

**The Impact of Providing Web-based PowerPoint Slides as Study Guides in
Undergraduate Business Classes**

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Abstract

This study examines undergraduate business students' use of PowerPoint slides provided as a supplement to class attendance, textbook reading, and other traditional course resources. We survey students in four diverse (accounting, marketing, management, and information systems) lower-level undergraduate courses in which the instructor provided PowerPoint slides in addition to traditional course lectures and materials for student use. The effects of students' learning strategies were measured against class attendance, test performance, and overall course performance. Results indicate that there is little relationship between use of these resources and grades on exams or overall course grades, consistent with several prior studies. Further, we find that students do not view these supplemental on-line resources as a substitute for class attendance.

Key Words: educational technology, multimedia, business education, PowerPoint

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Introduction

With the emergence of technology-enabled instructional assistance, professors have a broad range of options to supplement the traditional classroom experience. Many routinely use the Blackboard platform or similar products, and integrate presentation software, such as Microsoft PowerPoint (Yi and Hwang, 2003). Professors strive to improve learning outcomes, make courses more relevant and interesting, and allow for more efficient delivery of course content. Whether technology-enabled courses improve student performance is a topic of much debate today. Edward Tufte, a leading researcher in the field, noted that the core ideas of teaching are contrary to the cognitive style dimension of PowerPoint - explanation, reasoning, finding things out, questioning, content, evidence (Tufte, 2006).

Our study examines whether the provision of lecture outlines on PowerPoint slides, as a supplement to classroom lectures and discussions, enhance student performance on exams and courses. We also investigate whether any relationship exists between usage of this resource and class attendance and participation. We are concerned with whether use of this resource improves or detracts from performance and class participation (and attendance).

The main research questions addressed are:

1. To what extent do students utilize instructor-supplied web-based PowerPoint slides?

2. Is there a relationship between PowerPoint usage and exam and course grades?
3. Is the reliance on instructor-provided PowerPoint slides considered a substitute to class attendance and participation?

The next sections examine relevant prior research followed by a description of methodology, results, and discussion of the implications of this study.

Previous Research

Prior literature has examined various types of supplemental technological resources beyond textbooks, class lectures, and participation. Supplemental resources may include instructor-provided lecture notes and other tools associated with Blackboard-like web platforms. In this study, PowerPoint slides are considered as an additional (not substitute) resource for students.

While this study seeks an understanding of how students use archived web based PowerPoint slides as study guides, past studies have tended to investigate the effect of PowerPoint on students' classroom performance. Such studies throw light on the perceived value of PowerPoint to students, as well as guiding our understanding of the relationship between PowerPoint use and exam performance.

Rankin et al. (2001) found PowerPoint presentations to have “no significant effect in terms of student performance”. Moreno and Mayer (2000) in a study of psychology students concluded that PowerPoint had a negative effect on student performance. Daniels' (1999) study of economics students suggested that use of PowerPoint slides were not a significant predictor of classroom performance. However students perceived

that the PowerPoint slides were beneficial in a survey concerning the students' views toward the PowerPoint presentations. The majority of the students preferred the presentations (1999). This perception was again reported by Susskind (2005).

Lowry (1999) found that PowerPoint did significantly increase student examination scores. Mantei (2000) investigated the use of PowerPoint handouts before class, and also found that that exam scores were higher with the use of PowerPoint slides. In this case Mantei was investigating PowerPoint s as a study guide rather than as a presentation aid.

One study investigated the use of online study questions (for no credit) as a preparation for actual tests and quizzes. Findings indicate that those students who voluntarily took advantage of these practice questions scored higher in actual exams and quizzes (Grimstad & Grabe, 2004). In a similar study (Grabe, 2005), students were provided lecture notes via a course website. There was some evidence that students who utilized these notes scored better on exams than those who did not. Many students reported that they printed out these notes and brought them to class to use during lectures. However there was no evidence that these students scored higher on exams than those who merely used the notes as a supplemental study aid. There was also some evidence that students who used these notes had lower attendance in class than those who did not.

A study examining the efficacy of digital PowerPoint lecturing in undergraduate classrooms (Szabo & Hastings, 2000) found that students exposed to either PowerPoint slides, PowerPoint slides with lecture notes, or traditional lectures showed no significant differences in test scores. This is further substantiated by a more elaborate study (Barnett, 2003), in which students were placed into groups. One group received an instructor-

provided skeletal outline of lecture notes. A second group received detailed lecture notes. A third group relied solely on their own notes taken during lectures. Students in the first group (supplemental lecture outline) scored higher on exams than those who were provided with complete lecture notes. Further, there was little difference between those who received notes in outline form and those who relied on their own lecture notes.

Investigators have compared the use of PowerPoint to traditional overhead transparencies during lectures (Bartsch & Cobern, 2003). They further compared slides with pictures and text to those with text alone. Their findings indicated that, although students claimed to prefer PowerPoint slides, comparative scores on quizzes did not show improvement. Further, students exposed to slides with pictures and text fared worse on quizzes than students exposed to slides with merely text.

Weatherly, Grabe, and Arthur (2002-2003) compared one class which was provided with supplemental lecture notes on PowerPoint with a class which relied entirely on class lectures and their own notes. They found that those without the additional PowerPoint slides scored significantly higher on exams than those who had them. They found, in addition, that class attendance of those with the slides was lower than those who only relied on class lectures.

In a similar study, students provided with supplemental PowerPoint lecture notes were ranked from high to low in technology use and high to low in class attendance (Debevec, Shih, & Kashyap, Spring 2006). Findings suggested that the majority of students relied more on the PowerPoint lecture notes than on textbook review as preparation for exams. There also appeared to be no significant relationship between technology usage and class attendance. Finally there was no difference in exam scores

between those who prepared using the PowerPoint lecture notes and those who used traditional review methods (reviewing textbook chapters and lecture notes). In contrast, Harknett and Cobane (Nov. 2007) found that over eighty percent of the students they surveyed felt that PowerPoint slides were beneficial, while only three percent said they were unhelpful.

More recently, Craig and Amernic (2006) compared various studies and other empirical evidence (some of which is mentioned in this paper). They noted that students like to be taught using PowerPoint slides, consider them entertaining, enhance clarity, and aid recall of subject matter. However they concluded that there was little consistent evidence that their PowerPoint use resulted in significantly better learning or higher grades than conventional teaching methods.

Based on previous research we propose a model (Figure 1) which attempts to explain the linkage between students' reliance on downloaded PowerPoint slides and their final grades. We hypothesize that students' participation would be related positively to their year of study, and would also be positively related to their use of their textbook and downloaded PowerPoint slides. We consider Participation as a critical variable affecting success in examinations ultimately affecting a student's final grade.

[Insert Figure 1 about here]

Method

Two hundred and fifty two students in several multi-section undergraduate business courses (accounting, marketing, management, and information systems) completed a one-page questionnaire (Figure 2). This questionnaire was self-developed

based on a similar instrument used by Debrevec (2006). The questionnaire was administered by someone other than the course instructor. It was made very clear to the students that participation was purely voluntary and that results would be held in the strictest of confidence. Very few students declined to participate.

[Insert Figure 2 about here]

Students were asked to complete fourteen questions related to PowerPoint utilization, textbook utilization, test preparation techniques, note taking, and class participation. Students were also queried on major area of study, gender, and year of study (Figure 2). Results were then correlated with individual students' grades in the respective courses in the areas of attendance (or class participation), exams, and overall course grades.

There were 118 male students (48.4%) and 126 females (51.6%) with 8 students not responding (Table 1). Five were freshmen (2.0%), 103 were sophomores (41.5%), 107 were juniors (43.1%) and 33 were seniors (13.3%), with 4 students not responding (Table 2). Although the classes used in this study were primarily aimed at various business majors, 14 of the subjects (5.8%) were non-business majors. Of the remainder, 64 were accounting majors (26.6%), 56 were management majors (23.2%), 45 marketing (18.7%), 34 finance (14.1%), and 20 global business majors (8.3%). The remaining students were information systems or dual majors (Table 3). Eleven respondents did not identify their major area of study.

[Insert Tables 1, 2, 3 about here]

Results

The first research question addresses the extent to which students utilize the PowerPoint resources provided. We explore this question by first performing factor analysis on the 14 items in our survey. Factor analysis using varimax rotation provides information on the underlying structure among a set of variables. Varimax rotation is “generally considered superior to other orthogonal factor rotation methods in achieving a simplified factor structure,” (Hair, Black, Babin, Anderson, and Tatham, 2006). Two distinct factors emerged (eigenvalues greater than 1), as shown in Table 4. We label these PPT and BOOK. The first factor (PPT) reflects active student learning primarily through engagement with Powerpoint material. Items 3, 4, and 13 relate directly to students’ reported use of Powerpoint while item 1 is a more general indicator of active learning (paying attention). This construct exhibits reliability in terms of internal consistency as measured by Cronbach’s alpha ($\alpha = 0.80$). Coefficient alpha for a set of items is generally accepted to indicate sufficient reliability if greater than 0.60 (Nunnally and Bernstein 1994). Mean responses to these questions were 3.72, 3.02, 3.13, and 3.94, respectively (Table 4). This indicates that students primarily range between “neither agree nor disagree” to “strongly agree,” addressing the first research question.

Questions 5, 6, 7, and 8 had relatively high loadings on the second factor which we label BOOK. These items address utilization of the textbook, as opposed to reliance on the PowerPoint slides. Of the four items that comprise BOOK, the factor loading for item 7 was the lowest (0.53). However, item 7 did not load higher on any other factor extracted in the varimax solution. We include item 7 in the BOOK construct because of the implication that the student is actively interacting with the textbook and other course

resources (notes, readings, etc.) over time (“I review for a test more than one day before it is given”). This construct, BOOK, also exhibits acceptable levels of reliability with Cronbach’s alpha = 0.75. Mean responses to these questions were 3.44, 3.63, 3.3.98, and 3.66, respectively (Table 4). These results suggest that students favorably view supplemental lecture notes in PowerPoint format, but rely more strongly on textbooks.

[Insert Table 4 about here]

Further, we found the correlation coefficient between the two constructs PPT and BOOK to be positive and significant ($r=.240$, $p=.000$ in Figure 3). This suggests that utilization of the PowerPoint resources in conjunction with the textbook affects participation, which we propose also affects exam scores and, ultimately, final grade for the class, thus addressing the second research question. The model in Figure 3 has positive regression coefficients for PPT, BOOK, and Year as they affect participation. Because of the collinearity in the data (between PPT and BOOK), we need to have a closer look at the relationships in isolation to get a sense of underlying patterns in the data.

[Insert Figure 3 about here]

When we examine direct effects of PPT, BOOK, and Year on Participation, the individual effect of each is statistically significant, but weak (Table 5). The regression model with BOOK as a predictor of participation is slightly stronger than that of PPT to participation ($b = 0.2$, $t = 3.2$, $p = .002$). This implies that book utilization mediates the effects of PowerPoint and Year on Participation. It also suggests that the instructor-provided PowerPoint resources are not used as a substitute for class attendance and participation (research question #3). It is important to note these direct effects because of

the collinearity in the data. Figure 4 results are somewhat misleading in terms of effects of PPT, BOOK and Year on participation (coefficients for BOOK and Year are in fact negative). However the striking finding is the strong relationship between Participation and Exams, as one would expect.

[Insert Figure 4 and Table 5 about here]

For the sake of completeness, we keep all constructs in the model for the next layer of analysis (Figure 5) to note the path between Exams and Final Grade. Here we see that participation strongly affects exam scores ($t=10.16$, $p=0.00$) (Figure 5) which in turn strongly affect final grade, also addressing the third research question.

[Insert Figure 5 about here]

Discussion

We examine classes in which undergraduate business students are provided supplemental lecture notes in PowerPoint form on a course website. Students' responses on their usage of these resources, in addition to traditional course materials (textbooks and class lectures) are then correlated with year of study, individual student grades on class participation and attendance, exams, and final course grades. Results although mixed, primarily indicate that there is little evidence that these supplemental on-line resources significantly influence grades. One possible explanation is that providing PowerPoint slides could induce student note-taking passivity. Future research might examine how students take in-class notes with and without the provision of web-based PowerPoint slides.

Further, results show that students do not view these supplemental lecture notes as a substitute for class attendance. We found no significant differences based on gender, student major, or year of study. Students do indicate, however, that they like having these resources available, no matter what the degree of reliance on them.

There has been an ongoing debate about the role and value of downloadable PowerPoint slides in a classroom setting. The results of this study reinforced the findings of a number of earlier researchers including Szabo & Hastings (2000), Barnett (2003), Bartsch and Cobern (2003), Weatherly, Grabe, and Arthur (2002-2003), and Debevic, Shih, and Kashyap (2006). Whether PowerPoint slides and other on-line or multimedia supplemental teaching aids really have any measurable positive or negative influence on student performance (or class attendance) is still a subject for debate and exploration.

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Table 1: Gender

	Frequency	Valid Percent
Male	118	48.4
Female	126	51.6
Total	244	100.0
Missing	8	

Table 2: Year of Study

Year of Study	Frequency	Valid Percent
Freshman	5	2.0
Sophomore	103	41.5
Junior	107	43.1
Senior	33	13.3
Total	248	100.0
Missing	4	

Table 3: Majors

Majors	Frequency	Valid Percent
Business:		
Accounting	64	26.6%
Finance	34	14.1%
Management	56	23.2%
Global Business	20	8.3%
Information Systems	2	0.8%
Marketing	45	18.7%
Accounting/Finance	3	1.2%
Accounting/Management	1	0.4%
Accounting/Information Systems	1	0.4%
Management/Finance	1	0.4%
Non-Business:		
Economics	2	0.8%
Criminology	2	0.8%
Government	1	0.4%
Paralegal Studies	1	0.4%
Psychology	1	0.4%
Public Administration	3	1.2%
Public Relations	2	0.8%
Sociology	2	0.8%
Total	241	100.0%
Missing	11	

Table 4: Scores on the Questionnaire

Question	Item	Mean	Std. Dev.
Q1	I pay attention in class.	3.72	1.189
Q2	I take notes in class	4.09	.992
Q3	I take notes using the PowerPoint slides I downloaded.	3.02	1.218
Q4	I download PowerPoint slides from the Web site before class.	3.13	1.267
Q5	I read the relevant chapters in the book before I come to class.	3.44	1.002
Q6	As I am reading the book, I take special note of things discussed in class.	3.63	1.019
Q7	I review for a test more than one day before it is given.	3.98	1.068
Q8	I read chapters in the book as we go along and review them again before the test.	3.66	1.001
Q9	I review my class notes before the test.	4.38	.873
Q10	I download PowerPoint slides from the Web site right before a test.	3.02	1.256
Q11	I take practice quizzes on the Web site before the test.	3.55	1.133
Q12	I review PowerPoint slides before the test.	4.50	.609
Q13	I think that PowerPoint slides reinforce what my instructor presents in class.	3.94	1.040
Q14	I think that PowerPoint slides replace class lectures.	2.63	1.260

Table 5: Direct Effects Model Summary

Dependent Variable	Independent Variable	Adj r2	F	b	t	p
Participation	PPT	0.013	4.02, p=0.04	0.13	2.23	0.035
Participation	Book	0.038	10.11, p=0.002	0.20	3.18	0.002
Participation	Year	0.024	6.9, p= 0.001	.17	2.6	0.001

Figure 1: Proposed Model

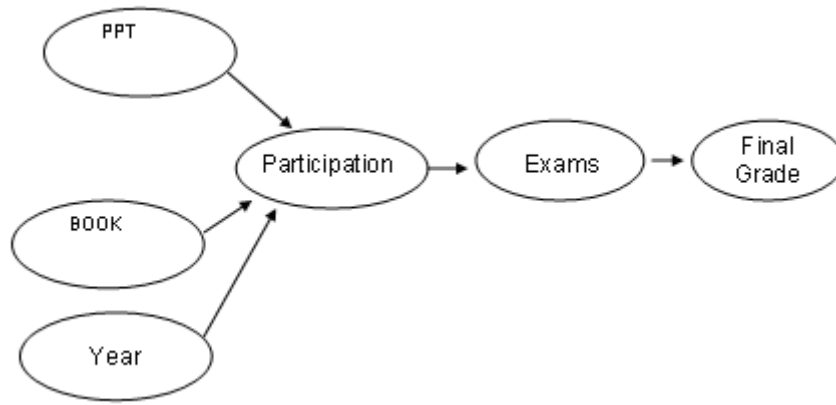


Figure 2: Survey Instrument

Dear Student:

Thank you for agreeing to participate in this research study. The aim of this study is to determine how students utilize PowerPoint slides provided on a course website. All data will be kept in a secure place, inaccessible to others. We are asking you to include your Suffolk Student ID Number to correlate your course grade to your responses, and assure that it will not be used for any other purposes. Confidentiality and anonymity will be assured through the assigning of a number to each participant. Thank you for your participation.

Q1	I pay attention in class.
Q2	I take notes in class
Q3	I take notes using the PowerPoint slides I downloaded.
Q4	I download PowerPoint slides from the Web site before class.
Q5	I read the relevant chapters in the book before I come to class.
Q6	As I am reading the book, I take special note of things discussed in class.
Q7	I review for a test more than one day before it is given.
Q8	I read chapters in the book as we go along and review them again before the test.
Q9	I review my class notes before the test.
Q10	I download PowerPoint slides from the Web site right before a test.
Q11	I take practice quizzes on the Web site before the test.
Q12	I review PowerPoint slides before the test.
Q13	I think that PowerPoint slides reinforce what my instructor presents in class.
Q14	I think that PowerPoint slides replace class lectures.
Q15	Gender: _____Male _____Female
Q16	I am a: _____Freshman _____ Sophomore ____Junior ____Senior
Q17	Major: _____
Q18	Student ID # _____

Figure 3: First Stage Analysis Model

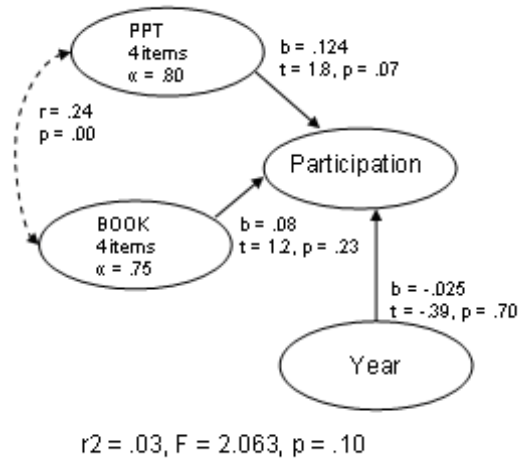


Figure 4: 2nd Stage Analysis Model

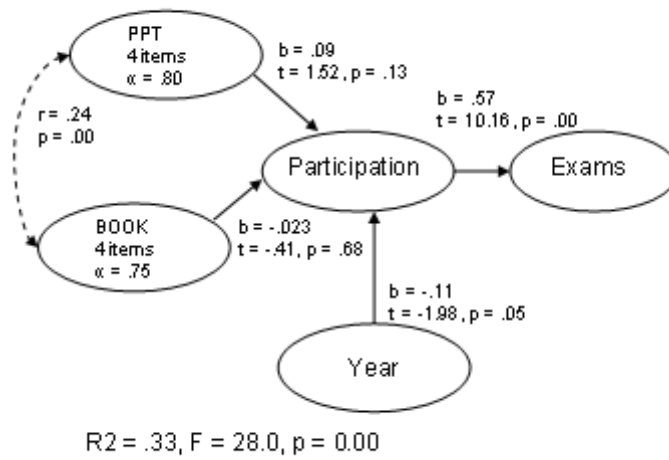


Figure 5: 3rd Stage Analysis Model

