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Establishing Best Practices for the Use of PowerPoint™ as a Presentation Aid

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Abstract

Despite the ubiquitous nature of PowerPoint, little research informs the practice of using presentation software to display textual information to accompany a presentation. The vacuum of empirically tested best practices has been largely filled with guidelines that, while intuitively logical, have little theoretical grounding. The present study examines the effect of providing text visuals, limiting the number of lines per slide, and the manner of displaying the lines, on retention. The results support the use of text visuals, but do not support the popularly recommended guidelines for number of lines and method of display, and suggest additional research is needed.

Presentations with accompanying PowerPoint™ visuals are ubiquitous. Microsoft claims there are more than 400 million PowerPoint users, collectively making an estimated 30 million presentations each day (Caplan, 2005). It is difficult to imagine another technology that so universally affects the practice of public oral communication. But is the practice of using PowerPoint as a presentational aid a good thing? There is no shortage of those who feel PowerPoint's effect is most often negative. Phrases like "death by PowerPoint" (DuFure & Lehman, 2004, p. 84) and "PowerPoint abuse" (Young, 2004, p. A31) have become idioms, while some authors assert simply that "PowerPoint makes you dumb" (Thompson, 2003). One of the most vocal critics of PowerPoint use is Yale's Edward Tufte, whose 2003 monograph, "The Cognitive Style of PowerPoint," is often cited. Tufte (2003) takes PowerPoint and PowerPoint users to task for encouraging presentation techniques, specifically the use of bullet lists, that "dilute thought" (p. 5) by reducing information to its lowest form and, in the process, eliminate narratives and causal reasoning.

Others, including Doumont (2005) and Katt (2006), argue that PowerPoint is a tool that can be used effectively or ineffectively depending on the practices of the presenter. Doumont argues that some of Tufte's (2003) criticisms suggest "a misunderstanding of the nature of oral communication, and of slides as a presentation aid" (Doumont, 2005, p. 65) and that effective slides, including bullet lists, can be helpful to an audience. That said, Doumont does not deny that many of the slides that presenters use are, in fact, *not* effective and thus *not* helpful. There are, however, few studies that provide empirical evidence to inform guidelines for proper use of PowerPoint or other instructional technologies.

Schrodt and Witt (2006) examined the effects of classroom technology use, including PowerPoint, on perceptions of teacher credibility and found teachers who augmented their face-to-face presentations with technology were generally perceived as being more credible than those who did not employ technology. In this study, however, students' attitudes were based on the instructors' descriptions of pedagogical devices that would be employed in the class, thus the *presence* of technology use, not the *quality* of technology use was considered.

Timmerman and Kruepke's (2006) meta-analysis of computer-assisted instruction (CAI) research examined comparisons of CAI channels (text, text with graphics, audio, video, apparatus). Although a number of moderating variables were addressed (course content, comparison medium, student level, CAI duration, CAI channel, opportunity for feedback, personal focus), whether the CAI technology was used well or poorly was not considered.

Cyphert (2007) points out that users of technology such as PowerPoint can be achieve an "electronic eloquence" (p. 171) by considering applications that go beyond merely using PowerPoint as a visual accompaniment to an oral presentation, suggesting a line of research that explores PowerPoint as a medium for visual rhetoric. Stoner (2007), analyzing the effectiveness of PowerPoint slides absent the oral message they we designed to accompany, suggests exploring PowerPoint from a new perspective, that of an inscriptional system. While studying these new approaches has merit, these lines of research do not address the fact PowerPoint will undoubtedly continue to be used as a presentational aid and that the best practices for *that* application remain primarily informed by speculation.

Pratt (2003) argues that, in spite of the abundance of examples of poor use, PowerPoint *can* be an effective tool, when properly used. If it is true that the effectiveness of PowerPoint depends on proper practice, what then constitutes effective practice?

Review of Literature Addressing Text Presentation Practices

Unfortunately, there is a paucity of research that informs the effective use of presentation software. Textbook authors and other scholars often fill the vacuum of empirically tested practice with prescriptive rules or guidelines that, while intuitively logical, have little, if any, theoretical grounding. For example, many authors suggest that, when using bullet lists, a presenter should limit the number of bullet points per slide and the number of words per bullet point. Bowman (1998) suggests a maximum of five bullet points with no more than five words in each. Brydon and Scott (2003) suggest a maximum of six lines, with six words in each. Hamilton (2003) also favors no more than six lines, with a maximum of 40 characters per line. Pratt (2003) offers the "triple seven rule" (p. 23) of no more than seven bullet points with up to seven words each. Adler and Elmhorst (2005) also endorse the seven/seven rule. Although none of these authors cite research-based evidence to support any version of these rules, there is a classic study by Miller (1956) that makes the case that human span of immediate memory (short-term memory) is limited to about seven chunks of information and that the span of absolute judgment (the number of stimuli that one can accurately discriminate simultaneously) is also about seven, imposing "severe limitations on the amount of information that we are able to receive, process, and remember" (p. 95). Remembering or processing over seven items simultaneously requires recoding on the part of the receiver. An inference can be made that holding displays of bullet points to seven or less items spares the receiver the necessity of recoding the data before storing them in working memory, thus making the information easier to mentally digest. Miller's conclusions provide a theoretical basis for speculating that limiting the number of bullet points to five, six, or seven may have a positive effect on the effectiveness of presentations, but fall short of providing empirical evidence to advance that position beyond speculation.

Prescriptive rules for other aspects of electronic slide presentation abound as well. Pratt (2003) suggests revealing the bullet points one at a time, as each point comes up in the presenter's narrative. Pratt claims that this practice benefits both the audience, who are not distracted by the display of points not yet covered, and the speaker, who is less likely to begin explaining a subsequent point before finishing the current one. Arrendondo (1994) also suggests bullet-points should be revealed one at a time.

Although few in number, there have been attempts to empirically test some of the intuitive prescriptions. For example, Bradshaw (2003) conducted an experiment in which several graphic elements thought to interfere with effective message processing (distracting background color, distracting font, use of sound effects, and insufficient font size) were manipulated. The comprehension of receivers who experienced the potentially distracting elements was less than that of the control group, who experienced presentations that were identical in content, but did not include the distracting elements, providing support for intuitive guidelines that recommend using non-distracting colors; simple, large fonts; and no gratuitous sound effects. Because the design of the experiment was to test the effect of multiple interfering factors acting in combination, the study did not attempt to determine which individual factors were responsible for the attenuation of comprehension.

The current study continues the process of establishing research-based best practices for using PowerPoint™ as a presentational aid by examining two frequently cited PowerPoint axioms: limit the number of bullet-points per slide, and reveal the bullet-points one at a time. Three basic questions are addressed:

RQ1: Does the inclusion of bullet-point visuals increase audience recall of the presented material?

RQ2: Does limiting the number of bullet-points per slide increase audience recall?

RQ3: Does revealing the bullet-points one at a time increase audience recall?

Method

Participants included 148 undergraduate students from a large, southeastern university. A one-way ANOVA revealed no statistically significant differences in age, GPA, or college-level standing of the five treatment groups. Each group was randomly assigned to receive one pre-recorded message. The audio portion of a twelve-minute treatment message consisting of four groups of five clearly-defined points each (a total of 20 points), was pre-recorded and transferred to video, where it was synchronized with each of the visual treatments. Thus the audio portion was identical for each treatment, but the visual portion, consisting of text slides only, varied in the following manner:

Group 1	five bullet points per slide, each line displayed one at a time
Group 2	five bullet points per slide, all lines displayed at once
Group 3	ten bullet points per slide, each line displayed one at a time
Group 4	ten bullet points per slide, all lines displayed at once
Control	introductory title slide only - no bullet points displayed

The design of the slides, in terms of colors, font, font size, and layout was the same for all treatments. In the versions that displayed bullet-point lines one at a time, each line appeared as the speaker began that particular point. In the versions that displayed all bullet-point lines at once, the lines were displayed as the speaker began the first point. The topic, Communication Apprehension, was relevant to the communication classes from which the participants were drawn, but presented prior to that topic being covered in class, making it unlikely that any of the participants had prior knowledge of the content of the message.

After receiving the message, participants were asked to answer questions in a printed booklet, including open-ended questions asking each participant to recall as many of the individual points that he or she could. After completing the test booklets, participants were debriefed and given the opportunity to ask questions.

Results

An initial analysis revealed several cases for which the data were incomplete, reducing the overall number of usable cases to 137. Of those, 27 received five lines per slide displayed one at a time, 25 received five lines per slide displayed all at once, 28 received ten lines per slide displayed one at a time, 31 received ten lines per slide displayed all at once, and 26 received the control treatment.

The first research question addresses the efficacy of displaying bullet lists, regardless of the method of display. A one-way ANOVA was performed to compare the recall of the control group (who received no visual information, other than a title slide) with the recall of the four groups that received some form of bullet list information during the presentation. ANOVA carries the assumption of equal *n*'s and homogeneous variances, however, the test has proven to be sufficiently robust to provide usable results when one of the assumptions has been violated (Hinkle, Wiersma, & Jurs, 1998). In this case, although the group sizes were unequal, Levene's Test did not reveal reliable differences in variance (*Levene Statistic* (1, 135) = 2.108, p = .149), so the data were analyzed without additional adjustment. The data revealed that those who received visual bullet list information demonstrated greater recall (*M*

= 9.23, n = 111, SD = 2.80) than those in the control treatment (M = 7.08, n = 26, SD = 3.45), to a statistically significant degree (F (1, 135) = 11.283, p = .001).

The second and third research questions address the effects of two common PowerPoint prescriptions: limiting the number of bullet-points to five per slide, and displaying the bullet-points one at a time, rather than all at once. A two-by-two factorial ANOVA was deemed an appropriate procedure. Again, the group sizes were not equal, but Levene's Test did not reveal reliable differences in variance (*Levene Statistic* (3, 107) = 0.269, p = .848), so the data were analyzed without additional adjustment. No statistically significant interaction effect between number of lines and method of display was found (F (1, 107) = 3.66, p = .059). There was also no statistically significant difference in recall based on including five versus ten lines per slide (F (1, 107) = 1.74, p = .190), however a statistically significant difference between the method of display treatments (one at a time vs. all at once) was revealed (F (1, 107) = 6.68, p = .011), although the effect size was marginal (r^2 = .056). The means are shown on Table 1.

Table 1
Recall – Comparison of means

	5 lines	10 lines	*Total*
Display one at a time	8.44	8.75	*8.60**
Display all at once	10.76	9.10	*9.84**
Total	*9.56*	*8.93*	

* p = .011

Discussion

The data support two conclusions. First, that augmenting a presentation with bullet-point text visuals can have a positive effect on audience recall of presented material. This finding is consistent with Vogel, Dickson, and Lehman (1986), who found the use of text slides (using overhead transparencies) to be effective in increasing retention.

Second, the data suggest that following the popular prescriptions for preparing and displaying the slides may not be as important as those making the prescriptions suggest. Further, the data indicate that some prescriptions, like displaying bullet-points one at a time, may not even be accurate. The authors could find no prescription that suggested showing bullet-points all at once is more effective than showing them one at a time, yet the groups in the all-at-once treatments produced reliably higher retention scores than those who received the (prescriptively favored) one-at-a-time method.

While one should be cautious about inferring too much from a single study, the implication for the future is that we ought not to rely on subjective, intuitive advice in determining best practices for PowerPoint use. As much as Edward Tufte may not want to hear it, PowerPoint is here to stay. That it is often used badly remains a given. That best practices need to be established to help presenters use this technology effectively is also true. Lacking, however, are sufficient empirical studies to inform the creation of those best practices. More research needs to be done. While research programs such as those suggested by Cyphert (2007) or Stoner (2007) may prove to be important from a theoretical perspective, the void in practical PowerPoint research B figuring out what works and what does not work

B must be undertaken as well. The sooner we can formulate research-based advice for PowerPoint users, the sooner we can stop resorting to intuitive speculation.

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