences in the change of the mean attitude between the PowerPoint group and the control group. Difference = [(postmean for PowerPoint group - premean for Powerpoint group) - (postmean for control group - premean for control group)]. The responses are on a scale of 1 to 5 with 1= strongly disagree and 5 = strongly agree. For the positive statements, a positive difference implies that the PowerPoint group had a greater change in their attitude toward economics. For the negative statements, a negative difference implies that the PowerPoint group had a greater change in their attitude toward economics. a designates a statistical significant at the 5 percent level.

therefore smaller for this test than for the other tests. There are 32 total observations as opposed to 69 observations in the two previous tests, with 11 in the control group and 21 in the PowerPoint group. The hypotheses being tested are that there are no differences in the average rating of the instructor between the two groups for each of the six questions directly pertaining the effectiveness of the instructor. The results of the t-tests used to test for these differences are presented in Table 4. The difference in the average rating would be positive if the students in the PowerPoint group rated the instructor higher than the students in the control group and negative if the opposite is true. For four of the six statements the difference is positive, for the other two it is negative, but in none of the six cases is the difference statistically significant implying that the use of PowerPoint presentations has no significant effect on student evaluations of the instructor.

CONCLUSIONS

Technological innovations have made it easier and less time-consuming for instructors to incorporate computer-assisted methods into their classes. Anecdotal evidence and some empirical evidence suggests that computer-assisted methods improve student learning and interest. This paper empirically addresses the question of what

TABLE 4
Students Evaluation of Instructor

Statement	Difference	P-value
1. The instructor was well prepared for class and used class time well.	0.0390	0.8196
2. The instructor presented the course material and answered in a manner that was very clear and understandable.	0.1515	0.7279
3. The instructor was enthusiastic about the subject.	0.1429	0.7152
4. The instructor cared whether or not the students learned the material.	-0.1255	0.7311
5. Overall the content of the course was: excellent; good, satisfactory; poor; very poor.	-0.0390	0.9116
6. Overall the teaching effectiveness of this instructor was: excellent; good; satisfactory; poor, very poor.	0.1472	0.6889

The responses for the statements 1 through 4 were on a scale of 1 = strongly disagree to 5 = strongly agree. The responses for statements 5 and 6 were on a scale of 1 = very poor to 5 = excellent. The differences represent the differences in the means calculated as the PowerPoint group mean minus the control group mean. A positive difference implies the PowerPoint group had a higher mean rating than the control group.

effect the introduction of just one of these computer-assisted methods, the use of PowerPoint presentations, has on the students in an introductory economics class. We found that it does not affect student performance, student attitudes towards economics, or student evaluations of the instructor.

The possible reasons for a lack of significant effects are varied. One reason is that the mere addition of PowerPoint presentations does not significantly change the course from the student's viewpoint; it merely supplements the traditional method of chalk-and-talk. Another reason for no effect, or argument why the use PowerPoint presentations might actually lower student performance, is that students tend to think that the material not presented on a slide is not important, so they tend to take notes only from the slides and not from additional information given during the lectures by the instructor. In this case the students might tune out the instructor after they have copied the information from the slides which might also make the class more boring to the student since they feel they do not have to listen as closely.

These results may also be specific to the use of computer-generated slides by this particular professor or for students at this particular institution. Another professor might be more effective using PowerPoint slide presentations. There may be techniques that would improve the effect of the use of slides in the classroom, such as making the presentations more spontaneous and interactive. Since the institution at which this study was performed is a small liberal arts school where classes are typically small and students receive one-on-one attention, the method of teaching might not be as significant as in situations where the teacher-to-student ratio is higher. The college also has a very small minority enrollment which is why no control variable for ethnicity is included and no conclusions can be made about its role. This study only looks at the use of computer-generated slides in introductory-level economics classes and therefore these results do not necessarily imply that the method would not be

beneficial in other types of classes such as upper division courses. Further studies using a variety of professors and classes across varied institutions are needed to draw these implications.

These results certainly cannot be applied to all forms of computer-assisted technology in the classroom. Similar experiments should be conducted at other institutions to determine if adding other computer-assisted methods enhances student performance or interest in the class. Additional experiments and tests can be applied to the Introductory Economics course to determine if other innovations, such as the use of e-mail to increase interaction and discussion and the use of the Internet and the World Wide Web to explore real-world applications and data retrievals, affect student performance as was done by Agarwal and Day [1998] for courses in graduate microeconomics and undergraduate macroeconomics.

NOTES

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1. Introductory Economics, ECON 151, is a one-semester course that combines microeconomic and macroeconomic principles.
2. The ACT score is the student's score on the American College Testing assessment instrument prepared by the American College Testing Program. In the literature, both student GPA and scores on standardized tests (ACT or SAT- the Scholastic Aptitude Test) are used as measures of student ability. For this sample, ACT scores were used instead of GPA since some of the students were first-semester students. A few students had not taken the ACT but had taken the SAT. In these cases, the SAT scores were converted to ACT scores using the conversion chart on page 35 of the *Handbook for the SAT® Program* [1998].
3. High school exposure to economics was self-reported by the students.
4. As an alternative methodology, Navarro and Shoemaker [2000a] use t-tests on the mean final score differentials of their two student groups, traditional classroom students and cyberlearners. To address any concerns regarding an omitted variable bias created by looking only at a test of means, the authors used a two-way analysis of variance test to analyze the effects of the background characteristics mentioned above. They found no statistical difference between student groups when they controlled for various background characteristics [Navarro and Shoemaker, 2000a, 23]. In their study, cyberlearners were found to have a slightly higher grade point average so the authors also used an analysis of covariance test to determine if the higher performance of this group could be explained by such things as student grade point average [Navarro and Shoemaker, 2000b, 363]. It could not explain any differences.
5. Other variables included in the original estimations were a variable for whether the students had previously enrolled in ECON 151 and either failed or withdrew before the end of the semester, a variable for whether the students had previously taken an Introduction to Business course, and a variable for whether the students had previously taken a lower-level economics course offered at the college, Economics of Social Issues. None of these were significant and omitting them increased the adjusted R-squared and did not significantly affect the other estimated coefficients. To increase the number of degrees of freedom these variables were omitted from the estimation presented. The insignificant results for the economics classes might be due to the fact that there were not enough subjects who had previously taken either ECON 151 or the Economics of Social Issues.
6. See Manahan [1983], Ferber, Birnbaum, and Green [1983], Watts and Lynch [1989] for examples.
7. Both semesters, the number enrolled in the 8:20 section is smaller than the number enrolled in the section taught at 9:45 which might indicate that students prefer the later class time.

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