

The Impact of PowerPoint on Student Performance, Course Evaluations, and Student Preferences in Economics Courses: An Experiment at Three Institutions

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Paper presented at the annual meetings
of the Allied Social Science Association
January 5-7, 2007
Chicago, Illinois

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Abstract: This study examines the impact of PowerPoint on student performance, course evaluations, and student preferences in economics courses. Professors from three different colleges each taught two sections of a course. PowerPoint was used in one of the two sections and a more traditional “chalk and talk” method was used in the other. Using regression analysis, the results showed that PowerPoint did not have an impact on grades when controlling for absences, hours of study, previous high school and college economics courses, math SAT scores, learning styles, and gender. Although the majority of students expressed a preference for PowerPoint over more traditional teaching methods, the effect on student course evaluations is mixed. At two institutions students indicated that they thought the professor was better prepared for the course in the section taught with PowerPoint. At the third institution the course taught without PowerPoint received a higher rating overall and students were more likely to recommend the course.

Key words: PowerPoint, teaching undergraduate economics
JEL codes: A20, A22

Introduction

Over the past ten years, the use of technology in college courses has increased dramatically.¹ One form of this technology is software that generates slides for projection of course material. While there are several presentation packages on the market, PowerPoint is the most common. Although PowerPoint was initially considered cutting edge technology for use in the classroom, many faculty members, administrators, and students now feel that PowerPoint should be used less frequently because it is too passive. For example, Creed (1997) argues that the use of computer-based presentations is too teacher focused. Kask (n.d.) and Parks (1999) suggest that computer-based presentations put some students to sleep in larger auditoriums where the lights have to be dimmed. Furthermore, students may be less inclined to come to class if the lecture notes are provided. Others, however, feel that PowerPoint offers the ability to engage students more fully. For example, Stone (1999) argues that classroom discussion is improved with computer-based presentations because discussion questions can be projected as part of the presentation and students’ names and comments can be typed into the presentation as they respond. These responses can then be posted or printed for all students. He also discusses

¹ A good summary of the expanded role of technology in economics classes may be found in Goffe and Sosin (2005).

writing exercises and experiments that can be facilitated by incorporating them into the presentations.

Because of the controversy about PowerPoint and the increase in its use, some studies have attempted to measure the impact of computer-generated presentations on student performance. Overall, the results have been mixed. In some cases, PowerPoint was shown to have no effect on student performance (Daniels, 1999; Rankin and Hoaas, 2001), while others found that it enhances performance (Hagen *et al.*, 1997; Kask, 2000; Lowry, 1999; Mantei, 2000; Susskind, 2005; Wilmoth and Wybraniec, 1998), and one study found that it had a negative impact (Sosin *et al.*, 2004). This variation in results may be explained by the different methods used in the studies, the control variables incorporated in the analysis, and the different disciplines examined in the studies. Two studies, for example, found both positive and insignificant effects when examining different courses or different methods to test PowerPoint (Kunkel, 2004; Szabo and Hastings, 2000). In addition to the variation due to the courses or methods, all of the studies, with the exception of the Sosin *et al.* study, examined the results from the courses taught by one professor at one institution. This can create a bias since student performance may depend on the teaching style used by a particular professor or certain types of students may choose a particular professor. The study conducted by Sosin *et al.* used professors at multiple institutions, but the professors did not teach both with and without technology, again creating a bias since student performance may depend on teaching and learning styles.

This study attempts to address some of the issues identified above by: 1) conducting an experiment at three different colleges with one professor from each college; 2) examining only the courses within the economics discipline; and 3) using the same method and control variables for the three experiments. In particular, one professor at each of the three colleges taught one course without PowerPoint and a separate section of the same course with PowerPoint during the same semester. Since a single instructor teaches the same content and uses the same assignments and exams in both the PowerPoint and non-PowerPoint sections of each course, a natural experiment is created that makes it possible to separate out the effect of the use of PowerPoint from other differences in instructor and course characteristics.² Students were also asked about their preferences regarding PowerPoint versus the more traditional “chalk and talk” method of teaching. Finally, this study examines the impact of PowerPoint on student evaluations of the course.

The paper begins with a literature review of previous studies that have examined the impact of PowerPoint on student performance and student preferences related to PowerPoint. This is followed by the methodology and empirical results of this study. The authors’ views of the advantages and disadvantages of using PowerPoint are then presented followed by conclusions.

² A similar methodology was used by Coates *et al.* (2004) to compare the effects on student performance of distance learning and face-to-face instruction. In the Coates *et al.* study, student self-selection had to be taken into account since students voluntarily selected whether to enroll in a distance learning or face-to-face course. In the current study, a natural experiment existed since students were not aware of the instructional methodology that would be used in their classes.

Literature review

Studies that examine the impact of PowerPoint (or other software presentation packages) on student performance generally follow one of four methods listed below.³ In the first three cases, the same professor teaches when more than one course is involved and student grades are used to examine the impact of PowerPoint.⁴ In the fourth case, data are collected on student performance from a variety of classes offered by different instructors using a variety of alternative pedagogical approaches at different institutions.

- 1) Within one course, some of the lectures are presented with PowerPoint and some are presented without PowerPoint.
- 2) Two sections of the same course are taught at least one semester apart. The first time it is taught without PowerPoint and the second time it is taught with PowerPoint.
- 3) Two sections of the same course are taught during the same semester. One section is taught with PowerPoint and one is taught without PowerPoint.
- 4) Data are collected concerning the characteristics of a number of equivalent classes offered by different instructors, and the effectiveness of alternative instructional methods is measured by the value added on a standardized measurement instrument (such as the *Test of Understanding in College Economics*).

The first method, teaching part of one course with PowerPoint and another part of the same course without PowerPoint, has the advantage of testing PowerPoint on the same set of students. The disadvantage, however, is that student exam scores used to test the impact of PowerPoint are based on different material. It is therefore impossible to determine if any difference in grades is due to the presentation style or the level of difficulty of the material. The second method also has advantages and disadvantages. Teaching one course with PowerPoint and one without PowerPoint allows the instructor to compare student tests on the same material. Teaching the two courses one semester apart, however, could lead to a bias if the professor improves the more recent course or does not emphasize the same material. Furthermore, experiments where a course is taught without PowerPoint during one semester and with PowerPoint during a subsequent semester may reflect situations where PowerPoint is being used for the first time by a professor in the later semester. This also creates a bias since appropriate use of PowerPoint is a skill that is developed over time. The third method, teaching two courses in the same semester with and without PowerPoint, is the best method since a comparison can be made of student exam scores on the same material and the professor can be sure to present and emphasize the same material in each class. Finally, the last method offers the ability to examine technology at multiple institutions, but the professors in this study did not teach courses both

³ Several studies reviewed in this section refer to “computer-generated slides” or “computer-aided presentations” rather than PowerPoint. Because the authors did not indicate which software package was used to generate slides, the term “PowerPoint” is used interchangeably with other terms for computer-aided presentations.

⁴ In addition to the three methods listed, Hagen *et al.*, 1997, tested PowerPoint in a course where students presented the majority of the material by making presentations of articles to the class. They found a significant increase in grades in the course where students were required to use PowerPoint for their presentations. This study is not included in this paper as part of the literature review since we are only examining the impact of PowerPoint as presented by the professor in different courses.

with and without PowerPoint. It is therefore hard to determine if the differences in student performance are due to technology differences or differences in teaching styles. A description of the research using all four methods follows with the results summarized in Table 1.

Presenting lectures with and without PowerPoint in one course. Two studies examined the impact of computer-based presentations within one course. Susskind (2005) taught two “Introduction to Psychology” courses. Within these courses he taught half of the material with PowerPoint and half without PowerPoint in a counterbalanced order across classes. His results showed no significant difference in student performance as measured by grades.

Szabo and Hastings (2000) gave one lecture with overhead transparencies, one lecture with PowerPoint, and a third lecture with PowerPoint and handouts of the PowerPoint slides to the same group of students in a physical education course. One week after each lecture, students were given a mock test. They found no significant difference in grades between the two tests on lectures given with PowerPoint. The grades from the tests based on PowerPoint lectures, however, were significantly higher than the grades from the test on the lecture given with overhead transparencies.

In addition to teaching with and without PowerPoint to the same set of students in one course, Szabo and Hastings also presented lectures with and without PowerPoint in two different sections of the same course. In the first group, students were taught with PowerPoint in the first week and without PowerPoint in the second week. The second group of students was taught without PowerPoint in the first week and with PowerPoint in the second week. Again, students were given a mock test one week after each set of lectures. The results showed that both groups of students performed better during the first week.

Combined, these two studies have mixed results when teaching the same set of students with and without PowerPoint. Furthermore, the material on the tests differed within each course so it is difficult to determine if PowerPoint or the level of difficulty of the material affected the grades.

Teaching without PowerPoint in one semester and with PowerPoint in a subsequent semester. A review of the literature revealed seven studies that examined the effect of computer-generated slides by teaching first without PowerPoint in one semester and with PowerPoint in a later semester. Again, the results were mixed. Three studies showed no effect on student performance (Ahmed, 1998; Daniels 1999; Szabo and Hastings, 2000), three studies showed a positive impact of PowerPoint (Lowry, 1999; Mantei, 2000; Wilmoth and Wybraniec, 1998), and one study showed that PowerPoint had a positive effect on the grades of female students only (Kask, n.d.). Again, these differences may reflect the discipline or the control variables used in the study.

In the case of no effect on grades, Ahmed (1998) gave one lecture with traditional overhead transparencies that lasted one hour and twenty minutes as part of a teacher education program on drug education in schools. She then gave the same lecture in a later semester using PowerPoint. Six questions from the lecture were included on a test given to both sets of students. Comparing individual questions, Ahmed showed that the scores were higher on two

questions in the course taught with overhead transparencies and that the scores were higher on two questions in the course taught with PowerPoint. These differences were not tested for statistical significance.

Daniels (1999) taught two sections of “Principles of Macroeconomics” and two sections of “Intermediate Microeconomics.” Using ordinary least squares regression with the final grade as the dependent variable, she used math scholastic aptitude test (SAT) scores, absences, hours of study, learning differences, gender, and learning styles as her independent variables along with a binary variable for PowerPoint. Only math SAT scores, absences, and learning styles were significant.

Szabo and Hastings (2000) taught two sections of “Motor Learning.” The first four lectures were taught without PowerPoint in one semester and with PowerPoint in a later semester. The same test was then given to both sets of students. Comparing only the average test scores, there was no significant difference.

Unlike the previous studies that showed no impact of PowerPoint, Lowry (1999), Mantei (2000), and Wilmoth and Whybraniec (1998) showed a positive impact of PowerPoint on student performance. Lowry taught “Environmental Science” using overhead transparencies in 1995 and then again in 1996 and 1997 with PowerPoint. Comparing the average test scores, he found a statistically significant difference. Both of the courses taught with PowerPoint showed higher average test scores than the course taught with overheads.

Mantei taught ten sections of “Physical Geology” using a traditional method and later taught four sections of the same course using PowerPoint. He found a statistically significant increase in test scores when using PowerPoint. Although he did not use any control variables, he examined the average ACT scores and noted that they appeared to be similar among students exposed to both types of presentations.

Wilmoth and Wybraniec three sections of “Introductory Social Statistics” without PowerPoint and later taught three sections with PowerPoint. They found significantly higher final grades among students who were exposed to PowerPoint and a lower variance in grades. In particular, they found that there were fewer outliers on the lower end of the grade spectrum within the courses taught with PowerPoint.

Kask (n.d.) also found a positive impact of PowerPoint. Unlike the previous studies, however, the difference was only significant for female students. In her study, Kask taught 14 sections of “Principles of Microeconomics” over a four-year period. Eight of these sections were taught without PowerPoint between 1995 and 1997 and six were taught with PowerPoint between 1997 and 1998. During one semester in 1997, she taught classes using both methods. Her results do not indicate, however, if there was a significant difference in grades for the courses taught during the same semester. Kask used three dependent variables: 1) the final grade in the course, 2) the Test for Understanding College Economics (TUCE) score, and 3) the change in the TUCE score based on a pre-test taken on the first day of class. Her independent variables included level of effort, gender, age, grade point average, math pretest, pre-TUCE score, the type of classroom, and the time of day.

Teaching with and without PowerPoint in the same semester. Only one study examined the impact on student performance of computer-generated slides by teaching courses with and without them in the same semester. Rankin and Hoaas (1999) taught two sections of “Introduction to Economics” with computer-generated slides and two sections without them. Using American College Test (ACT) scores, gender, freshmen, high school economics, and the time of the class as control variables, they found no significant difference in grades in the different sections of the course.

Comparing outcomes across courses and instructors. Sosin *et al.* (2004) investigate the effect of alternative instructional methodologies on student performance using a sample of 67 sections of introductory economics courses, taught by 30 instructors at 15 institutions. The use of PowerPoint in introductory microeconomics and macroeconomics courses is found to reduce student performance by 2.467 questions out of 22 questions on the modified macroeconomics TUCE exam and by 3.515 questions on the microeconomics TUCE exam. Both results are significant at the 5% level.

While this study contains a large sample size, it is not possible to disentangle instructor-specific (or institution-specific) effects from the use of specific technologies. It is, for example, possible that younger and less experienced faculty members are more likely to use PowerPoint than older and more experienced faculty members. While each instructor in this study taught more than one class, instructors tend to use a similar instructional methodology in different sections of the same class.

Student preferences and impact on course evaluation. In addition to examining the impact of computer-generated slides on student performance, several studies also asked students about their perceptions of PowerPoint. In all of these studies, PowerPoint received positive reviews. For example, Atkins-Sayre *et al.* (1998) and Nowaczyk *et al.* (1998) reported that students found PowerPoint lectures easier to understand than traditional lectures. Similarly, Wilmoth and Wybraniec (1998) indicated that student comprehension improved in the courses taught with PowerPoint. Daniels (1999) found that three-quarters of the students in her study preferred PowerPoint to the chalkboard. Similarly Harknett and Cobane (1997) found that 80 percent of students found PowerPoint slides beneficial and that the visual emphasis helped them to recall material during exams. Hagen *et al.* (1997) reported better satisfaction and participation with the use of PowerPoint. Szabo and Hastings (2000) reported that 90 percent of students thought that PowerPoint is “more attention grabbing than the traditional method of lecturing.” Furthermore, 65 percent of students in the study said that PowerPoint motivated them to come to class and 72 percent of the students said they would like to see PowerPoint used in all courses.

Of all of the studies that examine student perceptions about PowerPoint, only two studies study examined the impact of PowerPoint on course evaluations. Rankin and Hoaas (2001) found no significant difference in the evaluation of the instructor or the course when examining six questions taken from student evaluation forms. Wilmoth and Wybraniec (1998), however, found several significant differences. In particular, the courses taught with PowerPoint received significantly higher scores for the instructor ability to simplify material and make learning easy. In addition, a significantly higher number of students reported that they would recommend the

course and take another course from the instructor among those that had taken the course with PowerPoint.

Methodology

As stated earlier, the mixed results from the literature review may reflect the different methods and control variables used to test PowerPoint, the different disciplines involved, or the fact that only one professor taught the course or courses in each experiment. This study addresses these issues by examining the impact of PowerPoint when used by three professors at three different institutions within the field of economics. Furthermore, the same method is used at each institution and the same control variables. Finally, all three professors in this study had at least five years of experience using PowerPoint in the classroom.

Table 2 shows the three institutions where the courses were taught, the name of the course, and the enrollment numbers. In all three cases, the same material was taught in all sections of the course and all extra activities were identical. For example, group exercises, quizzes, and films were repeated in all sections of the course. For the sections using PowerPoint, the slides were made available to students prior to the material being taught and most students brought the printed slides to class.

To measure the impact of PowerPoint on student performance, we used ordinary least squares regression with the final course grade as the dependent variable. Our independent variables included a binary variable for the courses taught with PowerPoint, math SAT scores, absences, the number of hours that students studied, the number of semesters of high school economics previously taken, the number of college-level economics courses previously taken, Myers-Briggs Type Indicators (MBTI), and gender. The math SAT scores were used as a proxy for the general level of ability in the class since all of the courses taught require a working knowledge of simple algebra and graphing capabilities. The Myers-Briggs Type Indicators were used as a proxy for learning styles. According to Myers and McCaulley (1985), students are classified as having a sensing (S) perception or an intuitive (N) perception. Students with an intuitive perception deal more easily with abstraction, symbols, and theory, while students with a sensing perception need to incorporate their senses more fully into their learning experience (Lawrence, 1993). Two other classifications used by the MBTI include thinking (T) versus feeling (F) and judging (J) versus perception (P). Thinking types make judgments in a logical and objective fashion, whereas feeling types tend to use personal values or subjective measures to judge their environment. In the feeling versus perception classification, judging types prefer order and organization in contrast to perceptive types who tend to be more flexible and spontaneous.

Using the MBTI, Keirsey and Bates (1984) combined the classifications into four different learning styles: SP, SJ, NT, and NF. SP types need hands-on experience and respond well to competition. SJ students prefer structure in the classroom and like clearly defined assignments with limited flexibility. NT Types are independent and do not respond well to group situation. They tend to grasp theoretical material quickly and do not need many examples to reinforce an idea. Finally, NF types enjoy interaction and cooperation. They do not enjoy

competition. Because PowerPoint incorporates a variety of presentation techniques and gives structure to the class, we would expect learning to be enhanced for certain personality types.

In order to test the impact on course evaluations, we chose four questions from course evaluations that were similar across the three institutions. The means from these questions were compared to determine if there was a statistically significant difference in responses across sections.

Student preferences regarding PowerPoint versus a more traditional chalk and talk method were collected by a survey that included both open and close-ended questions at the end of the semester. The results of these methods are discussed in the next section.

Results

The impact of PowerPoint on student performance. As illustrated in Table 3 and Table 3a, the use of PowerPoint did not have a significant effect on student grades. The student absences variable is the only variable significant at each institution. Math SAT scores were significant at both California State University (CSU) and Washington College (WC), but not at Oswego. The NF learning style was significant at WC only.

The impact of PowerPoint on student attendance. As discussed earlier, it is often suggested that students will not come to class if PowerPoint notes are available. At both CSU and WC, there was not a significant difference in the number of absences when comparing the courses taught with and without PowerPoint. At Oswego, however, there was a statistically significant difference. The number of absences in the PowerPoint course was 7.5 on average compared to 5.6 absences in the course taught without PowerPoint.

The impact of PowerPoint on course evaluations. As illustrated in Table 4, the effect of PowerPoint use on student course evaluations is mixed. At CSU and Oswego, there was a positive and significant increase in the evaluation of instructor preparation and the instructor's ability to present the material effectively. At WC, the instructor rating and the overall course rating was significantly higher in the class in which PowerPoint was not used.

Student preferences regarding PowerPoint versus chalk and talk. When asked about their preferences between PowerPoint and more traditional teaching methods, 76 percent of the students at CSU, 81 percent of the students at Oswego, and 59 percent of the students at WC preferred classes with PowerPoint.

For those students who had had at least one course with PowerPoint at the college level, they were asked to rate the effectiveness of presenting course material with PowerPoint on a scale of one to five with one being "not useful at all" and five being "extremely useful." On average, students rated the effectiveness of PowerPoint at 4.0 at CSU, 3.95 at Oswego, and 3.48 at WC.

Discussion

For each instructor that participated in the study, it was the first time that he or she taught different sections of the same class both with and without PowerPoint during the same semester. A number of qualitative impressions were apparent. Some of these favored the use of PowerPoint:

- Students spent less time taking notes in the section of the class in which PowerPoint was used. Most students brought copies of the PowerPoint slides to class and added their own annotations to them as needed. Providing notes to students in the form of PowerPoint slides ensures a more accurate and organized set of notes. This allows students to reflect on the material that is being discussed without devoting as much effort to an attempt to transcribe detailed notes. Some studies have shown that provision of lecture notes in addition to student notes leads to better performance and retention (Kiewra, 1985). Studies also show that separating note taking from listening can lead to better retention (Aiken, 1975).
- Because students spend less time taking notes, the instructor can cover more material or use the extra time to reinforce concepts through problem sets, class discussion, or review of newspaper articles relevant to class material.
- The use of PowerPoint makes it possible for the instructor to review material for tests or at the start of each class period exactly as covered earlier.
- Photos, video clips, and hyperlinks to current information on the internet can be added to the PowerPoint slides

Some of the qualitative impressions suggested negative effects from PowerPoint use:

- There was a tendency to cover more material in the class in which PowerPoint was used. Writing on a chalkboard or a whiteboard takes time and provides more natural pauses and delays in the presentation. This provides students with more time to reflect on material before discussion moves on to additional topics.
- Discussions tended to be somewhat more spontaneous, resulting in at least the appearance of more student engagement in the section of the class in which PowerPoint was not used.

In addition to the factors listed above, the effect of PowerPoint will also depend on how it is used. Placing too much information on a slide in small font sizes or using too many colors or font sizes can be difficult to read and distracting. As early users of PowerPoint we included much more detail on each PowerPoint slide. Later, we eliminated many of the facts presented on the slides and included more questions. This method fosters more student engagement since they must think about the questions presented and take notes to fill in the gaps. It also encourages students to attend class since all of the information is not available on the slides.

While there are clearly advantages in both teaching methods, the use of a tablet PC may combine the best of both worlds. It would allow professors to prepare notes that could be distributed to students prior to class and add more information during class by writing directly on the projected notes. This would then be available to distribute later and to review at the

beginning of each class or before tests. As for visual clarity, the tablet PC can change the professor's handwriting into type print immediately.

Conclusions

The results presented above indicate that the use of PowerPoint appears to have no significant effect on student class performance. While students strongly state that they prefer classes that use PowerPoint, this result does not seem to have a very substantial effect on student evaluations of either the instructor or the course (in fact, it seemed to lower this evaluation at WC).

Table 1: Literature Review of Effect of PowerPoint on Academic Performance

Author/Year	Discipline/Course	Method	Effect of PowerPoint on Grades	Control variables
Ahmed, 1998	School Drug Education Program	Courses taught without and with PowerPoint in subsequent semesters	No effect	None
Daniels, 1999	Principles of Macroeconomics; Intermediate Microeconomics	Courses taught without and with PowerPoint in subsequent semesters	No effect	Math SAT scores Absences Hours of study Learning differences Gender Myers-Briggs Type
Kask, 2000	Principles of Microeconomics	Courses taught without and with PowerPoint in subsequent semesters. 8 sections taught without PP; Later taught 8 sections with PP; one semester offered both	Enhances performance of female students. No effect on males	female, age, age squared, GAP, math pre test, pre TUCE, extra credit points, CAP, four quiz, cap*auditorium, auditorium, afternoon, night
Kunkel, 2004;	Substantive, descriptive course with a lot of memorization and theory-based course with abstract material applied to concrete examples	Unsure – waiting for full article	Positive in descriptive course. No effect in theoretical course.	Don't know – need full article; description from “teaching prof” waiting for full article for more details
Lowry, 1999	Environmental Science	Courses taught without and with PowerPoint in subsequent semesters	Positive	None
Mantei, 2000	Physical Geology	Courses taught without and with PowerPoint in subsequent semesters	Positive	Looked at means of ACT for both groups, but didn't use in regression; ACT scores were similar for both groups

Author/Year	Discipline/Course	Method	Effect of PowerPoint on Grades	Control variables
Rankin and Hoaas, 2001	Introduction to Economics	Courses taught with and without PowerPoint in same semester	No effect (according to Susskind)	
Sosin <i>et al.</i> , 2004	Introduction to Economics	Thirty instructors at 15 institutions taught with varying levels of technology.	Negative	Email materials, courseware, talking, hours on the web, office visits, high school calculus, college calculus, GPA, gender, hours at job, credit hours, class size, semester
Susskind, 2005	Introduction to Psychology	Lectures with and without PowerPoint in one course	No significant difference in performance	None
Szabo and Hastings, 2000	Physical Education	3 studies 1) Courses taught without and with PowerPoint in subsequent semesters 2) Lectures with and without PowerPoint in one course 3) 2 groups; 1 given PP week 1 and no PP week 2; second group given no PP week 1 and PP week 2	Study 1: no significant difference in grades Study 2: PP lectures had higher grades than overhead lecture, but no difference in PP or PP with notes Study 3: both groups did better in week 1	None
Wilmoth and Wybraniec, 1998	Social Statistics	Courses taught without and with PowerPoint in subsequent semesters	Positive	None

Table 2: Institutions, Courses, and Enrollment Numbers for Study

Institution	Course Title	Enrollment in Courses Taught with PowerPoint	Enrollment in Courses Taught without PowerPoint
California State University – Sacramento	Principles of Macroeconomics	46	49
State University of New York – Oswego	Money and Banking	39	36
Washington College	Principles of Macroeconomics	31	31

Table 3: Regression Results: Dependent Variable = Student Grades

Variable	CSU			SUNY-Oswego			WC		
	Coefficient		P-value	Coefficient		P-value	Coefficient		P-value
Constant	69.58	**	0.001	73.81	**	0.000	29.21	**	.026
PowerPoint (1=used PP)	-0.33		0.886	-0.42		0.896	-4.39		.229
Math SAT	0.027	**	0.002	0.14		0.557	0.07	**	.002
Absences	-2.90	**	0.001	-0.98	**	0.017	-1.45	**	.003
High school econ	2.52		0.38	-1.18		0.774	-1.14		.641
College econ	-2.75		0.297	-0.005		0.997	0.38		.918
Hours studied	-1.09		0.277	0.48		0.546	-0.02		.771
Gender (1=Female)	3.48		0.139	-2.92		0.379	-0.05		.988
Adj R-squared	0.426			0.05			.208		
F Statistic	5.88		0.0001	1.35		0.258	2.99		.011
Observations	47			43			54		

** Significant at the 5% level

Table 3a: Regression Results with Learning Styles
Dependent Variable = Student Grades

Variable	SUNY-Oswego		WC	
	Coefficient	P-value	Coefficient	P-value
Constant	78.28 **	0.000	24.41 **	0.101
PowerPoint (1=used PP)	0.01	0.943	-4.24	0.317
Math SAT	0.10	0.683	0.07 **	0.008
Absences	-0.88 **	0.039	-0.94	0.159
High school econ	-1.78	0.692	-2.22	0.422
College econ	-0.26	0.863	0.95	0.820
Hours studied	0.37	0.676	-0.04	0.528
Gender (1=Female)	-1.32	0.734	-2.87	0.472
SJ	-1.85	0.732	8.00	0.149
NT	-1.91	0.758	8.14	0.148
NF	-6.79	0.255	16.60 **	0.037
Adj R-squared	0.02		0.20	
F Statistic	1.07	0.413	2.15	.045
Observations	43		47	

**Significant at the 5 percent level

Table 4: Student Evaluation of Instructor and Course

Question	CSU		SUNY-Oswego		WC	
	Difference	P-value	Difference	P-value	Difference	P-value
1. Instructor was prepared for course	0.11	**	0.045		-0.16	0.172
2. Instructor explained material effectively	0.09		0.27		-0.28	0.171
3. I would recommend this instructor	0.08		0.33		-0.28	* 0.093
4. Overall, I rate the course	0.06		0.22		-0.35	* 0.066

The scale for each question was 1 = strongly disagree to 5 = strongly agree. The differences represent the mean in the PowerPoint group minus the mean in the non-PowerPoint group. A positive difference indicates a higher mean in the PowerPoint group

*Significant at the 5 percent level

**Significant at the 10 percent level

Table 5: Student Preferences

Statistics	CSU	SUNY-Oswego	WC
1. Percent of all courses taught with PP among courses taken by students in sample	26%	46%	31%
2. Percent of students who prefer courses taught with PP	76%	81%	59%
3. Rating of PowerPoint in this course used in the experiment on a scale of 1 to 5*	4.0	3.95	3.5
4. Rating of PowerPoint in all courses taken on a scale of 1 to 5**	4.2	4.02	3.4

*On the scale of 1 to 5, “1” is least effective and “5” is very effective.

**For question 4, students were asked to rate the effectiveness of PowerPoint in all of the courses that they had ever taken that used PowerPoint rather than just in the course in this experiment.

References

- Ahmed, C. 1998. "PowerPoint versus Traditional Overheads. Which is More Effective for Learning?" Paper presented at the South Dakota Association for Health, Physical Education and Recreation, Sioux Falls, South Dakota.
- Aiken, E.G. 1975. "Memory for a lecture: effects of notes, lecture rate, and informational density." *Journal of Educational Psychology*. Vol 67, 3, pp. 439-444.
- Atkins-Sayre, W. Hopkins, S., Mohundro, and W. Sayre. 1998. *Rewards and liabilities of presentation software as an ancillary tool: prison or paradise?* Corpus Christi, TX: Del Mar College.
- Creed, T. 1997. "Power Point, No! Cyberspace, Yes!" *The National Teaching and Learning Forum*. 6(3) pg. 5.
- Coates, D, B. R. Humphreys, J. Kane and M. Vachris. 2004. "'No Significant Distance' Between Face-to-Face and Online Instruction: Evidence from Principles of Economics." *Economics of Education Review*. Vol. 23. pp. 533-546.
- Goffe, W. and K. Sosin, Kim. 2005. "Teaching with Technology: May You Live in Interesting Times." *Journal of Economic Education*. Vol. 36. No. 3. pp. 278-291.
- Daniels, L. 1999. "Introducing Technology in the Classroom, PowerPoint as a First Step." *Journal of Computing in Higher Education*. Volume 10, No. 2, pp. 42-56.
- Hagen, A., K. Edwards, and A. Brown. 1997. "The Impact of Technology on Classroom Presentations: An Empirical Investigation. *The Journal of Private Enterprise*, Spring, Vol XII, No. 2, pp. 54-68.
- Harknett, R. J., and C. T. Cobane. 1997. "Introducing instructional technology to international relations. *Political Science and Politics*, 30, pp. 496-500.
- Kask, S. N.d. "Using Computer-aided presentations (CAP) in teaching: does it improve student learning?" in *Readings in Teaching and Learning*. Edited by Leslie Nunn, The CIBER Institute, Littleton CO. May 2004 page 113-124.
- Keirse, D. and M. Bates. 1984. *Please understand me: Character and temperament types*. 5th ed. Del Mar, CA: Prometheus Nemesis.
- Kiewra, K. 1985. "Providing the instructor's notes: an effective addition to student notetaking." *Educational Psychologist*. Vol 20, No. 1, pp. 33-39.
- Kunkel, K. R. 2004. "A research note assessing the benefit of presentation software in two different lecture courses." *Teaching Sociology*, 32 (April), pp. 188-196.

- Lawrence, G. 1993. *People types & tiger stripes*. Gainesville, FL: Center for Applications of Psychological Type, Inc.
- Lowry, R. B. 1999. "Electronic Presentation of Lectures – Effect Upon Students Performance." *University Chemistry Education*, 3 (1), pp. 18-21.
- Mantei, E. J. 2000. "Using internet class notes and PowerPoint in the physical geology lecture. Comparing the success of computer technology with traditional teaching techniques." *Journal of College Science Teaching*. Mar/Apr 2000; 29, 5, pp. 301-305.
- Myers, I. B. and M. H. McCaulley. *Manual: A guide to the development and use of the Myers-Briggs Type Indicator*. Palo Alto, CA: Consulting Psychologists Press, Inc.
- Norwaczky, R. H., L.T. Santos, and C. Patton. 1998. Student perception of multimedia in the undergraduate classroom. *International Journal of Instructional Media*. 25, pp. 367-382.
- Nye, P. A., T. J. Crooks, M. Powley, and G. Tripp. 2004. "Student note-taking related to university examination performance." *Higher Education*. Vol 13, No. 1, pp. 85-97.
- Parks, R. 1999. "Macro Principles, PowerPoint, and the Internet: Four Years of the Good, the Bad, and the Ugly." *Journal of Economic Education*. Vol. 30, No. 3. pp. 200-209.
- Rankin, E. and D. Hoaas. 2001. "Teaching Note: Does the Use of Computer-Generated Slide Presentations in the Classroom Affect Student Performance and Interest?" *Eastern Economic Journal*, Volume 27, No. 3, pp. 355-366.
- Sosin, K., B. J. Blecha, R. Agarwal, R. L. Bartlett and J. I. Daniel.. 2004. "Efficiency in the Use of Technology in Economic Education: Some Preliminary Results." *American Economic Review*. Vol. 94, No. 2. pp. 253-258.
- Stone, L. L. 1999. "Multimedia Instruction Methods." *Journal of Economic Education*. Summer 1999. Vol 30, No. 3, pp. 265-75.
- Suskind, J.E. 2005. "PowerPoint's power in the classroom: enhancing students' self-efficacy and attitudes?" *Computers and Education*. Vol 45 2005, pp. 203-215.
- Szabo, A. and N. Hastings. 2000. "Using IT in the undergraduate classroom: should we replace the blackboard with PowerPoint?" *Computers & Education*, 35, pp. 175-187.
- Wilmoth, J. and J. Wybraniec. 1998. "Profits and Pitfalls: Thoughts on using a laptop computer and presentation software to teach introductory social statistics." *Teaching Sociology*. Vol 26, July, pp. 166-178.