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Chapter 5: Instructional Message Design with PowerPoint

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Instructional Message Design:
Theory, Research, and Practice

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Key Points:

- Given both advantages and disadvantages of PowerPoint technology, scholarly discourse on PowerPoint-aided instruction should focus on maximizing its capabilities rather than debating whether or not to use it.

- Though learners both expect and like the use of PowerPoint in the classroom, research on the tool's impact on cognitive learning is inconclusive.

- Responsibility for effective PowerPoint-aided instruction lies in the hands of instructional designers to create appealing displays conducive to learning, instructors to deliver the presentations engagingly, and learners to actively participate in the learning process.

Abstract

Now a household name, Microsoft PowerPoint software is one of the most commonly used slideware presentation tools in business, scientific conferences, education, and other professional, academic, government, and military settings. As an instructional message design tool, controversy proliferates surrounding its role in the classroom experience and its impact on cognitive learning. After compiling the research, lessons can be garnered on how to best visually display PowerPoint slides, how to most effectively deliver PowerPoint-aided instruction, and how to maximize student learning from PowerPoint-based lessons. This chapter will explore the existing body of literature on the technology's capabilities and limitations; offer best practices

for instructional designers, instructors, and learners; and suggest future directions for research on PowerPoint use in higher education.

Introduction

As a tool for visually supporting the communication of information, PowerPoint has stimulated a broad spectrum of criticism and praise. From Edward Tufte's (2003a) vitriolic abhorrence of the tool as "corrupt[ing] absolutely" to Yiannis Gabriel's (2008) celebration of the technology for its performative and spectacle-producing capacities, PowerPoint has garnered an impressive mix of critics and fans alike. From its initial release in 1990 to its ubiquity today in education, business, government, and military settings, discourse on this game-changing software has evolved from curiosity about its capabilities to trepidation around the tool's constraints on bi-directional communication to a heated debate over its impact on how people think to finally a more judiciously scientific approach to quantifying its merits and demerits (Kernbach, Bresciani, & Eppler, 2015). If there is one overarching takeaway from the existing body of research on this technology, it is that there are very few "absolutes" in life (sorry, Tufte), and that the power of PowerPoint lies in the wiles of its user, while its efficacy as an aid to the conveying of content is determined by its beholder.

Within the realm of instructional design specifically, with a focus on postsecondary education (college students and adult learners) though with brief mentions of applications in K-12 environments, we must examine the use of PowerPoint from three perspectives: that of the instructional designer, the instructor, and the learner. Ideally, the goals of the instructional designer and the instructor *are* the goals of the learner, but a myriad of factors come into play for each of these groups of individuals when determining the value of the tool.

This chapter will discuss common perceptions, good and bad, of PowerPoint use in the classroom as well as research that attempts to quantify the tool's efficacy in improving cognitive learning. Based on this research, best practices for instructional designers and instructors will be offered, followed by recommendations for further study of the learner's role in PowerPoint-assisted instruction, a relatively underdeveloped area in the scholarship.

The Debate: Dilution of Thought, or Vehicle of Expression

Yale professor emeritus Edward Tufte's bombasts of PowerPoint are the most frequently cited criticisms of the presentation tool. His attacks – supported by illustrations and thoroughly articulated reasoning – emphasize the risks of PowerPoint in watering down, "disrupt[ing], dominat[ing], and trivializ[ing]" content (2003a, n.p.); "reduc[ing] the analytical quality of presentations" (2003b, p. 24); and enabling audience members to be passive recipients of information rather than active contributors to cognitive learning processes. He argues that "Bullet Outlines" – endemic in PowerPoint presentations – "Dilute Thought" (2003b, p. 5) and asserts that alternative presentation aids like well prepared, printed-on-paper handouts "tell the audience that you are serious and precise; that you seek to leave traces and have consequences. And that you respect your audience" (2003b, p. 24).

While Yiannis Gabriel, professor at the University of London, respectfully acknowledges Tufte's charging of PowerPoint with crimes on communication, theirs would surely be an entertaining conversation to witness given Gabriel's (2008) less frequently cited but similarly passionate exaltation of the tool. Gabriel extols the technology's rarely-tapped potential to facilitate an entertaining multimedia performance made more valuable by (Western) society's proclivity for image, spectacle, and multiplicitous stimulation. To complement this, Levasseur and Sawyer (2006) show that multimedia elements excite arousal in and demand attention from an audience, enhancing recall and improving learning motivation and outcomes. They caveat, though, that too much arousal can become distracting and impede cognition. The need for balance supports widely accepted cognitive load theory (Sweller, Ayres, & Kalyuga, 2011).

Further conversations on the pedagogical risks of PowerPoint usage (or, abusage) reveal concerns that PowerPoint is "*becoming* THE message" (emphasis in original) of instruction rather than an enhancer or supporter of instructional messaging (Craig & Amernic, 2006). Critics equitably concede that the efficacy of a PowerPoint-aided lecture is largely determined by the communicative skills of the lecturer, but even the best presenters fall prey to restrictions on student-instructor relationship-building imposed by interrupted eye

contact, a darkened room, and the perceived dominance of the speaker over the audience (Craig & Amernic, 2006; Kernbach, Bresciani, & Eppler, 2015; Ledbetter & Finn, 2017).

Perhaps the biggest threat to the instructor-learner relationship is the relative rigidity of PowerPoint-led instruction in that premade slideshows essentially program the instructor's line of reasoning throughout the class, discouraging improvisation, and streamlining thought processes into an inflexibly linear path regardless of impromptu student input (Gabriel, 2008). While Gabriel does allow that some presentations and learners benefit from the tidiness and linearity offered via PowerPoint-guided instruction, Craig and Amernic (2006) fear that instructors who become over-reliant on the tool lose their abilities to adapt should unanticipated questions or situations arise, hampering classroom dialogue and stifling organic knowledge-creation because of "an unwritten convention of PowerPoint that 'no matter what, get through all the slides'" (p. 152). That linearity that resists digression can be both a good and a bad thing. An instructor prone to tangents might benefit from the structure of a linear presentation, as might an anxious or struggling learner. However, especially in postsecondary education or when working with adult learners, digressions from the lesson plan can be where some of the most productive and innovative conversations take place.

Looking more specifically at the software itself, Kernbach, Bresciani, and Eppler's (2015) codification of 18 constraining qualities of PowerPoint is especially illuminating of the common pitfalls associated with some of the tool's preformatted features. With the 18 items categorized into cognitively, emotionally, and socially constraining qualities, lessons abound for instructors and instructional designers alike. These lessons include ways to avoid loss of meaning through excessive abbreviation and bullet-pointing, to prevent disengagement from content due to overloading of elements on a slide or number of slides, and to resist over-aestheticizing presentations in a way that privileges appearance over substance, or form over function.

One of the most compelling studies, in my opinion, that lends credence to Tufte's call for the abolishment or at the very least temperance of PowerPoint use comes from Hertz, van Woerkum, and Kerkhof's (2015) interviews of 24 scholars (12 novice PowerPoint users and 12 advanced) regarding why they use the tool the way they do. While recognizing the limitations of purely anecdotal evidence from a non-representative sample, the interviewees' responses to the

question of what they would do should PowerPoint *not* be available to them were especially telling. Some flat-out stated that teaching sans-slides was not an option, suggesting that the prevalence of the tool has turned it into a crutch without which new instructors cannot even walk into the classroom. Others responded they would simply employ a different tool such as a blackboard, though with reservations about the quality of hand-drawn images compared to computer-generated graphics. What becomes most alarming, however, is the responses that they would adjust their rhetorical or communication practices,

> "…present more conclusions, give more examples, more descriptions, tell more anecdotes, invite the audience to think about subjects, and improvise more. Some would adjust their voice to maintain the audience's attention and to emphasize structure, or would adjust their articulation or vocabulary." (pp. 279-80)

To state that these are actions they would take should PowerPoint no longer be available is to imply that these are actions they do not privilege when PowerPoint *is* available. If the convenience of PowerPoint leads instructors to present fewer conclusions with fewer examples, descriptions, and anecdotes, or to modulate their voices in a less attention-maintaining manner that does not emphasize structure, this serves as disturbing evidence that the technology in question is, in part and for some, contributing to a decline in instructional quality.

It is easy to get caught up in negativity, but PowerPoint devotees are just as numerous as its enemies. Chief among PowerPoint disciples are learners. Not only do students simply expect PowerPoint to be used in the classroom (Rickman & Grudzinski, 2000) and appreciate when their expectations are met (Ledbetter & Finn, 2017), but they also believe it to be more interesting, more motivating and beneficial for learning, visually clearer with better emphasis on important concepts, and better structured than traditional overhead- or blackboard-assisted instruction (Szabo & Hastings, 2000). Learner perceptions of instructor credibility and reports of a positive affective experience also increase when the instructor employs technology both inside and outside the classroom, such as sending regular emails and even sharing social media posts with students (Ledbetter & Finn, 2017). How student perceptions align with academic performance will be discussed later, but holistically the

research points to learners looking favorably upon their instructors using PowerPoint as a presentation tool.

Many instructors like using PowerPoint, too. Some reasons are practical; often textbook companies provide ready-made slideshows, reducing the work of lesson-planning (Jordan & Papp, 2014), plus the software is relatively intuitive and easy to learn with minimal training (Hertz et al., 2015). Instructors appreciate the ability of structured slides to jog their memory as well as the advanced updates that enable real-time collaboration, allow users to embed multimedia videos and animations, and offer professional designer recommendations (Baker, Goodboy, Bowman, & Wright, 2018; Hertz et al., 2015). PowerPoint is also widely available, and modern classrooms are equipped to support PowerPoint-aided instruction.

Diverse perceptions of PowerPoint leave this debate in something of a stalemate. Some people like it. Some people don't. There is no question that the merit of the tool lies not exclusively within the tool itself, but instead within its user and its perceiver; in instructional design, this is within the instructor and the learner. As such, the debate is not as simple as whether the tool is beneficial or deleterious to the classroom experience, but rather the debate should (and, thanks to more recent scholarship, does) revolve around methodology, or *how* the tool's capabilities can be maximized by both instructors and learners (Jordan & Papp, 2014).

Before we dive in to some of those specific methodologies, though, we have yet to explore perhaps the most important question regarding this technology in the classroom, which is whether PowerPoint-aided instruction *produces better results* than non-PowerPoint-aided instruction in terms of student learning and academic performance. Let's investigate.

The Bottom Line: Does PowerPoint Actually *Work*?

Well, as with most things, there is no black or white answer to PowerPoint's impact on learner performance (quantifiable through assessments) as differentiated from learner experience (qualitative in preference). This absence of a clear-cut correlation is not due to lack of research on the topic, however. Baker et al. (2018) conducted an impressive meta-analysis of 48 studies on the topic (selected from a pool of 486 identified articles) only to conclude that PowerPoint has no statistically significant effect on cognitive learning, defined as

learning ranging from remembering facts to creating knowledge. This is almost undoubtedly a product of the spectrum of opinions on the tool discussed above, along with inconsistencies in presenter skill levels and variety in student learning styles. There are many other influencing factors to consider, though.

For instance, this meta-analysis reflects on the role of subject matter on PowerPoint's potential to yield results. The authors cite two studies (Rowley-Jolivet, 2002; Shapiro et al., 2006) that demonstrate PowerPoint to be effective in Science, Technology, Engineering, and Mathematics (STEM) disciplines, stemming (pun intended) from dealing with complex, model-based information that benefits from the visual (through graphics) and demonstrative (through animations) capabilities of the computer-based tool. Humanities subjects, on the other hand, dealing more with abstract ideas rather than tangible phenomena, are less conducive to the use of such static and dynamic visuals. Literature courses rely almost exclusively on the reading and analyzing of texts; philosophy seminars primarily entail debate and discussion. Neither subject *requires* imagery to learn, so PowerPoint usage in such classes would likely be unnecessary or text-heavy.

Learner age is another factor when assessing PowerPoint's value in achieving learning outcomes. Kalyuga, Ayres, Chandler, and Sweller (2003) discuss the expertise reversal effect – the principle that instructional techniques that work with inexperienced learners no longer work with advanced learners – in the context of multimedia instruction. Findings suggest that inexperienced learners (for instance, K-12 students) benefit more from PowerPoint's ability to explicitly outline key points and break down complex concepts into small chunks of information, while experienced learners find the additional support redundant, excessive, or reductive, ultimately interfering with their cognitive processing. These environmental factors of subject matter and student expertise merit further research.

Another influencing element coming to light is that of how individual student learning styles inform the relative efficacy of PowerPoint-augmented instruction. Levasseur and Sawyer (2006) synthesize four studies on this topic (Beets & Lobingier, 2001; Butler & Mautz, 1996; Daniels, 1999; Smith & Woody, 2000) and surmise that the best-case scenario for student learning would be to match those with preferences for visual learning with predominantly image-based, computer-generated slide presentations and those with verbal preferences with more text-oriented slides or handouts. These studies

show an overall preference for imagery over verbal representations (77%; Butler & Mautz, 1996) and for computer-generated slides over the use of overheads (54%; Beets & Lobingier, 2001). Daniels' (1999) study of the Myers-Briggs learning style classification system correlated students identified as having a "sensing-judging" style with preferring structured classroom environments and thus performing better with computer-generated slides, while those with "sensing-perceiving" proclivities learned better from hands-on experiences.

Gabriel (2008) offers parallels to the (perhaps over-simplified) dichotomy of verbal vs. visual learners in his discussion of caveats and benefits of using lists, images, and statistics in PowerPoint slides. Lists, consisting mostly of text, may appeal more to verbal learners in how they structure thought processes (likewise appealing to sensing-judging learners) and convey reasoning logic from instructor to student. Lists might turn off visual learners, though, in that contexts are obscured, or too much text is overwhelming. Images, on the other hand, may appeal more to visual learners in that they are engaging, demonstrative, and diagrammatic. Verbal learners, though, may perceive incongruence in exclusively image-based presentations or experience cognitive overload trying to extract meaning without textual explanation. Statistics have potential to be either or both visual and verbal, so as long as their presentation avoids misleading the audience, they could have benefits for both learning styles.

Of course, the idea of instructors catering presentation styles to individual learning styles is idealistic and ultimately impractical to implement at a 100% success rate. It does raise questions, though, of how instructors might pre-determine student learning styles to better design the classroom experience, or if there are other correlations, such as between learning styles and chosen undergraduate majors, that might facilitate lesson planning and decisions of whether or how to employ PowerPoint. With limited research addressing these questions, though, it seems that overall instructors should aim to incorporate a variety of presentation styles – verbal and visual, PowerPoint-aided and non-PowerPoint aided – or PowerPoint presentations that incorporate both verbal and visual elements in order to reach as diverse a population of learners as possible.

The scholarship's inability to pinpoint a clearly positive or negative relationship between PowerPoint and student success on assessments is somewhat contradictory to the overwhelmingly positive trend of student self-reports of *perceived* benefits on their

understanding of class material. For instance, university students in a social psychology class reported believing they learned more from PowerPoint-supported lessons compared to lessons supported by overhead transparencies, despite scoring 10% lower on the quizzes that derived from the PowerPoint-supported lectures compared to those following overhead transparency-based lessons (Bartsch & Cobern, 2003).

Learner and instructor perspectives do not always align on this topic, either. James, Burke, and Hutchins (2006) found that while university students and faculty members alike perceived PowerPoint to positively influence note-taking, fact recall, emphasis on key lecture points, and attention-holding, students were less trusting of the tool's ability to help them to learn more effectively than faculty members were. Results suggest that some instructors (in this study, business professors) may overestimate PowerPoint's value to the point of neglecting student desires for a more personal rapport with the instructor and more class-wide discussions, both social motivations.

In sum, Baker et al.'s (2018) meta-analysis cites over a dozen studies purporting statistically significant positive student perceptions of PowerPoint usage on cognitive learning. However, 23 studies across a range of disciplines and age groups show PowerPoint-supplemented instruction to produce *less* cognitive learning, while 25 studies show more cognitive learning, ultimately averaging out to a wash. James et al.'s (2006) citing of two studies (Lowry, 1999; Szabo & Hastings, 2000) showing a positive correlation between PowerPoint and cognitive recall, one study (Daniels, 1999) showing no correlation, and one study (Amare, 2006) showing a negative correlation reinforces this draw.

It is important not to undervalue student perceptions in favor of performance-based measures of "success" alone, though, as learner enjoyment of the classroom experience has incalculable second- and third-order effects on their long-term educational careers. PowerPoint's positive impact on student affect (Ledbetter & Finn, 2017), motivation and interest (Apperson, Laws, & Scepanksy, 2006; Szabo & Hastings, 2000), and satisfaction (Levasseur & Sawyer, 2006) is not to be belittled.

Now What?

Rather than feeling discouraged at the overall impasse that current scholarship leads us to regarding the virtues and vices of PowerPoint as an instructional message design tool, it is time now to capitalize on the lessons we are able to glean from the healthy debates thus far. I will discuss some of these lessons as they apply to both instructional designers and instructors in the categories of (1) visual display and (2) presentation delivery.

Part 1: Visual Display

How PowerPoint slides appear on the screen can make a world of difference when it comes to student perceptions of instructor professionalism and credibility, enjoyment of and engagement in the classroom experience, and understanding and recall of content. The visual impact of a well- or poorly-constructed slideshow presentation can determine first impressions of how a class will proceed and thus shape student expectations for the duration of the lesson and even the entire course. As such, it is important to be *intentional* (making purposeful message design choices about visual presentation) and *consistent* (clean, accurate, and professional) in crafting text, static graphics, and dynamic multimedia functionalities to achieve the foundational goals of encouraging and facilitating cognitive learning.

Text. PowerPoint designers regularly quote variations of the "6x6" rule for text, meaning a slide should have no more than six lines of text with no more than six words per line. Zimmerman and Zimmerman (1997) were among the earliest to recommend this rule in their manual *New Perspectives on Microsoft PowerPoint 97*, though they revised it for unspecified reasons to the "7x7" rule in their 2014 edition now co-authored with Pinard. This rule seems to me rather outdated, though, and somewhat useless on its own; the words still need to have meaning and significance, and, as with all message design, it comes down to *how* those 36 words are presented, not only in terms of being in a grid-like square, but in terms of the font's legibility from a distance, the text's contrast to the background even in poor lighting, the vocabulary's clarity and accuracy, and the text box's logical alignment and relationship to other elements on the screen.

Once we graduate from this elementary decree of how many lines of how many words to include on a slide, we can reflect more critically on how text format influences student learning. Five of Kernbach et al.'s (2015) six cognitively constraining qualities reflect shortcomings of text-based listing habits encouraged by PowerPoint's conveniently pre-formatted slide layouts: (1) *Abbreviating* words or concepts sacrifices meaning due to omission or partial-conveyance of content; (2) *bulleting* blurs the "big picture" in its generalizing tendencies; (3) *devaluing knowledge beyond the slide* deludes viewers into believing anything not on the slide isn't worth knowing; (4) *fragmenting* forces a choppy thought structure dictated by the order in which text is projected; and (5) *trivializing* renders content less significant because of its self-evident existence on the slide – it's stated in front of me as black and white fact, so what can I possibly contribute, and why should I bother trying?

Each of these cognitively constraining qualities carries lessons to employ bullet-pointed lists only when appropriate, for instance when the guiding logic behind content is sequential, hierarchical, or classified into groups or sets. Kernbach et al. (2015) also stress that provision of external learning materials as complements to slides (as opposed to letting the slides stand on their own) can help mitigate for the potential loss of meaning that results from abbreviated text or fragmented sentences. They argue the more diversity in instructional strategies, the better.

In a more targeted study on typography in presentation slides, Alley, Schrieber, Ramsdell, and Muffo (2006) discovered that actively resisting the constraints of abbreviation and fragmentation by using a succinct (no more than two lines) but syntactically complete sentence that summarizes the main point of a slide as the slide's headline – rather than the typical one- or two-word title – significantly increases retention of that main point. They maintain that this headline should be left-justified, bold, and in a sans-serif font. Foregrounding the key takeaway of any given slide *in* the title box rather than merely alluding to it in the title and then presenting it somewhere buried in the text body ensures that it is the first thing students read and makes it easy to reference when reviewing slides down the line.

Images and static graphics. While text is arguably indispensable in effective PowerPoint design, students find instruction more interesting when teachers use images instead of purely text-

based slideware (Tangen et al., 2011). The key to using graphics effectively is congruence, meaning visuals must relate to and support the content and associated text, if applicable. Per Mayer's (2001) coherence principle, text or images that do not align with the content are merely distractions that harm student learning and should be eliminated. As support, Bartsch and Cobern (2003) show a decline in both student preference for and performance following PowerPoint presentations displaying graphics that were irrelevant to the content. Tangen et al. (2011) also confirm that PowerPoint slides containing images logically related to the content were most beneficial to student learning. Conversely, purely text-based slides were found to be more beneficial to student learning compared to slides showing unrelated images, driving home that it is not just the presence of images but the images' association with the content that makes them conducive to learning.

There are also certain contexts in which some images are more beneficial than others. Hertz et al. (2015) identified five chief reasons why instructors use pictures in their presentations: to explain concepts like how something functions or to show progression through a flowchart, to support student comprehension of complex ideas, to serve as a mental break in content or a transition into a new topic, to add humor or positivity to the classroom environment, or to help themselves remember what to talk about. Hertz and colleagues also found that advanced presenters used almost twice as many images as novices, suggesting that less confident or experienced instructors rely on text as a crutch and fear the fact that images allow more room for interpretation, opening up both freedom for creativity in the best case and opportunity for *mis*interpretation in the worst case.

Subject matter comes into play, too. Gabriel (2008) points out that scientific fields like "anatomy, geography or physics" benefit most from the use of images, given their "infinite variation of nuance, magnification and colour, immeasurably enhanc[ing] understanding and communication" (p. 265). Less demonstrative subjects, though, like foreign languages or law, are characteristically less visual in nature, so use of graphics or clip-art would be extraneous to the subject matter and could even seem amateur.

Regardless of subject, this notion of images (and text and multimedia elements, for that matter) potentially being extraneous is a danger all instructors and instructional designers should beware. Mayer and Moreno (2003) identify three assumptions associated with

learning that employs both words and images: *dual channel*, meaning humans process verbal and visual information separately; *limited capacity*, meaning humans have limited processing abilities in those channels; and *active processing*, meaning learning requires substantial effort in both channels. Given that PowerPoint presentations using both text and images target both verbal and visual channels, incorporation of graphics must avoid inducing cognitive overload in students by a) not redundantly illustrating what was already communicated through the verbal channel, b) not serving purely decorative functions, and c) not being so intricate or complex that the learner is unable to parse meaning from them.

Multimedia functionality. Over the years, PowerPoint has grown into a surprisingly multifaceted multimedia software tool that enables its users to employ audio, video, animation, special effects, and interactivity in addition to text and graphics. There are competing programs for these advanced features (the entire Adobe Creative Suite being one example), but instructional designers stand to gain from maximizing these oft-overlooked capabilities within PowerPoint given their relative simplicity compared to pricier alternatives.

As motivation to explore these more challenging features, Hallett and Faria (2006) show that students both recalled more and were more interested in instruction when the material was delivered through a combination of the advanced multimedia features of audio, video, animation, and special effects as compared to a traditional lecture. Gabriel (2008) also purports that modern culture not only promotes but necessitates multi-tasking in a way that favors multidimensional experiences over one-directional lectures.

Incorporating animation into a PowerPoint slideshow is another relatively simple way to increase the complexity or sophistication of the presentation. Animation enables the instructor to control when and how text appears to echo their lecture organization and direct learner attention to certain topics at certain times. Doing so keeps the learner on pace with the instructor, preventing them from looking ahead or being distracted by material the presenter has not yet addressed. Animation can also extend to figures, making objects move across the screen, or demonstrating progression (in time, size, or significance). These effects cannot *only* be attention-grabbing, though; they must also aid in the explanation or exposition of the content (Reiber, 1990).

Findings on whether animations influence cognitive learning are murky. Miller and James (2011) found in their research on PowerPoint usage in college-level astronomy courses that students perceived animated slides to be more effective, but in-class exam scores revealed no quantitative benefit from the use of animations. They did find, however, through end-of-semester surveys, that the animations may have improved long-term memory of the material and that animating graphics may be more impactful than simply animating text. More research is needed to conclusively determine the benefits of animation, but arguably student preference for movement on the screen is justification enough to employ it.

Overall, when it comes to piecing together text, graphics, and other multimedia elements, Baker et al. (2018) recommend instructors consult the principles of cognitive theory of multimedia learning. Mayer and Moreno's 2003 article on reducing cognitive load in multimedia instruction offers nine techniques, including conveying words through auditory narration rather than on-screen text (modality principle), offering cues for how to process information (signaling effect), and avoiding visually displaying and orally speaking the same text, again erring on the side of narration over projecting large blocks of text on a slide (redundancy effect). These broad lessons can apply in a multitude of scenarios with PowerPoint-aided instruction, with the general takeaway that, often, less is more.

Despite PowerPoint's multifaceted capabilities, through the piecing together of these visual aspects of a slide-based presentation, instructional designers can quickly recognize the limitations of having to fit sometimes large amounts of information into a finite amount of space, or of imparting intricate or abstract concepts by means of a tangible medium. As such, the visuality of a PowerPoint presentation only takes the learning process so far. Ultimately, the efficacy of PowerPoint-based instruction will come down to how the presenter delivers the visual aid to convey their message.

Part II: Presentation Delivery

The visual display of a PowerPoint presentation is only one piece of the puzzle when it comes to using the technology in the classroom. Yet another of Kernbach et al.'s (2015) insightful constraining qualities is that of *overaestheticizing*, or allowing the visual aspects of a PowerPoint presentation to take precedence over

the content of the presentation itself. They reference Tufte (2006) to accentuate that visuals serving purely ornamental purposes are distracting and counterproductive to learning. So, while aesthetic elements certainly play a role, how instructors use the visual aid to support and facilitate their delivery – rather than allowing it to give the presentation for them – is of greater importance.

  Rhetorical skills and lesson facilitation. While it is easy to get caught up in the beautification of a PowerPoint presentation, instructors should also recognize the need to devote just as much, if not more, energy to their own rhetorical skills. Hertz et al. (2015) identify that one reason why novice instructors relied on PowerPoint stemmed from personal insecurities, either because they felt they lacked charisma, were anxious that their pronunciation was difficult to understand, or feared they might forget what to say and thus appear unprepared. I am by no means unsympathetic to these forms of self-doubt, but they cannot be used as excuses to rely on technology to do the teaching in place of the instructor. Instead, they must be used as motivation to discover methods of alleviating these apprehensions.

  Holistically, we must recognize, as Schnettler (2006) did, that the presenter and the slides are (or should be) intertwined. Presenters must be able to *translate* bullet point lists and graphical images to the audience. This means speakers should rarely read slide text verbatim or superficially summarize projected images (the audience can do this themselves, given a few moments of silence) but instead should offer their expert interpretations of the text or graphic, elevating it from its mere face value into something of significance.

  The speaker's delivery and ability to expound upon what is displayed on-screen is crucial to the effectiveness especially of text-based slides given the frequent pitfall of bullet-pointed lists to "imply certain assumptions that are not always met," for instance, that the items listed are exhaustive or mutually exclusive (Gabriel, 2008, p. 263). Lists can often be reductive, slashing complex ideas down to superficial summaries communicated through truncated sentences. Craig and Amernic (2006) even warn of PowerPoint's "profound impact on literacy", where "[t]he obligation to form full sentences has become optional and the spelling of polysyllabic words has become a lost art in a sea of PowerPoint-induced abbreviations" (p. 157). Two lessons here become, first, resisting temptations to over-simplify slide text to the point where quality is compromised due to limitations in

quantity (the area available on the slide, or the arbitrary 6x6 rule), and, second, to mitigate for the condensed text by using practiced rhetorical skills to clearly articulate the meaning of that text.

Learner-instructor relationship. One of the biggest critiques from students and instructional designers alike of PowerPoint-led instruction is the seeming barrier it emplaces between the learner and the instructor (Jordan & Papp, 2014). Craig and Amernic (2006) assert that PowerPoint can (but does not have to) limit "immediacy behaviors" like maintaining eye contact, reading body language and facial expressions, hearing laughter or side chatter, etc. (p. 152). Kernbach et al. (2015) categorize both emotional and social constraints that result from PowerPoint usage, including lack of personal attachment, dominating (of the presenter over the audience), and sitting in the dark (a physical environment that renders the audience sleepy and thus less likely to engage in lively discussion).

Some instructors actually *like* that PowerPoint presentations interrupt direct eye contact and take attention away from them (Hertz et al., 2015). In cases where one-way communication is the goal, this limitation may in fact not be a problem (Kernbach et al., 2015). However, in most higher education classrooms and adult learning environments, active discussion and interactive group collaboration are considered more engaging and productive (Baker, Jensen, & Kolb, 2005). Instructors insistent on using PowerPoint in these contexts should look for ways to integrate discussion into their slides.

One technique camera-shy instructors can use to help break the ice with students is embedding adjunct questions, defined as questions explicitly incorporated into instructional texts (or, in this case, PowerPoint presentations) to engage learners with the content (Valdez, 2013). Valdez's experiment with anatomy students discovered that the students who were asked open-ended adjunct questions throughout a lesson retained and comprehended the information significantly better than the students who were asked no questions. Students can respond to the questions in writing (as they did in Valdez's study) or through a facilitated class-wide discussion as a method of reinforcing the material and creating memorable experiences.

As a second ice-breaking technique, DenBeste (2003) suggests beginning class projecting an image to spark a conversation about the significance or relevance of that image to the topic of the lesson. She

argues that this sets the tone for the rest of the session, gives students something to recall and build upon, and gets them talking right from the start, increasing the likelihood of speaking again later. This can establish a more conversational rapport between the instructors and learners early in a lesson.

Future Directions: Learner Responsibility

Thus far we have focused predominantly on the instructors' and instructional designers' roles in ensuring a successful PowerPoint-assisted classroom experience. But, are not the learners – especially once they pass the K-12 age group – partially responsible for their own development? A few scholars have alluded to the need to proactively teach students how to get the most out of PowerPoint-led instruction (Baker et al., 2018). For instance, students should receive guidance on where to direct their attention during class, and on how to take useful notes (Raver & Maydosz, 2010). Instructors should also foreground student expectations regarding technology use in their syllabi and ensure that learners recognize PowerPoint in the classroom as a framework of key ideas and not the end-all-be-all of content (James et al., 2006; Ledbetter & Finn, 2017). Each of these ideas merits targeted research to see how active learner engagement could potentially help mitigate for some of the aforementioned limitations or weaknesses associated with PowerPoint itself or its deliverers.

Researchers should then explore how instructors teach learners how to use PowerPoint, as it is the go-to tool for student presentations, again due to its widespread availability and relatively intuitive interface. Hertz et al. (2015) suggest that students should first and foremost be taught rhetorical communication skills (sans-PowerPoint), then how to design aesthetically pleasing and functional slides, and only then how to deliver those slides to an audience. This is just one potential method for training our universities' future PowerPoint-wielding faculty members that deserves further consideration.

Conclusion

In sum, the visual display of PowerPoint slides may receive an "ooh" or an "ahh" on first glance, but PowerPoint-aided instruction

ultimately is only as valuable as the instructor delivering the slides makes it. Instructor preparation needs to focus equally on cultivating rhetorical confidence and classroom facilitation skills as well as fostering meaningful relationships with the learners without hiding behind technology.

Despite development of competitors like Prezi and Google Slides, PowerPoint software does not appear to be going anywhere any time soon. Even with its challenges and drawbacks, there is no denying that PowerPoint *can* be used effectively. It is simply up to instructional designers to craft meaningful, cognitively manageable slides, instructors to present those slides with authority *and* flexibility, and learners to understand the role technology plays in the classroom balanced with their own responsibilities. With this trifecta of skill and awareness, PowerPoint can truly live up to its potential.

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