

Literature Review: Perceptions and Cognitive Impact of Using PowerPoint

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## Introduction

Instructional tools used to project instructor notes and course content have been used in education for centuries. “In 1975, fifty thousand overhead projectors were sold in America. By 1985, that figure increased to more than a hundred and twenty thousand” (Parker, 2001, p. 63). As computers evolved, additional, more “flashy” tools became available. In May, 2001, more than two hundred and fifty million computers had PowerPoint installed on them (Parker, 2001, p. 61). In 1987, PowerPoint started out as a black-and-white tool that printed on paper with the intent of using a copy machine to transfer the image to an overhead transparency (Parker, 2001, p. 63). Though it may now be used in almost every classroom and business meeting, many people question the value of PowerPoint. You may have even heard the phrase “Death by PowerPoint” as an expression used to describe society’s frustration with the overuse of the product. Tufte (2003) has been quoted as saying that PowerPoint is “making us stupid, degrading, the quality and credibility of our communication, turning us into bores, wasting our colleagues’ time” (Tufte, 2003). According to Parker (2001), even Bob Gaskins, the man known for taking the inspiration from a friend and creating PowerPoint, is “...skeptical about the product that PowerPoint has become” (Parker, 2001, p. 63). These are pretty harsh and judgmental comments for a product that is so universally known. Therefore, it is the intent of this literature review to explore these perceptions and the effectiveness of PowerPoint on student learning.

## Methodology

In an attempt to be more objective in the selection of resources to review, only studies that focused on the use of PowerPoint within a college setting were chosen. Articles included studies conducted within multiple subject areas catering to a diverse student demographic in regards to gender, race, and age. The studies were then subdivided by those focusing on learning

effectiveness versus those focusing on students' perception of PowerPoint's use. To maintain a focus on learning, studies focusing on the use of PowerPoint within the business sector were dismissed. To also maintain a higher level of validity, only studies using PowerPoint were used. Studies where similar presentation software was substituted for PowerPoint were left out. One exception to this was if the study compared the use of PowerPoint to the use of another presentation application. For example, Wolf (2007) conducted a study where "students perceive lectures with Classroom Presenter as more interesting and more adequately paced [than those using PowerPoint]" (Wolf, 2007, p. 79).

Once articles meeting the above criteria were identified, they were read and another filter process was used to narrow the field once again. For example, though an interesting article, Nope's (2007) study had to be removed for the purpose of this review. Nope's study "sought to determine if supplementing lectures using Microsoft PowerPoint slides with handouts of the slides enhanced test-taking performance in an undergraduate Human Development course" (Nope, 2007, p. 1). The idea of using handouts produced by PowerPoint during a lecture adds another level of complexity to the focus of using PowerPoint as a "stand-alone" presentation tool. Additionally, this was the only article that focused on the use of supplemental handouts to such lectures. The remaining articles were reviewed for consistency in methodology and scope specific to that of this review.

### Analysis

Many of the studies reviewed covered both students' perception of the use of PowerPoint within the classroom as well as the tool's actual learning effectiveness. It seems logical to analyze students' perceptions first and then compare that to the impact on learning. However, based on the studies reviewed, it would be hard to deduct whether or not preconceived opinions about PowerPoint contributed to students' post-measure results.

Initially, over 15 articles on the topic were reviewed. Out of those, five articles focused on student perceptions as well as performance. Out of the five, three of them reported overwhelmingly that students perceive PowerPoint as a tool that either makes content more interesting, helps them stay focused, increases their instructors credibility, or projects the instructor as more organized than those using more traditional teaching tools such as an overhead projector and/or the chalkboard. One of the studies (Nouri & Shahid, 2005) had mixed results between surveys conducted periodically throughout the course of a term versus the end of the term survey. The final survey (Wolf, 2007) reported negative perceptions of PowerPoint based on it being compared to a more interactive presentation tool. Wolf (2007) was the only researcher in this review that compared the use of PowerPoint to the use of another electronic presentation tool. Wolf's (2007) study compared, over the course of two years, students' interests in content and perception of pace by splitting participants into two groups. One group was subjected to thirty-six 50-minute lectures where the instructor utilized PowerPoint to present content. The second group was subjected to the same lectures where Classroom Presenter was substituted for PowerPoint. Classroom Presenter is a slide presentation application, much like PowerPoint, with more interactive features such as digital inking (the ability to write on the screen with a digital pen) and the ability to connect the instructor's device to the students' devices for information sharing and student-to-instructor interaction. If an instructor has a TabletPC, a laptop computer whose monitor swivels, lays flat, and allows a user to write on it with digital ink like a notepad, PowerPoint could utilize the inking capabilities. However, PowerPoint does not have the ability to connect multiple devices. Therefore, the instructor-student interactive component of Classroom Presenter may have had a direct impact on the survey's results.

For the purposes of the study, each group was provided with an optional web-based, post-class survey. The biggest difference noted between the two applications is that Classroom Presenter allows the instructor to interact with it by digitally highlighting information and using electronic inking capabilities to write directly on the digital slide. There was not a significant difference in the results specific to the pace of the presentations. However, 17% vs. 3% of those attending lectures using Classroom Presenter perceived lectures to be more exciting. It's not hard to speculate that the added interaction of Classroom Presenter was preferred by the students. This may cause one to speculate the effectiveness of any presentation tool compared to instructor presence and interaction with students.

Continuing with student perceptions, but narrowing our scope to only those who compared PowerPoint presentations to more traditional lectures, we find that students prefer the use of PowerPoint within the classroom setting. In the remaining three surveys covering perception, all of them used an experimental research method where one group of students was exposed to PowerPoint lectures while the other group was not. Nouri & Shahid (2005) report that accounting students did not find the entertainment value of the class using PowerPoint notably higher than the class subjected to the more traditional lecture method without PowerPoint. However, they do report that "students are more likely to report the instructor as informative, effective, prepared, and time efficient than students in traditional section" (Nouri & Shahid, 2005, p. 67). These types of statistics make it difficult to argue that performance increases when a student's perception of a course's entertainment value increases, which was an initial hypothesis of Nouri & Shahid (2005).

Even though Nouri & Shahid's (2005) survey did not prove a statistically significant result specific to entertainment value, Atkins-Sayre, Hopkins, Mohundro, & Sayre (1998) had a

different response. Out of 485 participants, 73% indicated that the PowerPoint presentations helped keep their interest and 72% said that it was more effective than other visual aids. Equally significant is that 72% noted that PowerPoint enhanced the instructor's delivery and 71% indicated the desire to see other instructors use PowerPoint. One speculation as to why these responses may be more favorable for PowerPoint than the Nouri & Shahid's (2005) survey could be the date in which the study was conducted: ten years ago (Atkins-Sayne, et al., 1998). According to their survey, only 29% of the participants had seen PowerPoint prior to their experience relating to this study. (Atkins-Sayne, et al., 1998). Therefore, one might argue that the newness of the tool at the time could have increased likeability. Long-term studies may need to be conducted in order to consider the lifespan of the product and its effectiveness.

One survey that may contradict the argument that time and lack of exposure influence likability is that conducted by Amare (2006). Amare (2006) conducted a survey that resulted in 79% of the 84 participants indicating that they liked PowerPoint better than the traditional lecture methods and 62% noted that they gained more knowledge from the PowerPoint presentation. However, one interesting result of this study is that though students perceived themselves as gaining more knowledge when PowerPoint was used, students attending the traditional lecture sections received higher post-test scores. This was true even when their pre-test scores were lower to begin with (Amare, 2006). This leads us to the second focus of this review, which is whether or not PowerPoint is an effective learning tool and increases educational performance.

When reviewing Nouri & Shahid's (2005) research, the evidence does not support an increase in performance based on the use of PowerPoint. However, the results did support a statistically significant difference in performance in two out of the six quizzes used in the study. The concern is that one of the quiz results supports a statistically significant increase in

performance by the students exposed to PowerPoint ( $p < 0.032$ ), and the second quiz results supports statistically significant increase in performance by the students participating in the more traditional classroom ( $p < 0.003$ ) (Nouri & Shahid, 2005). Nouri & Shahid (2005) speculate that the opposed differences in these two quizzes could have resulted from the chapter content relating to the respective quizzes. The chapter where the students exposed to PowerPoint performed significantly better was a more discussion-oriented chapter. Whereas, the chapter relating to the second quiz, where students in a more traditional setting significantly outperformed the PowerPoint group, utilized a more “walk-through solutions” approach (Nouri & Shahid (2005).

One study that did conclude that PowerPoint use was effective based on post-test results was conducted by Blokzijl & Andeweg (2005). Unlike the other studies mentioned thus far, Blokzijl & Andeweg (2005) had three groups. One group without PowerPoint, one with extensive-text slide use of PowerPoint, and one with a more concise-text slide use of PowerPoint. The difference between the extensive and concise slides was the amount of text on the slide. For example, an extensive-text slide may have a direct quote from the professor or text; whereas, a more concise slide would consist of a more bulleted summary of the information.

Another unique characteristic to this study versus others is that it detailed very specific standards for each type of slide. Industry standards were used as guidelines to create the slides and conduct the presentations. The results of the study can be presented in two parts: 1) post-test results immediately following the presentation; and 2) post-test results one week after the presentation. Immediately following the presentation, students without PowerPoint scored an average of 50.86%; whereas, the extensive and concise groups scored an average of 62.31% and 60.41% respectfully. One week later, those without PowerPoint scored an average of 47.33%;

whereas the extensive and concise groups scored an average of 52.82% and 51.82% respectfully. (2005). Though it is clear that the two groups using PowerPoint scored notably higher immediately following the lecture, it can also be noted the overall retention of information dropped considerably for those who participated in classes using PowerPoint. This brings up another interesting topic for further research: the long term effects on the use of PowerPoint in education specific to retention of information.

Bartsch and Cobern (2003) also deviated from the two-presentation model and provided students with a text only presentation, a presentation with PowerPoint pertaining content-relative graphics, and a presentation with PowerPoint containing unrelated graphics. “The results indicate that unrelated graphics in a presentation have a negative effect on the enjoyment and the learning of the material” (Bartsch & Cobern, 2003). Furthermore, “the results also indicate that having related pictures were neither beneficial nor harmful to the enjoyment or learning of the material” (Bartsch & Cobern, 2003). In regards specifically to learning, there was a significant difference in recall of material on post-tests. Results reported better scores for students participating in text-only and PowerPoint presentations with relative graphics (both  $P$ 's  $< 0.01$ ) versus PowerPoint presentations with unrelated graphics (Bartsch & Cobern, 2003). However, the results also show that there was no significant difference between text-only presentations and the PowerPoint presentations with relative graphics ( $P > 0.10$ ) (Bartsch & Cobern, 2003).

In an attempt to measure the influence of auditory impact of PowerPoint, Wiebe, Slykhuis, and Annetta (2006) conducted a study where preservice teachers were provided a PowerPoint presentation without live instruction. One group was provided the presentation without sound and the other was provided the same presentation with instructor voiceover. According to the results of post-tests provided, there was no significant difference ( $p > 0.05$ )

between the two groups (2006). The obvious difference between this study and the others discussed above is the lack of physical presence on the part of the instructor. Since the results indicate no difference between text-only and narrated slides, we can again question whether or not instructor presence is more influential to learning than visual presentations.

### Discussion

If the research surrounding the effectiveness of PowerPoint does not substantially support its use, then why do so many instructors still implement it within the classroom? This in itself would make an interesting study. However, this writer presumes that PowerPoint is a tool that requires little training and computer skill to use while easily replacing more traditional teaching tools, such as the overhead projector, with a digital alternative. In its minimal use, PowerPoint is used as a physical prompt to keep an instructor on track. More extensive uses may include text-heavy slides that the instructor reads from or self-paced presentations leaving out the physical presence of the instructor all together. If instructors are going to continue to implement PowerPoint in the classroom, it is important that future research focus on successful strategies for implementing it in a manner that increases transfer of knowledge. One way of doing this could be focusing on existing, respected theories as building blocks for developing a successful curriculum without PowerPoint, surveying the effectiveness of the curriculum through the use of pre and post tests to obtain baseline data. After baseline data is established, an additional study of the same course where a control group is introduced to the curriculum without PowerPoint, while introducing PowerPoint as the treatment to a second group could be conducted. This focus on the pedagogical soundness and evaluation of the original curriculum before introducing PowerPoint was something not focused on in the research reviewed above. For example, no study mentioned whether or not the original curriculum was created using Chickering's seven principles of good practice (Chickering & Gamson, 1987) or Bloom's Taxonomy of Educational Objectives for

Cognitive Domain (Bloom, 1956). Two of Chickering's (1987) principles encourage student interaction with the faculty and other students. Chickering and Ehrmann (1996) even adapted the principles to describe appropriate ways to use computers, video, and telecommunications technologies (Chickering and Ehrmann, 1996) to ensure these principles could be applied when creating curriculum using multimedia tools. Bloom's taxonomy (1956) helps development assessment activities that focus on a student's ability to demonstrate knowledge, comprehension, application, analysis, synthesis, and evaluation of content. Knowing whether or not curricula were developed with these types of theories in mind help us determine if PowerPoint removed these interactions from the classroom by becoming a crutch for the instructor, therefore, dampening the quality of overall instruction to begin with. Without this type of structure, one might argue that the curriculum or actual instruction methodologies tainted the validity of the study equally as much, if not more than, the use of PowerPoint. Finally, structuring a study with such strongly accepted cognitive theories adds creditability to the instructor as well as the overall results.

Continuing the discussion of future research, Craig and Amernic (2006) contend that "we need to understand also our audience's 'perceptual, cognitive, and emotional capabilities, expectations, and habits' and to explore the relationships between audience and 'visual technology' and 'manipulations of that technology' in a better fashion" (Craig & Amernic, 2006, p. 155). This type of study would be very complex and might require a longer term relationship with the same participant group in order to establish the cognitive and behavioral "expectations and habits" of the group before studying the latter components. Such a study may require researching the effects of slide transitions, still graphics, animated graphics, supplemental handouts, etc. as they relate to attitudes, distractedness, and overall transfer of knowledge.

Though the results of this review did not help demote the use of PowerPoint within the classroom, which is what this writer presumed would happen; it provoked more interest in the topic. Future research will surround the use of PowerPoint, and other presentation applications, within distance education courses. Within the University of Illinois Global Campus, instructors transitioning from onground (on campus, face-to-face classes) to online often wish to simply shift their current curriculum to the online environment with little to no change in language use or consideration for the lack of physical presence by the instructor. One result of this mentality is the desire to merely place PowerPoint presentations inside Desire2Learn, the Global Campus' course management system (CMS), to serve as the course's "lecture" materials. Instructors often forget that their onground students not only benefit from seeing the PowerPoint presentation, but they get to see it in the context of a live presentation with the instructor expanding on slide text, and interacting with students by answering questions and facilitating discussion. Therefore, research that focuses on such use of presentation applications is essential for supporting instructional design teams to be able to promote best practices within the development of online courses. This research will need to focus on its use in both asynchronous and synchronous environments. In the asynchronous environment there will be need to concentrate on the use of text-only and instructor-narrated presentations. Whereas, research specific to the synchronous environment could focus on the instructor's use of slides to support a lecture-only environment in comparison to an instructor using the slides to provoke interaction between students and instructor within the live environment.

For instructors wishing to continue using PowerPoint in the classroom, Doumont (2005) and Dryden & Dryden (2008) offer some advice for designing slides. First, Doumont (2005) provides us with specific "laws of communication": 1) adapt to your audience; 2) maximize the

signal-to-noise ratio; and 3) use effective redundancy (Doumount, 2005, p. 68). To adapt to your audience, Doumount (2005) suggests focusing on what a message means to an audience rather than detailed information. Maximizing the signal-to-noise ratio refers to how much the slide, or text on a slide, competes for a student's attention over the instructor's word. Therefore, slides should contain as few words as possible while still conveying the same content. Finally, the information on a slide should be redundant to the instructor's verbal message. Doumount (2005) illustrates this by proving an analogy of a "deaf" student who uses the slides as the only sources for information and comparing it to a "blind" student who only uses the verbal rhetoric as the source for information. According to Doumount (2005), students within both of these categories should be able to receive the same message from the respective sources, therefore, defining the text on the slide as redundant to that of the verbal lecture (Doumount, 2005, p. 68).

Suggestions provided by Dryden & Dryden (2008) correlate with the process they require their students to participate in when creating PowerPoint slides for classroom presentations: 1) do not work in PowerPoint to create the presentation; PowerPoint should be a supplement tool to an already composed piece of work; 2) ignore the AutoContent Wizard offered by PowerPoint; and 3) create slides that support arguments and serve as mnemonics for the speaker and visual aids for the members of the audience (Dryden & Dryden, 2008, p. 102). A test for judging slides is also offered, which is to "[limit] each unit of thought to a single line of text" (Dryden & Dryden, 2008, p. 102). Finally, Dryden & Dryden offer a few additional rules that one should follow when developing slides: "1) don't use all caps; 2) don't use more than two fonts; 3) don't use red or pink text; 4) don't have more than six words per line; and 5) don't use redundant text on the same slide" (Dryden & Dryden, 2008, p. 102). Even if the suggestions above are

implemented, both Doumount (2005) and Dryden & Dryden (2008) agree that the foundation for all presentations is one that is built on sound educational principles.

### Conclusion

On a final note, it is obvious that the research does not support the use of PowerPoint based on any direct, measurable impact on educational performance. However, it is also obvious that the research does not necessarily support the discontinuation of the product either. Therefore, one might still question whether or not to use PowerPoint in the classroom. This writer recommends focusing on a solid curriculum based on such existing principles by Chickering & Gamson (1987) and Bloom & Krathwohl (1956). Specifically, it is suggested that instructors take a cue from Chickering and Gamson (1987) and create curriculum that requires student-student and student-instructor interactions as well as student-content interactions. These principles of engagement have proven to be important foundations for curriculum develop and should be respected as such. The use of any presentation tool, including PowerPoint, should do nothing more than support such curriculum, not replace it.

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