

The impact of presentation graphics on students' experience in the classroom

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Abstract

To investigate the benefits and perceived effectiveness of instructional technology, students enrolled in several courses were compared on student evaluations of instruction, grades and an attitudinal questionnaire. The instructors of the courses taught the same course across two successive semesters, using traditional “chalk-and-talk” methods the first semester, and PowerPoint the next; all other techniques (e.g., exams, lecture material) were held constant. Results suggest that organization and clarity, entertainment and interest, professor likeability, and good professor behaviors were enhanced with PowerPoint although final grades were not.

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1. Introduction

The use of presentation graphics (e.g., PowerPoint) in the classroom appears to be embraced enthusiastically by faculty and administrators at institutions nationwide. Many classrooms are being equipped with computers and costly projection devices to support presentation graphics,

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as well as other visual presentation media. Faculty members are contributing countless hours in the preparation of slide show presentations to accompany lecture material, necessitating large electronic files that create increasing electronic storage capacity needs. Textbook companies are contracting with individuals to construct textbook-specific slide shows in an effort to increase the marketability of their textbooks. Despite the extensive investments of human and financial resources, few studies exist that clearly delineate the benefits of the use of presentation graphics (Murray, 2001). Specifically, there is limited empirical evidence to date supporting a positive impact on student learning and students' and professors' perceptions of the classroom experience.

Among the studies of presentation graphics that exist to date, the majority emphasize that presentation graphics increase the interest level of the classroom experience. In a study by Szabo and Hastings (2000), 155 students were administered a 10-item questionnaire to measure how they felt about the use of presentation graphics (compared to a traditional lecture format) in the classroom. Ninety percent of the respondents believed that presentation graphics were more attention capturing than traditional lectures and 85% said that it was more interesting. In another study (Mantei, 2000), students were exposed to either traditional lectures with overheads or to lectures supplemented with presentation graphics where notes were posted to the Internet. The students in the presentation graphics condition reported that they found the presentation graphics format more interesting and enjoyable, and that when notes were posted on the Internet, it enhanced their learning. Similarly, Atkins-Sayre, Hopkins, Mohundro, and Sayre (1998) reported that 73% of the 485 students they surveyed found that presentation graphics helped them maintain an interest in the lecture.

If students report that they find presentation graphics to be more interesting and attention capturing, it is reasonable that they also may find the course instructor to be more engaging and more competent. In fact, Atkins-Sayre et al. (1998) found that students believed presentation graphics enhanced an instructor's delivery, and more importantly, their credibility. Atkins-Sayre et al. (1998) also found that students who were taught with the aid of presentation graphics believed that they were better able to learn or retain the material from class; several studies suggest that students believe lectures are better structured and more clear when presentation graphics are employed (e.g., Atkins-Sayre et al., 1998; Mantei, 2000; Szabo & Hastings, 2000). Furthermore, Szabo and Hastings (2000) found that students reported being more motivated to attend the lectures when presentation graphics were used. These studies, taken together, suggest that students benefit from the use of presentation graphics in the classroom, or at the very least they perceive a benefit. Nonetheless, in Mantei's (2000) study, there was no significant difference between the student evaluations of faculty teaching performance when instructors used traditional lecture format compared to when they used presentation graphics.

In addition to examining students' beliefs regarding the efficacy of different instructional methods, research has also been conducted focusing on the actual influence of presentation graphics on students' grades in a class, producing somewhat mixed results. For instance, Ahmed (1998) found very little difference between the test scores of 143 students in a teacher education class where the students were taught for two semesters using traditional lecture method (with overheads) and for two semesters using presentation graphics. In a study by Beets and Lobingier (2001), 26 students in each of 3 Introduction to Financial Accounting Principles classes with the same instructor, same textbook and same syllabus were exposed to one of three conditions. In the first condition the professor used a traditional lecture method. In the second condition the professor used a

traditional lecture method with the aid of overheads. In the third condition the professor lectured with the aid of presentation graphics. Students were exposed to one condition then given an exam. Following each exam, the conditions were rotated so that each student was exposed to all three conditions. When analyzed by method of presentation, the researchers found no significant difference in the grades across methods. They did, however, find that over half of the students indicated a preference for the presentation graphics condition. Students who indicated a preference for the presentation graphics condition tended to earn higher grades when the material was presented using that modality. In a study by Rankin and Hoaas (2001), the same professor taught 4 sections of Introduction to Economics classes over the course of two semesters. Each semester the professor taught one class using a traditional lecture method and one class using lecture augmented by the use of presentation graphics. Consistent with other studies, Rankin and Hoaas found no significant effect of the method of instruction on student performance. Researchers have found the same pattern for several classes in the discipline of psychology; the use of multimedia in the classroom had no direct impact on grades for students enrolled in social psychology (Bartlett & Strough, 2003), abnormal psychology (Brewster, 1996) or physiological psychology courses (Stoloff, 1995). However, consistent with research mentioned earlier regarding student perceptions, Brewster (1996) did show a difference in attitudes towards the multimedia presentations; students were more positive in their evaluations of the class when multimedia were utilized.

In contrast, other researchers incorporating multimedia presentations in a variety of psychology courses (developmental, statistics, abnormal psychology and introductory psychology) have found higher final examination scores (Erwin & Rieppi, 1999) and more favorable anecdotal comments on student evaluations of those courses (Seaman, 1998). As a potential qualification to benefits, Smith and Woody (2000) found that students gained higher examination scores from multimedia courses only if those students scored high on measures of visual orientation, indicating that the benefits of multimedia presentations may be associated with learning styles or preferences. This is consistent with the findings of Beets & Lobingier (2001).

The current study was conducted to further examine the benefits and perceived benefits of use of presentation graphics (i.e., PowerPoint) in the classroom. Unlike previous research, we attempted to take a multidisciplinary approach by examining the use of PowerPoint in classes from several academic programs. In addition to assessing students' perceptions and attitudes regarding use of PowerPoint in the classroom, we also examined the direct benefits of the use of PowerPoint by analyzing final course grades. We predicted that PowerPoint would make the courses more entertaining and interesting, hopefully leading to better grades.

2. Method

2.1. Participants

Measures were obtained from students enrolled in ten separate classes (five courses from four disciplines) across two semesters (first semester the class was taught without PowerPoint technology; during the second semester, the professor did use PowerPoint technology in the same course) at a comprehensive co-educational state university with approximately 4000 students located in the Mid-Atlantic region of the United States of America. Ninety one percent of the students

are full-time and 67% live on-campus. Eighty seven percent of the students are Caucasian. There were a total of 218 students enrolled in the various courses without PowerPoint and 181 enrolled in the courses using PowerPoint. In the target classes, 70% of the students were female in the fall semester and 74% of the students were female in the spring semester. In the fall semester, 77% of the students in the target classes were underclassmen (freshmen and sophomores) and in the spring semester, 73% of the students in the target classes were underclassmen. Several students were absent on days when surveys and instruments were administered in their particular class. As a result, 104 students enrolled in non-PowerPoint classes, and 95 students enrolled in PowerPoint-enhanced classes, completed a Student Assessment of Instruction instrument. Likewise, 152 students enrolled in non-PowerPoint classes and 144 students enrolled in PowerPoint-enhanced classes, completed an Impact of Presentation Graphics Survey.

Five faculty members agreed to participate in this study. There were three females and two males who ranged in teaching experience from 1 to 17 years at this institution. All participating faculty reported familiarity with PowerPoint software and were offered instruction regarding the use of the software. The five faculty had institutional access to equivalent technology in their classrooms and offices and self-reported proficiency in its use. These faculty members signed release forms allowing the researchers access to their teaching evaluations and student grades for the target classes. As an incentive and also to enhance their own PowerPoint presentations, these faculty were provided a desktop scanner for their offices.

2.2. Materials

Students' responses on the University-wide Student Assessment of Instruction Instrument (a standardized 37-item questionnaire) and an Impact of Presentation Graphics Student Survey (a 28-item questionnaire written by the researchers) were obtained at the end of each semester of data collection. The University-wide Student Assessment of Instruction instrument was developed to allow administrators, faculty, and others to evaluate instructors' classroom performance based upon student evaluations. Our university has used this particular instrument for approximately 10 years. All probationary faculty members and those who wish to be considered for performance salary increases are required to permit their students to anonymously complete the instructional evaluation prior to the end of the semester. Specific instructions for the administration of the evaluation activity are provided with the forms. The Impact of Presentation Graphics Student Survey consisted of two sections each requiring students to respond using a 7-point Likert Scale (with one being Strongly Disagree and seven being Strongly Agree). The first part assessed student interest and focus and instructor preparation and organization for the class they were currently taking. The second part assessed general attitudes regarding PowerPoint and class time management, enhancement of learning and interest across their academic experience. This second section also assessed general student preferences regarding the physical properties of the PowerPoint slides and classroom environment (again, across their general academic experience). As such, the two sections did not assess separate constructs regarding the use of PowerPoint, but asked the student to assess the current class in one section and their general academic experience in another. All items from both questionnaires are presented in [Tables 1 and 2](#) in the results section of this report. A computer scanner was provided for each instructor participating in the study so that they could scan images (photographs, charts, graphs) for their PowerPoint presentations. This was provided

Table 1

Means, standard deviations and multivariate analysis of variance F ratios on impact of presentation graphics survey items as a function of presentation format used in class: chalk and talk (fall, 2002) vs. PowerPoint (spring, 2003)

Question (1, strongly disagree, 7, strongly agree)	Chalk and talk (<i>N</i> = 152)		PowerPoint (<i>N</i> = 144)		<i>F</i> (1,294)	Effect size Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
<i>Perceptions of current class experience</i>						
In reference to the instructor's presentation style, it was easy to determine the relative importance of terms and concepts (i.e., which covered material was more important)	5.46	1.30	5.73	1.25	3.30	
The instructor was able to stay focused on the lecture material (e.g., he/she did not skip around and "go on tangents")	5.80	1.36	5.53	1.43	2.73	
It was easy for me personally to stay focused on the lecture material	4.93	1.50	5.31	1.43	5.12*	.26
The instructor was effective in maintaining students' interest in the lecture material	5.18	1.27	5.54	1.24	5.77*	.27
The instructor used time effectively to balance lecture and discussion	5.75	1.26	5.92	1.17	1.52	
The instructor typically appears to be well prepared for class	6.47	.76	6.61	.79	2.56	
<i>General preferences for presentation technique</i>						
I prefer classes where the instructor spends the majority of class time lecturing	3.94	1.73	4.12	1.74	.77	
I prefer classes where the instructor spends the majority of class time facilitating discussion	4.74	1.51	4.82	1.51	.22	
I prefer classes where the instructor follows an explicit outline (i.e., prefer to know where you are at all times)	5.77	1.34	5.98	1.12	2.12	
I prefer classes where the instructor presents material in class that is not in the textbook	4.09	1.68	4.25	1.55	.74	
An instructor should not feel obligated to cover material that is in the textbook unless students express that they do not understand the material	3.45	1.77	3.42	1.80	.02	
The use of PowerPoint is helpful in increasing learning in the classroom	5.40	1.34	6.14	.94	29.59***	.63
The use of PowerPoint increases student interest (entertainment value) of a college class	5.15	1.39	5.57	1.36	7.08**	.30
The use of PowerPoint can help a student get a better grade in the class	4.67	1.43	4.92	1.46	2.25	
I generally prefer slides that provide full text of the lecture material (i.e., <i>everything</i> the professor wants me to know is completely written out on the slide)	5.36	1.57	5.28	1.63	.17	
I generally prefer slides that provide key phrase outlines of the lecture material	4.93	1.28	5.10	1.41	1.18	
I generally find visual elements (e.g., pictures/charts/graphics/maps) helpful in PowerPoint presentations	5.79	1.16	5.90	1.12	.64	
I find it helpful for professors to read the PowerPoint slides as they are presented	5.35	1.42	5.66	1.30	3.86*	.22

Table 1 (continued)

Question (1, strongly disagree, 7, strongly agree)	Chalk and talk (<i>N</i> = 152)		PowerPoint (<i>N</i> = 144)		<i>F</i> (1,294)	Effect size Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
I find it helpful for professors to use the PowerPoint slides as discussion points for the lectures	5.49	1.13	5.68	1.14	1.99	
I find it helpful for professors to use decorative backgrounds on PowerPoint slides used for classroom lectures	4.40	1.39	4.49	1.61	.24	
I find it helpful for professors to use computer-generated sounds with PowerPoint presentations	3.62	1.54	3.84	1.78	1.32	
I find it helpful when each slide is revealed all at once	4.13	1.66	3.83	1.82	2.28	
I find it helpful when slides are “animated” (i.e., built line by line) as the lecture progresses	4.31	1.61	4.86	1.67	8.36**	.33
I feel that the use of PowerPoint inhibits discussion	4.03	1.53	3.49	1.64	8.40**	.33
During lectures using PowerPoint, I prefer the lights on full (possibly sacrificing the quality of the screen image)	2.67	1.46	2.85	1.64	1.03	
During lectures using PowerPoint, I prefer the lights to be dimmed, producing a sharper screen image.	5.28	1.38	5.44	1.50	.85	
During lectures using PowerPoint, I prefer the lights turned off, producing the sharpest screen image	4.18	1.94	4.26	1.94	.12	

Note: * $p < .05$. ** $p < .01$. *** $p < .001$.

as both an incentive and to allow the participating instructors to enhance their PowerPoint presentations with pictures.

2.3. Procedures

Five faculty from four separate disciplines (Psychology, Sociology, History and Political Science) agreed to teach a class without instructional technology (“chalk-and-talk”) in the Fall 2002 semester and then with instructional technology (PowerPoint) in the Spring 2003 semester. “Chalk and talk” methods included writing on the blackboard, using overhead projector, maps and other materials in the classroom during regular course lectures and discussion. These faculty used the same textbook, tests and lecture material across the two semesters, the only difference being the use of PowerPoint technology to support at least 50% of their lectures in the Spring 2003 semester. The classes were Introduction to Psychology, Foundations of Western Civilization, American Government and Politics, Principles of Sociology, and Research Methods in Psychology. Participating faculty were provided instruction in the use of PowerPoint and a scanner to assist in their PowerPoint presentation development.

3. Results

Collapsed across classes, a Multivariate Analysis of Variance (MANOVA) was conducted assessing the effects of presentation format (PowerPoint vs. “chalk and talk”) on the 28 survey

Table 2

Means, standard deviations and multivariate analysis of variance F ratios on items from university-wide student assessment of teaching instrument as a function of presentation format used in class: chalk and talk (fall, 2002) vs. PowerPoint (spring, 2003)

Question	Chalk and talk (<i>N</i> = 104)		PowerPoint (<i>N</i> = 95)		<i>F</i> (1,197)	Effect size Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Compared to other courses . . . (1, much less; 2, less; 3, average; 4, more; 5, much more)						
How much reading was required?	3.66	.83	3.45	.82	3.23	
How much writing was required?	3.27	.91	3.36	.92	.47	
How much other work was required?	2.91	.93	3.15	.83	3.52	
How difficult was the course?	3.55	.77	3.62	.69	.49	
How hard did you work?	3.52	.82	3.67	.75	1.90	
Attitudes: (1 = no, definitely not; 2 = no, probably not; 3 = neutral; 4 = yes, probably; 5 = yes, definitely)						
Do you have a more positive attitude about this subject after taking this course?	3.82	1.01	3.80	1.13	.01	
Would you like to take another course from this instructor?	4.04	1.17	4.35	.92	4.25*	.29
Workload: (1 = none, 2 = 1–3, 3 = 4–6, 4 = 7–9, 5 = more than 9)						
On the average, how many hours per week did you spend preparing for class?	2.64	.71	2.82	.85	2.55	
Overall evaluation: (1, poor; 2, below average; 3, average; 4, above average; 5, excellent)						
Rate the instructor overall	4.10	.92	4.34	.82	3.77*	.27
Rate the course overall	3.60	.96	3.72	.94	.79	
Rate your learning overall	3.64	.86	3.76	.87	.86	
Assessment of teaching: the instructor . . . (1, hardly ever; 2, occasionally; 3, sometimes; 4, frequently; 5, almost always)						
Promoted discussion	4.31	.96	4.51	.67	2.81	
Presented material in a clear and organized way	4.37	.98	4.70	.64	7.79**	.39
Encouraged students to express themselves	4.35	.94	4.53	.70	2.31	
Was enthusiastic about the subject matter	4.67	.70	4.82	.41	3.20	
Considered issues from an ethical perspective	4.40	.74	4.55	.67	2.04	
Gave exams that covered important material	4.45	.79	4.58	.65	1.53	
Spoke with expressiveness and variety in tone of voice	4.50	.85	4.70	.55	3.63	
Demonstrated the significance of the subject matter	4.45	.79	4.68	.62	5.26*	.32
Made it clear how each topic fit into the course	4.45	.84	4.67	.57	4.69*	.30
Offered explanations for grades earned	4.31	.94	4.46	.82	1.54	
Summarized material in a way that aided retention	4.19	.89	4.44	.76	4.51*	.30
Clearly stated the objectives of the course	4.32	.77	4.52	.67	3.77*	.27
Explained course material clearly	4.30	.87	4.56	.68	5.45*	.33
Related course material to life situations	4.33	.90	4.46	.76	1.33	
Gave exams that were based on course content and requirements	4.43	.81	4.63	.65	3.59	
Encouraged the consideration of ideas from diverse perspectives	4.34	.84	4.41	.81	.40	
Provided feedback on exams and papers in a timely fashion	4.34	.90	4.43	.71	.55	
Offered the opportunity to practice or apply skills through exercises and projects	3.79	1.15	4.21	.92	8.10**	.40

Table 2 (continued)

Question	Chalk and talk (<i>N</i> = 104)		PowerPoint (<i>N</i> = 95)		<i>F</i> (1,197)	Effect size Cohen's <i>d</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Was available for consultation with students outside of class	4.39	.78	4.56	.60	3.06	
Gave projects, tests, or assignments that required critical thinking or problem-solving	3.98	1.04	4.26	.90	4.14*	.28
Gave projects, tests, or assignments that required original or creative thinking	3.88	1.14	4.17	.99	3.75*	.27
Was clear in stating expectations for papers and other assignments	4.39	.90	4.47	.71	.47	
Gave helpful feedback on papers and assignments	4.22	.91	4.48	.78	4.71*	.30
Used instructional technology to enhance presentations	3.49	1.51	4.78	.49	62.86***	1.14
Gave projects or assignments that required the use of computers	3.83	1.27	4.41	.84	14.37***	.54
Demonstrated how technology can be used to search for information, present information, or solve problems	3.36	1.39	4.16	.95	22.12***	.67

Note: * $p < .05$. ** $p < .01$. *** $p < .001$.

items related to students' perceptions of effective classroom practices (The Impact of Presentation Graphics Student Survey). Analyses indicate that students who completed the class during the semester in which PowerPoint was used to present class material were more likely to feel that it was easy to stay focused on lecture material, that the instructor maintained student interest in the course material, that PowerPoint is helpful in increasing classroom learning, and that PowerPoint increases the interest level of a college class; they were also less likely to believe that PowerPoint inhibits classroom discussion (See Table 1). As can be seen from Table 1, most of the effect sizes (Cohen's *d*) were medium with at least one being a large effect size (the item stating "PowerPoint is helpful in increasing learning in the classroom").

A second Multivariate Analysis of Variance (MANOVA) was conducted assessing the effects of presentation format (PowerPoint vs. "chalk and talk") on responses obtained from the university-wide, 37-item end-of-semester student evaluation of teaching instrument. Analyses indicated that students enrolled in the PowerPoint classes were more likely than students enrolled in the "chalk and talk" classes to want to take another class offered by that same professor, they rated the professor more favorably overall, and they believed the professor presented material more clearly, demonstrated how each topic fit in the course, summarized information in a way that aided in their retention, and used technology effectively to enhance presentations (See Table 2). Again, the effects sizes of the significant findings were all medium to large.

Furthermore, students enrolled in the PowerPoint classes indicated that the professor demonstrated the significance of the subject matter more, more clearly stated the objectives of the course, offered more opportunities to apply learned skills through exercises and projects, gave more projects that required problem solving and critical, original or creative thinking, gave more helpful

Table 3

Questions associated with three general areas showing significant differences between use: chalk and talk (fall, 2002) vs. PowerPoint (spring, 2003)

Organization/clarity/interest	
IPGQ	It was easy for me personally to stay focused on the lecture material
IPGQ	The instructor was effective in maintaining students' interest in the lecture material
IPGQ	The use of PowerPoint is helpful in increasing learning in the classroom
IPGQ	The use of PowerPoint increases student interest (entertainment value) of a college class
SAI	Presented material in a clear and organized way
SAI	Made it clear how each topic fit into the course
SAI	Summarized material in a way that aided retention
SAI	Explained course material clearly
Professor "likeability"	
SAI	Would you like to take another course from this instructor?
SAI	Rate the instructor overall
"Good professor behaviors"	
IPGQ*	I feel that the use of PowerPoint inhibits discussion
SAI	Clearly stated the objectives of the course
SAI	Offered the opportunity to practice or apply skills through exercises and projects
SAI	Gave projects, tests, or assignments that required critical thinking or problem-solving
SAI	Gave projects, tests, or assignments that required original or creative thinking
SAI	Gave helpful feedback on papers and assignments
SAI	Demonstrated how technology can be used to search for information, present information, or solve problems

Note: SAI, student assessment of instruction; IPGQ, impact of presentation graphics questionnaire. Except for IPGQ*, all means were higher for PowerPoint condition.

feedback on tests and assignments and demonstrated how technology can be used to search for and present information or solve problems to a greater extent than students enrolled in classes not using PowerPoint (see Table 3). Analyses of the impact of the use of PowerPoint on students' final grades in the classes revealed no significant differences between the classes with and without the use of PowerPoint.

4. Discussion

Although the data indicated that there were no differences in grades as a result of the use of PowerPoint in the classroom, there were differences on a variety of questions from both the university-wide Student Assessment of Instruction and the Impact of Presentation Graphics Student Survey questionnaire. These questions tended to group themselves according to three general areas: organization/clarity/interest, professor "likeability", and "good professor behaviors" (see Table 3). For organization/clarity/interest, students responded more favorably toward the classes taught with the use of PowerPoint. It is interesting to note here that, consistent with other research, the students generally believed that the use of PowerPoint facilitated their learning even though grades were not significantly different (Atkins-Sayre et al., 1998; Beets & Lobingier,

2001; Mantei, 2000; Rankin & Hoaas, 2001; Szabo & Hastings, 2000). Likewise, students responded that they liked the professor more (rated the professor higher overall) and would like to take another class from the professor when PowerPoint was used. Lastly, students responded more favorably in classes using PowerPoint to professor behaviors seemingly unrelated to the use of PowerPoint (e.g., handing back papers on time with helpful feedback, assigning more tasks requiring critical or creative thought). It seems that the use of PowerPoint may have created a generally favorable impression of the class and the professor while not significantly affecting grades. We speculate that grades are not significantly different because the use of PowerPoint indeed does not significantly affect grades. Rather, it seems that the use of PowerPoint makes for a better experience for the students from their perspective. It is our contention that this confers an enormous benefit towards education in that students like the courses better and therefore have a more favorable attitude toward their education. We did not collect data on attendance and gender, however, we feel that both of these might be excellent variables to assess in terms of the effects of PowerPoint in the classroom. Presumably, attendance would have an effect in that those who attended should be more influenced by the classroom techniques than those who had high absence rates.

The learning seems to be the same (although other studies have indicated that grades improve with presentation graphics and multimedia presentations), but the overall experience appears to be more favorable in classes taught with presentation graphics than in classes not taught with presentation graphics. This appears to spread beyond the factors directly and obviously related to the use of PowerPoint such as lecture organization and clarity and the relevance of topics to the course. The use of PowerPoint also enhanced professor likeability directly (over-all rating of instructor, and willingness to take another course with instructor) as well as indirectly by enhancing the perception of “good professor behaviors” such as providing helpful feedback on assignments and giving assignments that required critical and creative thinking, all of which were presumably consistent across semesters.

Thus, the conclusion that might be drawn from these data is that although the use of presentation graphics (especially PowerPoint) may not be the magic bullet previously thought (in terms of significantly increasing grades), there seems to be a consistency in this study and across most of the others to date in that students prefer it. Therefore, the use of presentation graphics in the classroom is probably worth the financial, personnel and time resources necessary to equip classrooms with the projection equipment and train faculty on the use of the equipment and software.

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