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PowerPoint in a New Key

Mark R. Stoner

This essay offers an analysis of PowerPoint apart from the histrionics of the "'tis and 'taint" arguments about its value, and proposes a program of research to move forward our understanding of PowerPoint as an inscriptional system. To that end, the study begins with a discussion of PowerPoint as an inscriptional system that employs both discursive and presentational codes. Concepts drawn from the literature are used to analyze a sample of PowerPoint materials. A research agenda is developed from the implications of theory and the results of the analysis.

Keywords: PowerPoint; Pedagogy; Inscriptional Systems; Metadiscourse; Codes; Logic

Whether one traces the advent of PowerPoint™ from its first iteration as "Presenter" (Gaskins, 1984) or to its essential dominance as the presentational application as part of the Microsoft Office Suite™ (1997), a great deal has been said about it in a relatively short period of time. Much of what is written about PowerPoint falls into three general categories: tips for using it, arguments defending it, and arguments criticizing it. This essay takes another cut across the grain by offering a theoretical analysis of PowerPoint apart from the histrionics of the "'Tis and 'Taint" arguments (Atkinson, 2004; Byrne, 2003; Keefe & Willett, 2004; Lanius, 2004; Mason & Hlynka, 1998; McDonald, 2004; Tufte, 2003a; Voss, 2004) about its value, and proposes a program of research to move forward our understanding of PowerPoint as an inscriptional system (Pea, 1993).

Levasseur and Sawyer (2006) conducted a comprehensive review of the extant literature on the use of PowerPoint (i.e., computer-generated slides) in the classroom. Overall, the conclusions remain ambiguous. "Put simply," they write, "the majority of studies comparing computer-generated slide-based instruction against other instructional methods have failed to find significant differences in learning outcomes" (p. 116).

Mark Stoner (Ph.D., The Ohio State University, 1987) is professor in the Department of Communication Studies at California State University, Sacramento. The author wishes rto thank Jo Sprague (San Jose State University), Becky LaVally (University of Texas, Austin), colleagues at the University of Newcastle Upon Tyne (U.K.), Universitaù Della Svizzera Italianna (Lugano), and two anonymous reviewers for their helpful comments. Mark nStoner can be contacted at stoner1@csus.edu

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What is discouraging is that, as Lavasseur and Sawyer suggest, the use of computer-generated slides "*should* be able to augment student learning" (p. 117). They continue:

> Computer-generated slides adhering to certain design principles might consistently enhance learning. Unfortunately, existing research offers little guidance on the design process. . . . Clearly, future scholarship needs to uncover design principles that would allow educators to generate discernible learning improvements from this teaching technology. (p. 118)

Their call for scholarship addressing design principles that foster learning is on point. This essay is an effort to start that line of study. Such a study of PowerPoint requires a conceptual point of view that affords systematic examination of it. Any programmatic research effort requires a heuristic theoretical perspective that points at least to related topics which, when investigated systematically, may yield a coherent body of useable knowledge. Such a project invites starting with a wide frame which can be focused on individual qualities of PowerPoint and its use. To that end, this study begins by discussing PowerPoint as an inscriptional system that employs both discursive and presentational codes. Since PowerPoint is both a tool for writing and reading, analytical concepts are drawn primarily from technical writing literature that attends to issues related to writing and reading. Using concepts drawn from the existing relevant literature, analysis of a sample of PowerPoint materials is presented for the purposes of illustrating the relevance of the concepts and excavating potential areas of research that are logically related. This is a rhetorical analysis that moves from description to analysis and then interpretation of the rhetorical (design) elements of a PowerPoint presentation (Andrews, 1983; Cathcart, 1966; Stoner & Perkins, 2005). The specific analytical tool or "search model" (Stoner & Perkins, 2005, p. 32) is constructed from concepts that emerged from the literature review. Based on the analysis, a program of research is outlined, suggested by both theory and the results of the analysis that may provide a better understanding of the nature of and, consequently, the effective use of PowerPoint as a pedagogical tool.

The Communication Key

Starting from a wide frame, Langer's (1959) analysis of symbolism makes clear our use of two complementary symbol systems: discursive and presentational. Briefly, discursive symbols are verbal. In speech or writing, words, to be meaningful, must be articulated one after another in particular syntactic orders or patterns. Discursive communication comprises discrete information bits that build meaning over time—as in the case of this sentence. That is, readers or listeners must wait for speakers to articulate a series of syntactically governed morphemes before messages can be sensibly and correctly decoded semantically. Logical relationships are constructed between the words syntactically by which parts of the world are named, categorized, ordered, and contextualized, making them meaningful (Langer, 1959).

Coupled with the discursive system that drives logical efforts at understanding experience, presentational representational systems, grounded in perception, serve important nonrational functions. These Gestalten forms rely on perception of pattern and on physical experience, and serve to articulate intuitive knowledge (Langer, 1959). Presentational symbolism is experienced in an instant, as a whole. For example, when one walks into an art gallery and views a picture, one takes in the picture in its entirety. For presentational symbols, there is no dictionary to arbitrate meaning, nor is there any formal grammar of presentational forms to which one can appeal to reduce ambiguity. Such symbolism gains meaning from conventions or patterns recognized through experience, but without a formal grammar or dictionary. The meanings of any presentational message may be quite clear (e.g., international driving signs), but sometimes presentational messages (graphs, images, diagrams, verbal models, etc.) are so unclear and ambiguous that, without the verbal message gloss, interpretations can be quite diverse. This is a particularly acute problem for PowerPoint presentations as they are commonly put online. Any analysis of PowerPoint must acknowledge the dual codes of discursive and presentational symbols. The question of how these codes interact and how meaning is made by audience readers emerges as the fundamental question any research program relative to PowerPoint must engage.

PowerPoint and Pedagogy

For the most part, PowerPoint is used primarily for pedagogical purposes. This focus is appropriate, given its almost ubiquitous use in primary-university classrooms, training rooms, briefing rooms, and even churches. Whether the user is displaying a map of the solar system in a fifth-grade science class or principles of evangelism for missionaries, PowerPoint may be used for conveying information and for interpreting material presented. If we begin from a constructivist perspective, which makes sense when one observes that PowerPoint is used in social contexts (there is no evidence, for example, that anyone uses PowerPoint to keep a journal), the starting point for the discussion is this: Knowledge is socially constructed. At some point in all pedagogy, someone talks or writes (or in the case of PowerPoint, often both codes are employed simultaneously), while others listen and think about the content of the presentation. The specific quality of dual codes functioning—speech and writing—is important to understanding PowerPoint as an inscriptional system.

"Effects with" and "Effects of" Tools for Thinking

Miller's research (1956) sheds light on the cognitive capacities of modern people and helped to explain how we cope when those capacities are strained. One coping strategy is construction of representations for chunks or clusters of information which serve as a kind of memory dump and facilitate thinking about the patterns within the information so that mental capacities are not completely expended on remembering the information itself. An abacus is one such representational tool. The

beads on the abacus display information (the outcome of prior mental work such as counting or calculation) for the user who can then do more complex things with available cognitive resources. When we design and employ such tools for mental work, we are *distributing intelligence* (Nickerson, 1993; Pea, 1985, 1993). Pea (1985) argues that, "Intelligence is not a quality of the mind alone, but a product of the relation between mental structures and the tools of the intellect provided by the culture" (p. 168). This understanding of *intelligence* controls the analysis in the present study.

An important and relevant insight about the mechanisms we devise to assist our thinking is that they contain residue of the logics used by their designers (Norman, 1988; Pea, 1993). These media are not neutral, but typically, the directive effects on thinking or behavior are not visible. For example, LEGOS carry within their design implicit directions for use and limitations on their use (Norman, 1988). What is important to note is that while the logic of the tool continues to operate, it is relegated to the background relative to function. However, in the case of inscriptional systems such as PowerPoint, the logic of the tool, while immediately invisible, may have a profound effect on users' thinking. Pea (1993, p. 57) has argued that "computer tools serve not as they are often construed—as 'amplifiers' of cognition—but as 'reorganizers of mental functioning'". Nickerson echoes Pea's insight, and emphasizes the point that these devices do not think for us, but direct, shape, and influence how we think and about what we think (Nickerson, 1993, p. 243). Salomon, Perkins, and Globerson (1991), pp. 2–4) point out that while we may be quite aware of the "effects with" such technologies in achieving certain outcomes or products of thinking, we may not be as aware of the "effects of" using these devices to train our habits of mind.

By way of example, consider an instructor's use of a three-dimensional model of an atom to explain the notion of atomic structure. The model provides a concrete, sensible representation of *atom* which students can easily understand. The model as representation serves an important function of providing an elementary understanding of atomic structure (the effect *with* the model is a functional conception of *atom*). At the same time, it constructs a way of conceiving *atom* that is factually incorrect. The model substitutes a static and concrete conception of an atom as something like a minisolar system for a more accurate but abstract understanding of atom as a phenomenon better described statistically. Most people understand matter as tiny balls and sticks holding the parts of the atom together rather than as various particles held together by invisible forces wherein the positions of any of the particles are a statistical guess, better represented by a cloud than an orbit (the effects *of* use of the model is a strongly held, but incorrect conception that requires of students some effort to unlearn in order to for them to move to a more sophisticated understanding of atomic structure). The subtle effects of the tools with which we work on what and how we think are particularly relevant in pedagogical contexts. PowerPoint, as a writing and reading tool, certainly imposes on the structure of information presented, on the logic of the content's form and meaning, which consequently requires certain kinds of responses by audiences. All tools provide direction for their

use more or less effectively, and PowerPoint is no exception. More needs to be known about the specific effects of PowerPoint on how information and its interpretation are constrained by the coding requirements of that medium.

PowerPoint as Inscriptional System

This is not to say that all "effects of" PowerPoint are necessarily negative. All tools have certain affordances which can be appropriated by users to the degree that users understand the technology of the specific tools being employed. According to Norman (1988), "affordance refers to the perceived and actual properties of a thing, primarily those fundamental properties that determine just how the thing could possibly be used" (p. 9). What makes PowerPoint essentially different from common tools such as door handles, scissors, or luggage carriers is its symbolic and communicative nature. We use representational tools so automatically and so commonly that their inherent qualities recede from consciousness. Nevertheless, as Pea (1993) notes, representational systems, a category that PowerPoint inhabits, possess an "external, in-the-world status which allows for the construction, review, deconstruction, and the emergence of completed structures of inscriptions that have little relation to their patterns of temporal development" (p. 61). Pea is pointing to the requirement of inscriptional systems that they be taught to novice users since such systems are not re-presentational or immediately intuitive. For example, in choreography, labanotation is an inscriptional system that describes dance steps. Figure 1 describes a basic dance step, but for readers of this essay with no dance background or instruction in labanotation, it makes no sense because it has "little relation to [its] patterns of temporal development" (Pea, 1993, p. 61).

Just to be clear, inscriptional systems are not necessarily graphical or nonsymbolic. For example, Quine (1937) lays out a way of notating logic for the purpose of limiting logic to mathematics. Quine *inducts* readers into an understanding of the symbols, their relationships (syntactics), how they translate in context (semantics) for the purpose of preventing intrusion of nonlogical statements (pragmatics). His essay amounts to a tutorial for inducting users into the system for the same reasons a choreographer must be taught to use labanotation.

Pea (1993) goes on to note that the inscriptions "rarely reveal their affordances for activity" and that a "person has to be introduced to, and preferably participated in, the activities that give meaning to these inscriptions" (p. 62). He argues that expert users of inscriptional systems know what they do effectively and where their weaknesses lie. However, "much of this is invisible to the initiate since . . . social practice does not lie 'in' the representation itself, but in its roles in relation to the activities of persons in the world" (p. 62). That is to say, the inscriptional system is *symbolic*, possessing a logic (syntax) of symbols and an inherent logic of action. For a choreographer, in order for a labanotation to make sense, it must employ the syntactic rules of the inscriptional system so that interpretation (semantic) of the diagram results in replication of proper action.

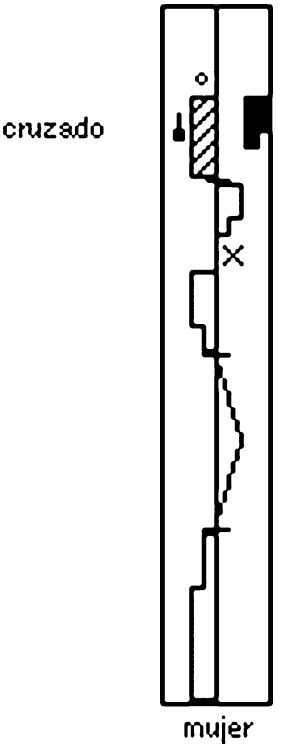

Figure 1. Example of labanotation for a single dancer.

People using PowerPoint assume it to be a neutral tool for writing and reading, but in as much as it is a humanly designed inscriptional tool, it must possess a logic-limiting quality as do all such tools; as an inscriptional system, that quality of PowerPoint is essentially invisible to any user not attending specifically to the subtle effects imposed when encoding messages. Although a great deal has been written about how to use PowerPoint, nothing in the literature, so far, has focused on the limiting effects or affordances of PowerPoint as an inscriptional system. Given its pervasiveness, these are areas of study to which we should attend.

In order to confront PowerPoint directly, the frame must be narrowed from the broad theoretical perspective taken so far to an examination of the application in use. The following section explores theories of writing and reading. Concepts drawn from this discussion will form a search model for an analysis of a sample PowerPoint presentation posted on the web. From that, a research agenda indicated by the analysis is offered.

Writing, Reading, and PowerPoint

As a presentation tool, PowerPoint employs various media within the modes of discursive and presentational communication, each of which employs different semiotic principles. Consequently, audience members are listeners and readers

simultaneously dealing with very different symbolic codes. Gold (2002, pp. 258–259) argues that PowerPoint has redefined the notion of reading from a solitary to a corporate affair. He further asserts that the normal channel of business communication has shifted from the memo to the projected slide read by the audience as a group while listening to a verbal gloss. The effect of such communication is unclear. We can get some help from the existing research on reading and writing.

Jahandarie's (1999) review of the literature raises significant questions about how the processes of composing and reading interact. He notes that the research on reading while listening is variable: "In short, combining listening with reading does not seem to have consistent effects on comprehension and memory . . ." (p. 193). We know very little about the *modality effect* attributable to choices of media (p. 170). When using PowerPoint presentations, communicators are necessarily employing various communication codes with little understanding of, or consideration for, the effects of such use. "Different tasks may be more or less conducive to different coding processes," Jahandarie writes (p. 162). We have little to guide us in making the most effective choices. The relationship between written and oral communication codes, especially in the context of almost universal use of PowerPoint by presenters, has so far attracted little research. What has been done treats PowerPoint as a kind of conduit wherein it assessed on the basis of changes in student test scores (Bartsch & Cobern, 2003; Kunkel, 2004; Mantei, 2000), and the modal effects related to how students interpret content remain unexamined.

The work of Sadoski and Paivio (1994) moves beyond Jahandarie's work by providing a systematic theoretical perspective they call dual coding theory (DCT). Further, DCT expands the research perspective by including humane concerns such as the nature and function of affect in the complex processes of composing and reading. This shift helps direct attention to the complexity of face-to-face communication events like those enacted in PowerPoint presentations wherein relational messages in both the verbal and visual codes serve to guide proper attribution of meaning. Nevertheless, such research remains limited to the essentially silent process of composing and typically individual act of reading. The pedagogical advice of this body of theory and research is important, but it maintains a constant focus on the acts of composing written texts and the reading of them. It provides direction for teaching writing and reading as central processes in literate societies. But while PowerPoint allows one to write a presentation in isolation, and while it also allows one to read the slides alone as well, it is primarily intended as an aid to speech. Consequently, a broader approach is needed—one that attends to how people *interact* in the process of making meaning.

Such an approach is essentially rhetorical in as much as it features the action of author as message creator, the nature of the message, and audience response. Aristotle (1984, p. 24) defined rhetoric as "the faculty of observing in any given case the available means of persuasion." Rhetoric entails situated action by message makers who select and organize content and use a variety of modalities for the purpose of helping audiences make the same meanings as the speaker. The work of Kress and his associates (Kress, Jewitt, Ogborn, & Tsatsarelis, 2001; Kress et al., 2005) provides an

integrated theoretical approach that treats the modalities of writing, reading, speech, and visual communication as complementary coding, decoding, and recoding schemes. His theory provides a heuristic, analytical, and interpretive rhetorical vocabulary for dealing with the sort of complex multimodal communication a PowerPoint presentation entails.

According to Kress et al. (2005), a "multimodal approach is one where attention is given to all the culturally shaped resources that are available for making meaning: *image* for instance, or *gesture*, or the *layout*—whether of the wall-display, or the furniture of classrooms—and of course *writing* and *speech* as talk" (p. 2). They go on to state, "Putting it in disciplinary terms, our theoretical approach is a semiotic one, an approach that focuses on meaning in all the ways it is made and read in culture" (p. 2). This is important if we are to generate research about PowerPoint that moves beyond arguments of its value or studies about information retention.

My concerns about PowerPoint are related primarily to its use as a pedagogical tool. As noted above, extant research typically uses information recall as an independent variable to measure the *value* of PowerPoint. However, this diminishes the nature of classroom as a site where intellectual work and transformation take place. Kress et al. (2001) argue that,

> "acquisition" is an inappropriate metaphor to describe the process of learning: it implies a stable system which is statically acquired by an individual. Instead we see learning as one of a series of processes of transformation. In apperception an individual makes selections from the world in focus, guided by her or his interest (which includes, of course, a sense of social environment in which this happens). (p. 28)

The notion of instability or fluidity in communicative action is an important one that serves to reshape how one approaches any analysis of PowerPoint as a pedagogical tool. The taken-for-granted belief-in-action that instructors dispense information to students is widespread in classrooms from primary school to university and in corporate and government training courses. Underlying the approach is a belief in the stability of knowledge, that what instructors know can be reproduced in students. Kress's semiotic approach refocuses attention on the act of message construction and message interpretation and moves PowerPoint to the category of communication medium. Design of meaningful, not just memorable, messages—messages that teach and transform—involves:

> selecting the material forms of realization from the culture's existing repertoire, and of selecting the modes which the producer of the text judges to be most effective . . . in relation to the purposes of the producer of the text, expectations about audiences and the kinds of discourses to be articulated. (Kress & Van Leeuwen, 2001, p. 31)

The *instability* of the nature and effect of communication springs from the interaction of choices of ideas, organization of them, and selection of media coupled with the interpretive skills and resources of audiences. To understand the nature, function, and effect of PowerPoint as an inscriptional system, such notions as

medium, mode, interpretation, and rhetoric must be applied to a variety of uses of PowerPoint as a sign-making apparatus.

Metadiscursive Tools

Good presenters create a relationship with their audiences; presentations have an interpersonal component (O'Neil, 2005/2006). Effective presenters do not just dispense or cover material, but rather induct audiences into ways of understanding content. Just as audiences cooperate with speakers (Grice, 1989), so speakers need to cooperate with audiences by helping them navigate the complex oral and visual messages encountered in PowerPoint presentations. To do so, speakers must manage both discursive and presentational modes of symbolizing. In PowerPoint, these modes confront authors at two levels. The first level involves the design templates and wizards offered by PowerPoint to provide a *look* or style and structure for the presentation. For example, if an author selects a simple template such as that in Figure 2, the logic of the entire presentation is constrained to a two-level structure within every slide.

The presentational code (taking the slide as a whole visually) uniformly divides ideas into superior and subordinate. Font sizes are preselected, too, which limit the discursive code to fragments of ideas. The design schemes press for a consistent

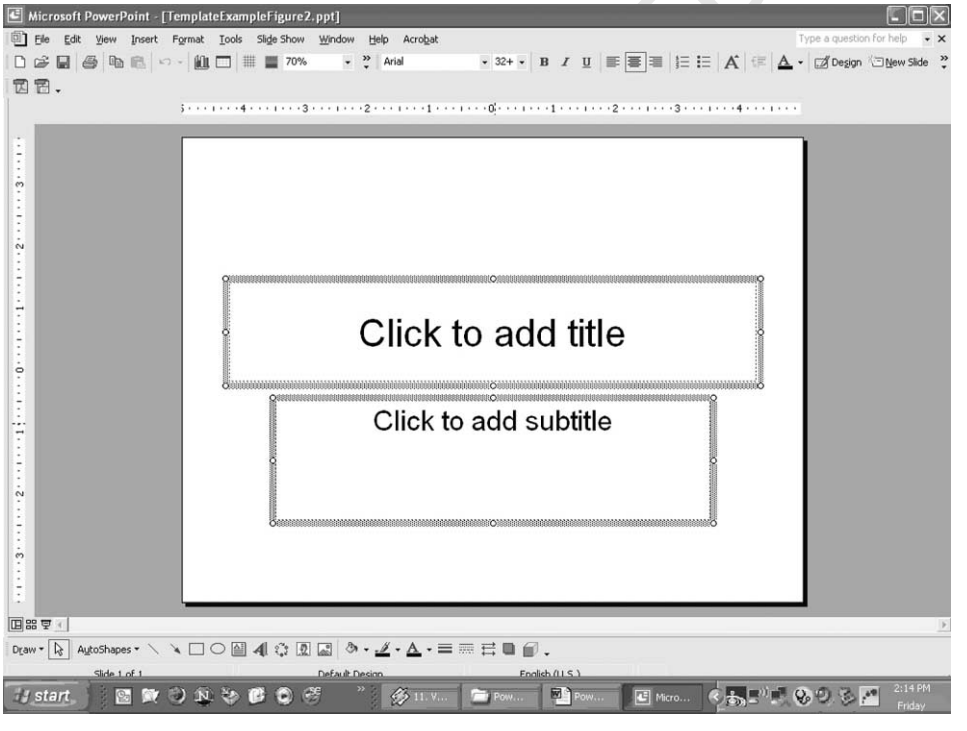

Figure 2. PowerPoint template demands two logical levels.

logical structure that as often as not is a procrustean bed. To accommodate templates, authors must often distort real conceptual relationships, or consistently violate the template, which invalidates the notion of *template*. Figure 3, a popular scheme of PowerPoint presentations, clearly invites a specific logical arrangement of ideas. Presentationally, the design divides all slides at two levels.

If an author chooses to construct their own style, they must confront the nonobvious constraining nature of the slide at the display unit. This will be discussed at greater length below.

Visual metadiscourse (Kumpf, 2000) is an important tool to guide readers of any text. For example, the section headings and subheadings in this essay are intended to help readers follow the flow of the discussion and remember its content. The section titles, if meaningful, act as a form of distributed intelligence. Such messages about the message or metadiscourse "helps writers arrange content by providing cues and indicators that both help readers proceed through and influence their reception of texts" (Kumpf, 2000, p. 401). If Gold (2002) is right, audiences of PowerPoint presentations are also readers. At this point one may assume that, when reading, audiences bring the habits acquired from reading expository texts to PowerPoint presentations as well. In his work on technical writing, Kumpf outlines ten categories of metadiscourse applied to standard technical writing. Table 1 presents a brief review

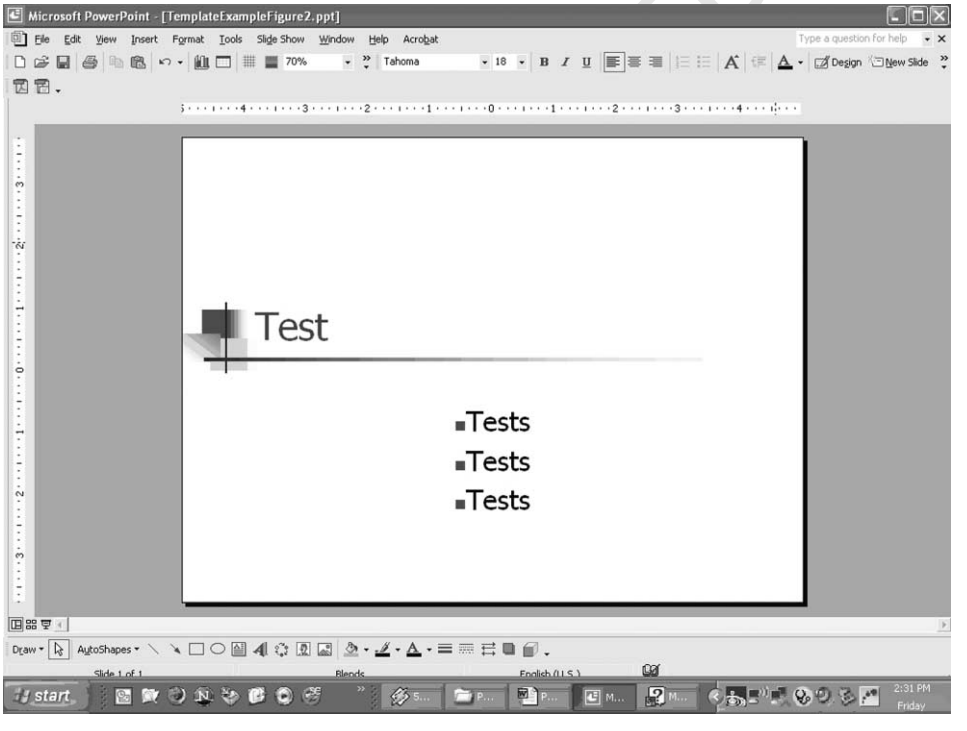

Figure 3. Template shows the logical relations at two levels.

Table 1 Kumpf's Metadiscourse Categories Reviewed and Adapted to PowerPoint

A. Category of visual metadiscourse	B. Nature of the cue in written texts	C. Nature of the cue in PowerPoint
1. First impression	Establishes expectations for structure, vocabulary, syntax, and argument level; easily accomplished by readers leafing through a text; useful for readers prioritizing reading tasks.	Audiences must use the cues of style since the presentation is not available for preview. Audiences cannot "prejudge" or anticipate the nature of and application of content.
2. Heft	In hard copy, this is the bulk, length, and density of text; a physiological cue; heft is controllable via choice of format, even division of text into volumes.	Heft is masked unless the author chooses to reveal the thumbnail outline of the presentation; even so, "heft" has little relevance as metadiscourse.
3. Convention	The degree to which the cues suggest standard professional practices shape the content; cues expectations of genre; facilitates audience assessment before, during, and after reading.	The degree to which the cues suggest standard professional practices shape the content; limits assessment of material to end of presentation.
4. Chunking	Organization of parts that indicates relationships and boundaries of them; the display unit of pages has minimal impact on chunking.	Difficult to indicate relationships *among* slides without substantial planning and effort, but almost automatic *within* slides.
5. External skeleton	Comprising such elements as headers, footers, indentations, section titles, and page numbers; related to chunking; helps reader apprehend the overall logic of the text.	Headings serve primary function within the presentation; within the slide, headings, indentations, bullets or numbers and coded colors help guide audience members; the overall logic of the presentation remains opaque and difficult to apprehend.
6. Consistency	Repeated elements such as font, structure, organization, headings, and graphical style.	Visual consistency is easy to achieve via PowerPoint; templates give a powerful sense of cohesion; ease of use invites shifts in presentational patterns that diminish cohesion.
7. Expense	Choices of material and format can indicate considerable or minimal expense in creating the written material; importance of expense is heavily affected by context and function of the text.	Expense is not relevant to or visible to audiences regardless of context.
8. Attraction	Ability to attract readers and maintain attention; motivating to keep reading.	Audiences are forced to keep pace with the presentation.
9. Interpretation	Guides for making sense of graphics; sometimes text must be employed to gloss the visual.	Guides for making sense of graphics and text within slides; sometimes, verbal gloss must be employed to explain the visual or text.

Table 1 (*Continued*)

A. Category of visual metadiscourse	B. Nature of the cue in written texts	C. Nature of the cue in PowerPoint
10. Style	Visual style should complement verbal style; elements outside of the content but related (e.g., tone and tropes).	PowerPoint's style (embedded in templates, tools and slide conventions) dominates presentations, although it can be modified by some choices of design and delivery by author; provides the few means by which audiences construct a first impression.

of Kumpf's categories as they relate to traditional texts, and adaptations of those categories as they relate to PowerPoint.

While the table suggests that all categories are equally important, when applied to PowerPoint, some are more important than others, especially in pedagogical contexts. The most relevant categories are chunking, external skeleton, consistency, and interpretation. Categories of secondary importance are convention and style. As noted in the cells, *first impression*, as it relates to the technical part of any presentation, has little relevance, since audiences cannot preview the content in the ways a print text can be previewed; *attraction* has little role, since audiences are compelled by the presentation to attend and read along at a pace set by the presenter. *Heft* is not relevant, since the presentation lacks mass; *expense* is also irrelevant, given the ubiquitousness of PowerPoint.

Logic and PowerPoint

Chunking, *external skeleton*, and *consistency* all relate to the logic of the author's content. These cluster as guides by which audiences attribute meaning to, or interpret, the message. The effects of PowerPoint on these elements have not yet been systematically examined. It is suggested in the discussion of Figures 2 and 3 that PowerPoint templates intervene relative to logic. For example, presenting an ethnography in an essay may require a complex, sometimes loose, sometimes reflexive structure. A rich narrative overlaid with a conceptual or theoretical analysis may require the use of such narrative tools as flashbacks and subplots which complicate the storyline, while analysis requires shifting voice back and forth from character to analyst. Also, longer transitional statements or paragraphs serve to *chunk* topics, ideas, insights, as do previews and summaries. Organizing a complex message is difficult to do in print, but the minimally constrained nature of the display unit of pages allows shifts in voice and topic. Should a reader get lost, review is easy to accomplish.

On the contrary, the display unit of the slide and its limitation on content, its penchant for simple subordination and persistent linear flow make chunking difficult. As noted in Table 1 (cell 4C), it is difficult to show relationships *between*

slides and even more difficult to do so among groups of slides, especially if the topics are not contiguous. A presentation author must be very attentive to the logical structure of the content and be creative and energetic in devising sensible cues to audience-readers to make the logic obvious over the noise of the PowerPoint design structure. On the other hand, the opposite effect seems to obtain *within* the display unit of the slide—whatever is in the frame always appears to be related in a hierarchical form. Consequently, expressing such logical qualities as contrast, exclusion, and disjunction is quite difficult within the PowerPoint slide. Again, authors trying to express logical relationships that are not similar to the default logic of PowerPoint must invest significant effort into working around the problem, if a work-around can be devised.

Kumpf (2000) characterizes *external skeleton* as "page numbers, headings, tables of contents, running headers or footers, paragraph indentations and chapter markers" (p. 410). These are the tools used in expository writing to assist readers in following the logic of the material. Of course, PowerPoint does offer some tools; it even pushes some such as headings and multiple levels of bullets. However, Kumpf notes that in expository writing, the external skeleton "relies much on chunking because the visual separation caused by chunking helps identify the parts of the skeleton" (p. 411). As noted above, one of the great challenges authors in PowerPoint face is how to accomplish chunking. Since metadiscursive tools are linked, the effect of external skeleton is substantially diminished as an assist to logic when chunking is difficult or impossible to accomplish, as is the case with PowerPoint.

Consistency as a metadiscursive tool is two-edged when using PowerPoint. As noted earlier, templates and wizards afford a built-in consistency that, in some cases, may be quite handy to an author and helpful to audience readers. On the other hand, that consistency may become a barrier to showing appropriate relationships between ideas. For authors who are not aware of the effects of the residual design logic of PowerPoint or are too rushed to invest the effort required to work around it, the effect of consistency can result in presentations that are misleading or logically incorrect.

The cumulative effect of problems of chunking, external skeleton, and consistency may lead both author and audience to wrong interpretations of the content. While Kumpf limits his discussion of interpretation to graphical information in texts, a broader application of the concept is appropriate and warranted. While graphics specifically and the visual component of PowerPoint generally are important, the textual content and the verbal gloss all work together to achieve some rhetorical effect—the discursive and presentation elements must be treated as constituting any presentation as a whole. After all, the goal of presenters is to get the audience to see and understand the content in the way the author wants—the goal is for the audience to understand, to value, and to agree with or to confirm the author's interpretation of the content. No matter what media are chosen by an author to achieve certain rhetorical goals, the competent author must be aware of and able to control the effects of the media on the meanings audiences ultimately attribute to the message. Doing that appears to be easier said than done.

Analysis of Example PowerPoint Slides

Description of Sample

Perhaps thousands of presentations exist that could be selected for this analysis. However, in order to fairly exemplify some dynamics of PowerPoint as an inscriptional system, a presentation was selected that indicates that the author (Seligman, 2001) had an audience in mind and, when writing the presentation, made efforts to facilitate audience understanding using whatever tools he could muster. This presentation is appropriate for purposes of illustration because the author was confronted by a complex, multifaceted topic, and he seems to have made conscious efforts to organize nonlinear content in way that he believed assisted the audience's understanding of the content within the linear, hierarchical structure of PowerPoint. This slide show was purposely selected for two reasons beyond those stated above: First, since the content is not directly related to communication studies, the hope is that readers will experience reading the presentation a bit more like a student new to the content, drawing attention to the nature of and effects of PowerPoint on understanding and interpretation of it. Second, this presentation modeled the common practice of posting *naked* presentations for students to access without written or audio commentary. This also focuses attention on the slide show per se which, while admittedly missing the verbal gloss, keeps attention at this point on PowerPoint as an inscriptional system.

The presentation treats the topic, "Reasoning with Diagrams," which is located in the discipline of philosophy generally and faculties of mind, specifically. The presentation consists of 33 slides which vary in content and purpose. The first slide acts as a title page, and the second slide poses an agenda (Figure 4) which suggests that this was designed originally as a face-to-face presentation. The third slide (Figure 5) begins the content of the presentation. The final three slides of the presentation consisting of three bulleted, complete sentences per slide, serve as a summary of the main ideas. The body of the presentation contains slides that, at different points, list terms, present research questions, pose questions to the audience-readers, and present graphical illustrations and statements of fact. The slideshow version employs builds for all slides except the first five introductory slides and the last three summary slides. The structure of the presentation as a package of 33 slides suggests that it was intended to be treated as a single presentation which one may assume was glossed by the author for his audience on the date of the presentation. The presentation was posted to the web without notes or other explanation beyond the content of the slides themselves. This is a common academic practice, posting PowerPoint notes for student access in exactly this fashion. For purposes of this essay, the first nine slides of the presentation will be analyzed. These nine represent the universe of design elements comprising the entire presentation, so there is no need to include the remaining 24. The focus of the following discussion is on the inscriptional qualities of the sample slides, not the author's ideas or his expertise in the content area.

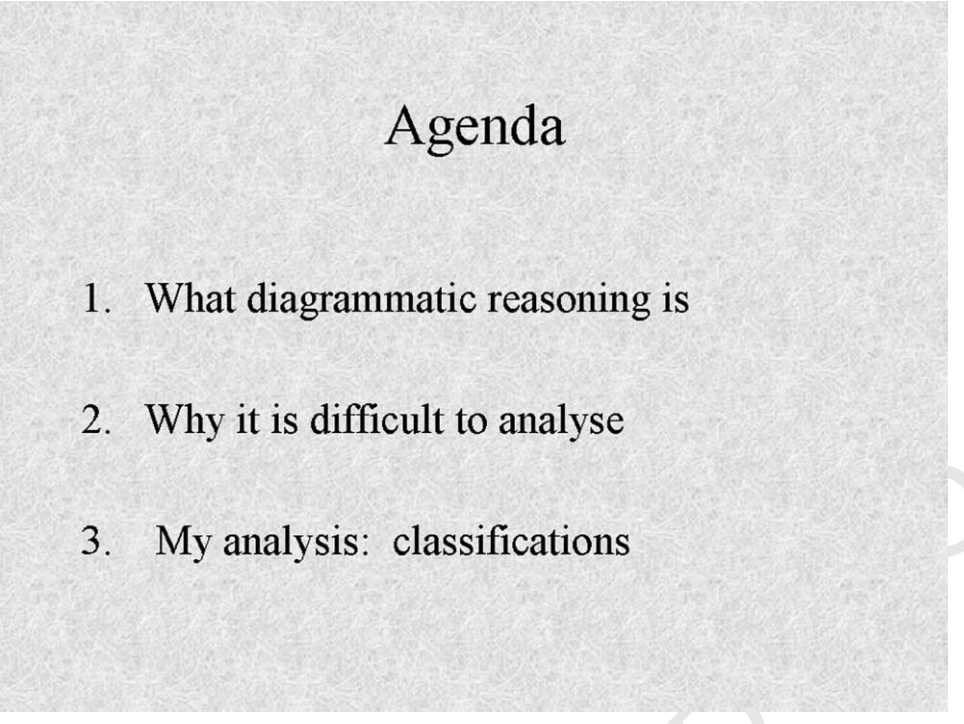

Figure 4. Slide 2 of 33 in the presentation.

Analysis

It is important to remember that PowerPoint was conceived as a presentational aid, a way of constructing complementary verbal or graphical visual aids to accompany an oral presentation. The intent of any purposeful presentation is facilitation of audience understanding and interpretation of content presented by a speaker. Consequently, questions of how such presentations have meaning for audiences are foundational to any understanding of PowerPoint as an inscriptional system. Control of interpretation of the message is a particularly salient concern regarding important and complex topics. It is this significant question of control of interpretation that Tufte (2003a), pp. 7–10) raises in his analysis of NASA's presentation of information related to the Columbia disaster. As noted earlier, the central task of a presenter is helping audiences see and understand content in particular ways; chunking, external skeleton, consistency, and interpretation are necessarily metadiscursive tools for that task.

The topic poses presentational problems for the author, since it requires use of logical structures not well served by PowerPoint as an inscriptional system (e.g., contrast, exclusion, and disjunction). The agenda (Figure 4) announces the logic of the presentation by laying out three topics in a particular order. Using this slide, Seligman previews the chunks of the presentation and a skeleton for understanding diagrammatic reasoning by using numbered topics to mark a path through the content.

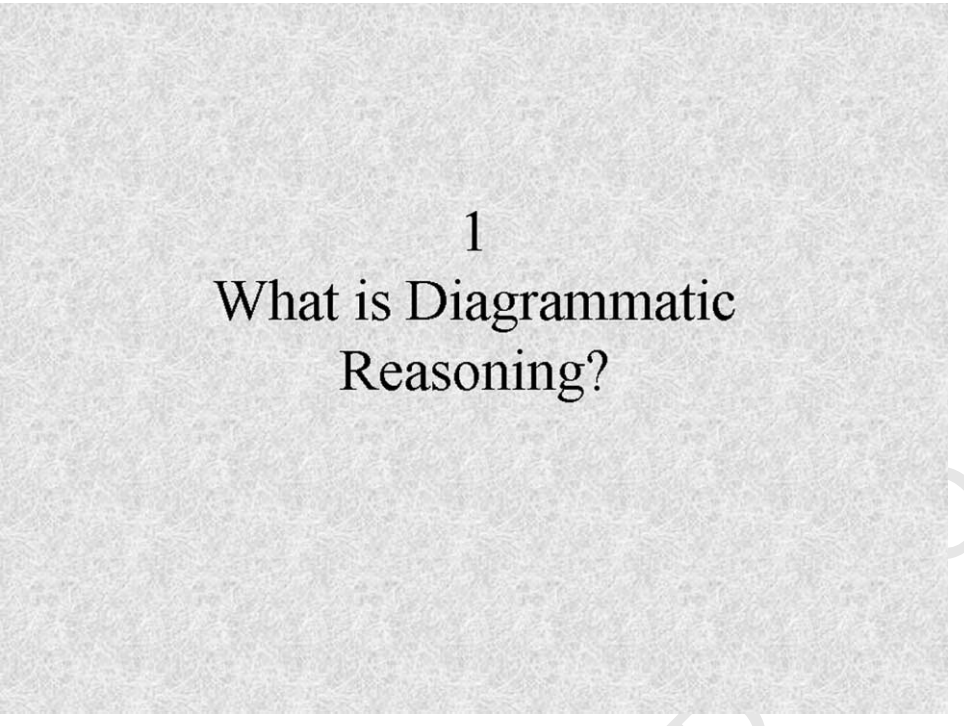

Figure 5. Slide 3 of 33 in the presentation.

Note, however, that the next slide (Figure 5) shifts the syntax from indicative to interrogative. Such a shift may seem minor or even irrelevant, but the grammatical shift also signals a different line of attack on the topic from dispensing information to exploring a topic or constructing an answer. Both are legitimate scholarly responses to a question. However, the audience is required to shift from the role of consumer to potentially one of investigator or subordinate (answering a question). Without the ability to preview the entire presentation, audience readers are unclear about their role or the general direction the presentation may take. Granted, at the moment of presentation, the presenter's speech and paralinguistics may unambiguously clarify the tack the audience reader is to take. However, in the form posted to the web, no such interpretive guide exists. For this particular lapse of consistency, PowerPoint cannot be blamed. The role of the reader of the unglossed posted presentation is ambiguous at this point.

In spite of that problem, the next slide hints that the author was concerned about the logical problems faced by the audience in that the number "1" was continued from the previous slide (Figure 6). While an effort to mark a logical chunk is important, the structure of the slide poses two problems for audience readers. First, note the top and bottom borders constructed by what seem to be examples of genres of diagrams that may apparently be used for reasoning purposes. The body of the slide follows the simple two-level design of the template illustrated in Figure 2.

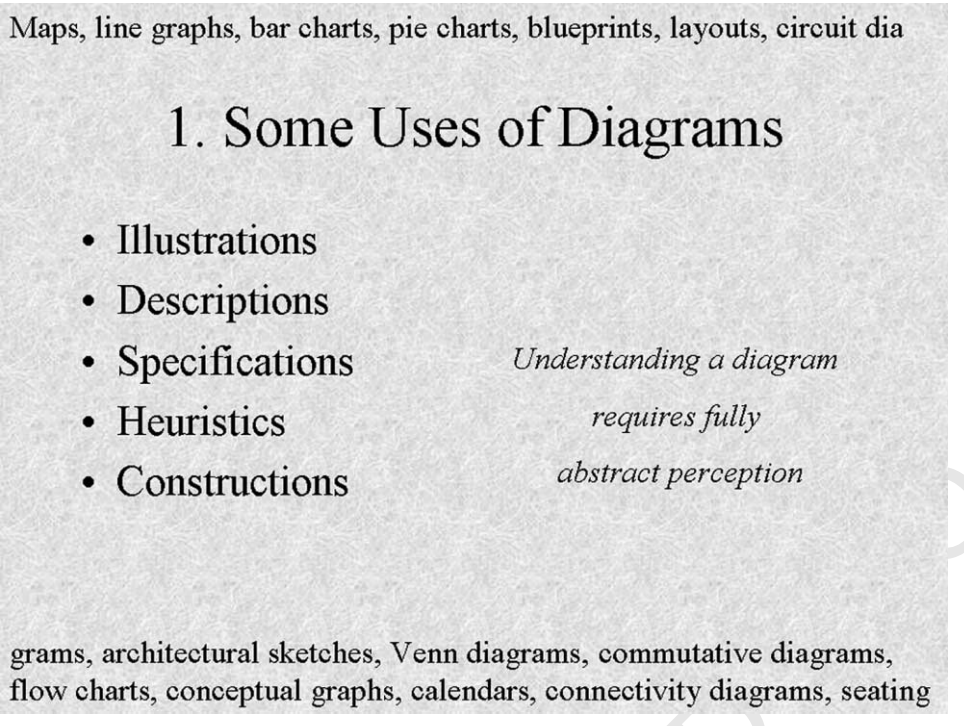

Figure 6. Slide 4 of 33 in the presentation.

However, the borders and addition of the italicized statement next to the bulleted list pose interpretive problems for readers. The border may be intended as notes for the presenter. That is, the author may have wanted to comment on the variety of possible diagram formats and distributed the memory task to the slide. However, given that audiences seem to privilege text over speech, it is likely that readers were attempting first to consume the numerous terms presented along the top and bottom of the slide, then interpret the lists during the presenter's gloss. At the same time, the italicized declarative statement in the slide invites audience readers to form a logical connection between it and the rest of the slide. If the author included the border lists to distribute the cognitive work of remembering a long list of kinds of diagrams, it may have functioned in the opposite fashion for audience readers by overwhelming their short-term memory capacities and requiring them to search for a way of making sense of the list while, at the same time, listening to commentary on the meaning of the bulleted topics.

Because the unit of display in PowerPoint is the slide, logical connections between slides are difficult to establish. The logical connection between slide 4 (Figure 6) and slide 5 (Figure 7) is unclear. The author maintains the cue of the numeral "1," but the seemingly abrupt shift in topic begins to erode the meaning of the number. It is assumed that the presenter articulated the relationship between slides. However, as it exists online, there is no transition to bridge the ideas. Consequently, those who read

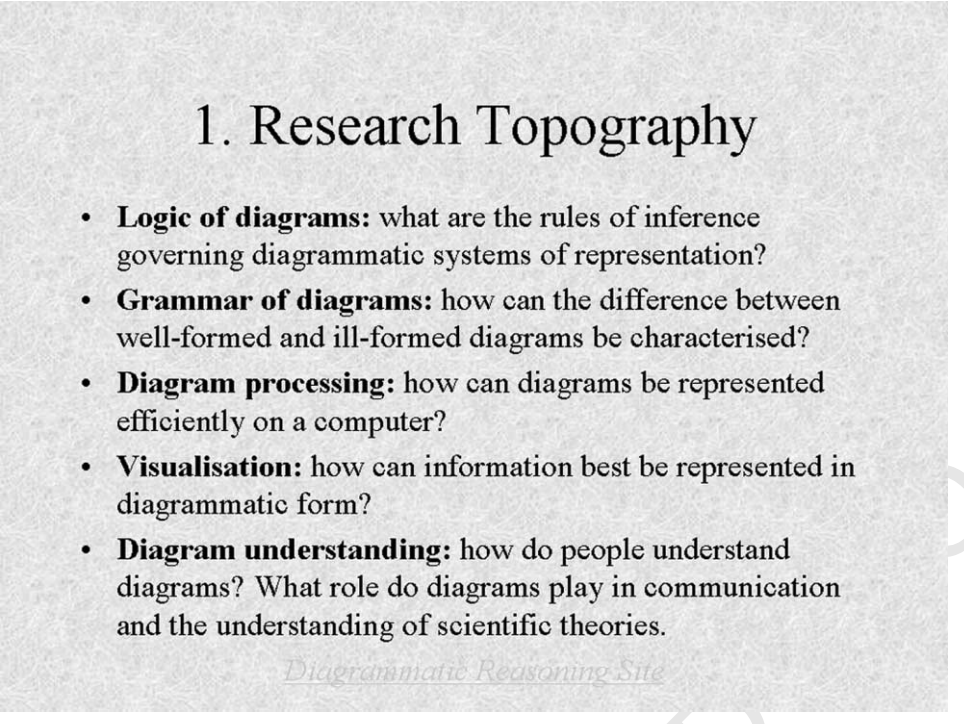

Figure 7. Slide 5 of 33 in the presentation.

the presentation without the oral gloss may or may not properly interpret the meaning of the content. By contrast, standard expository writing, such as essays or books, affords the inclusion of transitional material in the form of phrases, or sentences, paragraphs, or longer units as necessary to guide readers' interpretations of content. The author of this presentation was left with little else to use visually but the weakening cue of the number "1" to merely *point to* a connection between slides.

Slide 5 (Figure 7) and slide 6 (Figure 8) further disrupt logical cohesion of the presentation. The internal organizational structure of slide 5 poses a topic of "Research Topography" but nothing inside the slide serves to elaborate or illuminate the metaphor of topography. Also, within the slide, there is no guidance regarding the relationships between the topics in bold font and the questions posed next to them. Possibly the verbal gloss accomplished those tasks, but no residue of that exists. This is an artifact of the inscriptional system with which the author is working. The template (Figure 2) offers only a title and subtitle. There are few metadiscursive tools with which to work, since the central tools of chunking and external skeleton are confounded by the complexity of the content and the interrelatedness of these tools, as was noted above. Chunking of ideas is important to logical presentation, but the nature of the content makes chunking difficult; that is the central authoring challenge Seligman faces with the chosen topic. Without chunking as a complementary tool, such external skeleton tools as headings are weakened in their effect. The problem

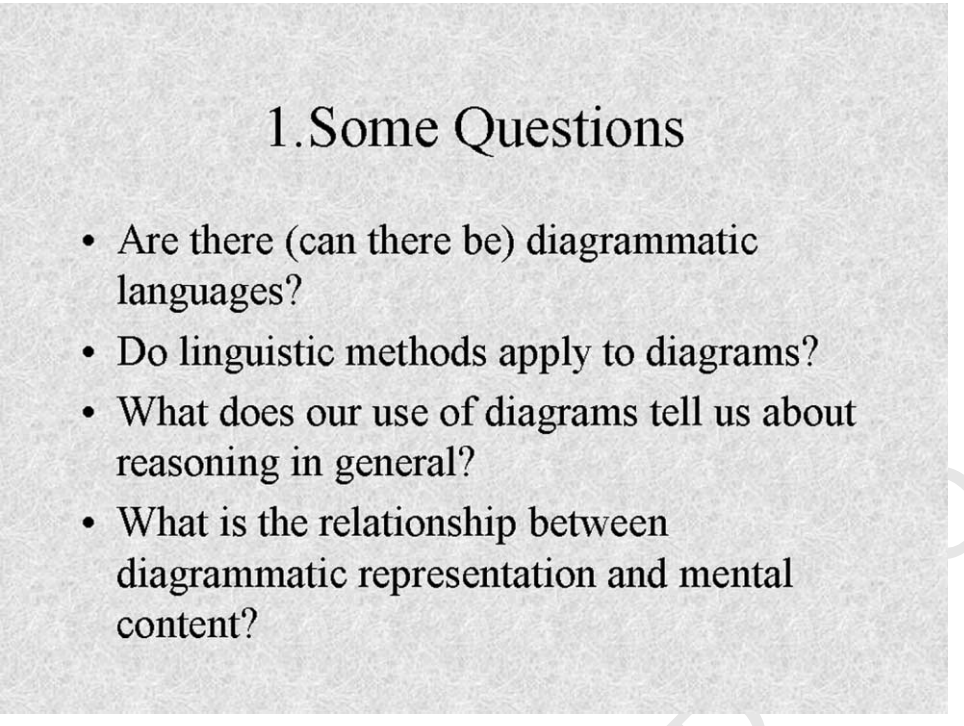

Figure 8. Slide 6 of 33 in the presentation.

seems to stem from the compressing effect of PowerPoint wherein few words can be employed within a slide and still be readable, so few are used.

By slide 6, serious problems of logical cohesion accrue; the referent for "1" is four slides away and hidden from audience readers. Within the slides, consistency of display is lacking, and there is no transitional element between them. The topic of slide 6 appears to be a continuation of the body of slide 5, and the bullets in slide 6 appear, at first, to function in the same way as they do in slide 5. However, on closer reading, these are very different kinds of questions. Those posed in slide 5 are intended to invite elaboration of the associated topics in bold font. On the other hand, in slide 6 the questions are much larger conceptual or research questions, which point to epistemological gaps relative to the main topic of reasoning with diagrams. For audience readers, the template structure and the apparent consistency of form level the questions to a single list. For most students, the effect of such leveling is diminution of questions as the logical drivers for the development of new knowledge through research. All questions seem to be little more than a work order for an answer constructed from existing knowledge.

The nature of slide 7 (Figure 9) is substantially different from all preceding slides. The author is deploying some of the graphical affordances of PowerPoint including objects and color. However, the internal structure of the slides continues to be in turmoil. For example, the bullets in slide 4 simply mark topics; those in slide 5 imply

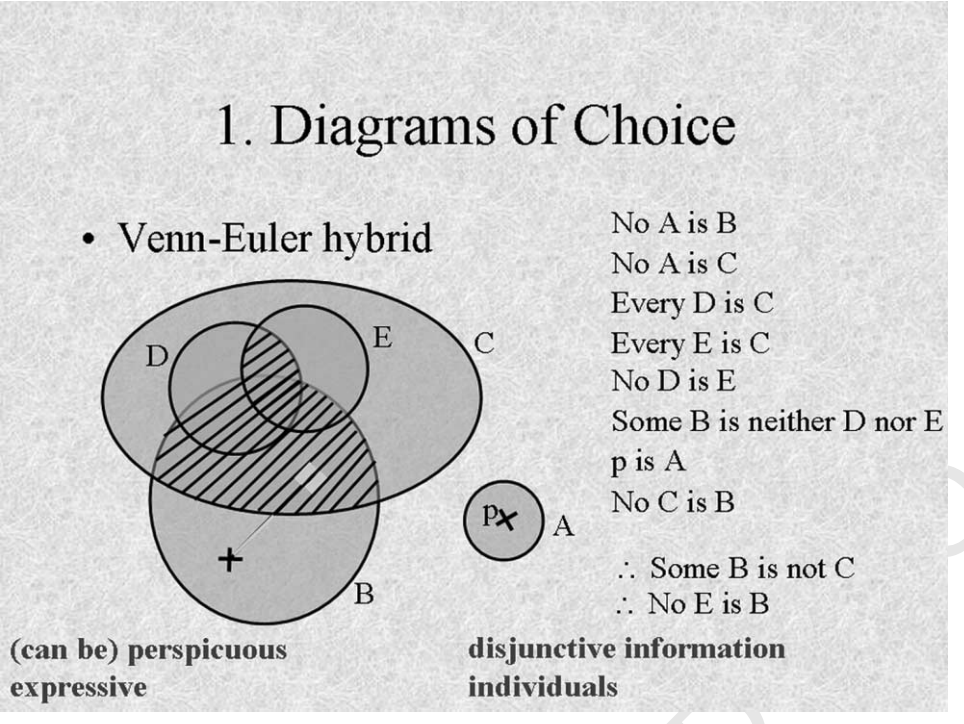

Figure 9. Slide 7 of 33 in the presentation.

some relationship between the slide heading and the topic/question array. However, the bullets in slide 7 are superfluous. Slide 7 presents examples of two diagrams of choice. They are two of the category, not subordinate to the category. So, within this presentation, the bullet migrates from a relational marker to just a marker, similar to the marks on a chalkboard an instructor makes when pointing to an item under discussion. Interestingly, the constant use of the bullet becomes counterproductive, since its meaning as an index is lost due to inconsistent associations.

A different but related problem emerges in slide 9 (Figure 10). Notice the penultimate bullet point in slide 9. This poses a problem for readers of the presentation who confront it apart from the oral commentary. If, by slide 9, the audience readers still associated "1" with the topic, "What is Diagrammatic Reasoning?" and if the spare term "Characteristics" was associated properly with "Diagrams of Choice" rather than the process of reasoning with diagrams, the bulleted list properly serves to illuminate the concept of diagrams of choice. However, "*Free rides (Shimojima)*" seems to be an item of a different kind and quality from those preceding it and the one immediately following it. Consistency as a metadiscursive tool seems to be purposely abandoned, but the reason for doing so is unclear. Neither "free rides" nor "Shimojima" reappears in any of the other 33 slides, so the meaning cannot be puzzled out by context or other hints within the content of the slide array. While such a design choice may have been to make either

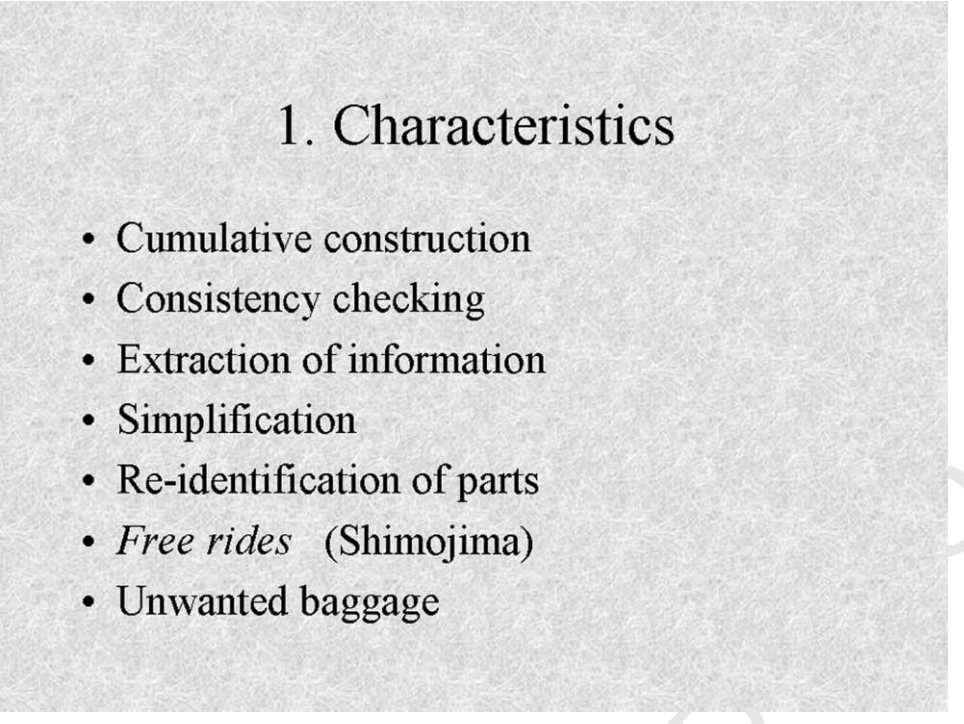

Figure 10. Slide 9 of 33 in the presentation.

term or both a *marked* term, there is no evidence that this was the specific intent. Of course, violations of patterns can be useful as semiotic tools by directing audience attention to an anomaly within a landscape of similar objects. The meaning of the anomaly is different from what surrounds it. A problem authors face when using PowerPoint is the unity within slides and between slides that disenfranchises difference. Lacking the capacity for asides, explanatory footnotes, parenthetical phrases, statements, or paragraphs by which the meaning of an anomalous event can be discussed and clarified, PowerPoint leaves anomalies stranded as in Figure 10.

The next slide in the array (Figure 11) raises a question: "Is this logic?" The slide graphically poses a set of logical relationships. The context and syntax of the slide suggest that the question is a rhetorical one, posed to the audience readers for purposes of inviting them to apply content presented earlier. However, without the verbal gloss, the question hangs unanswered. For readers not present (students or other scholars interested in the topic), the answer for them may be yes or no depending on how the previous material has been understood within the readers' existing knowledge, beliefs, and values regarding the nature of logic. The presentational channel that uses the embedded coding rules and meanings for Venn and Euler diagrams constructs a slide that is dense with information. At the same time, the discursive channel presents an ambiguous prompt relative to the slide's presentational content. At this point, the external skeleton of the presentation seems to have

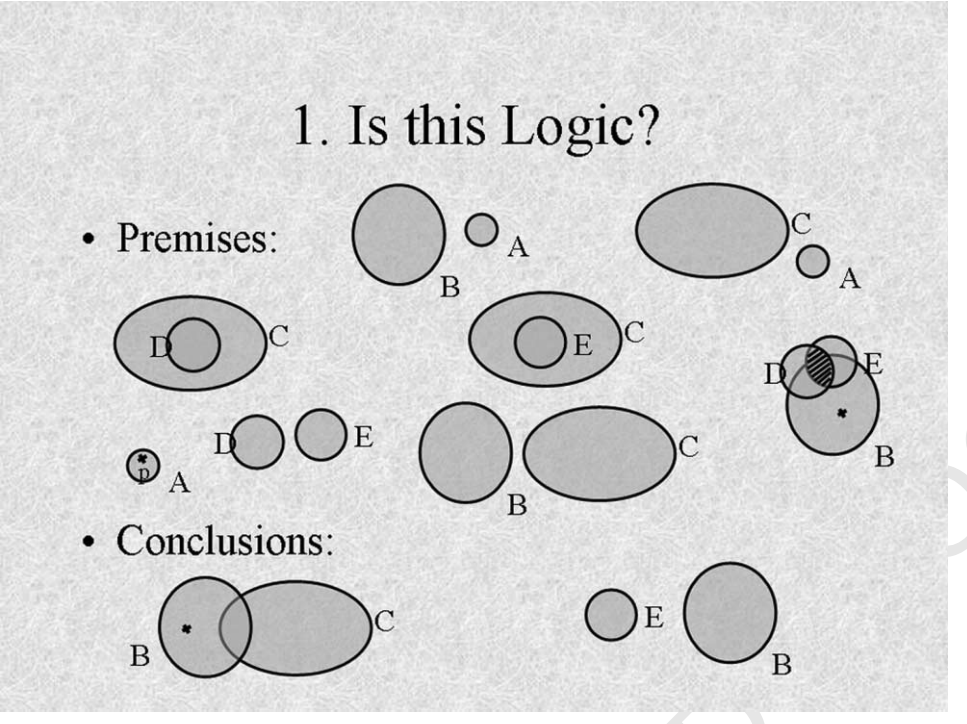

Figure 11. Slide 10 of 33 in the presentation.

atrophied almost completely. While the graphical elements of the slide may trigger memory of facts presented earlier, there seems to be no means by which interpretation of the slide can be controlled. Even within glossed presentation, unless the author is aware of the cognitive demands being made on the audience and provides verbal supports, the audience could become confused or disconnected from the flow of ideas. Without the gloss, that must certainly be the case unless the readers' expertise supplies the needed guides for making proper sense of the slide. Most likely for such audiences, the presentation is actually uninformative or uninteresting. In this case, the communication channel is simply too limited to effectively lead the audience to new insight. The problem seems to lie with the limited potential of the slide to contain sufficient or necessary information and the difficulty of making connections between slides. That problem is illustrated in the final example.

Slide 11 (Figure 12) takes us back to the sorts of problems we identified at the outset of the analysis. The number "2" is evidence that the author was making efforts to logically chunk ideas by using the numeral code to connect this section with the original definition of "2" in the agenda: "Why is it difficult to analyze?" (Figure 4). However, in this case, a syntactical disjunction, as in slide 3 (Figure 5), shifts the frame from interrogative to declarative. While the specific lapse in consistency is the responsibility of the author, that may be due to an assumption by him that the numerical code was sufficient to cue audience readers that a major shift in topic had

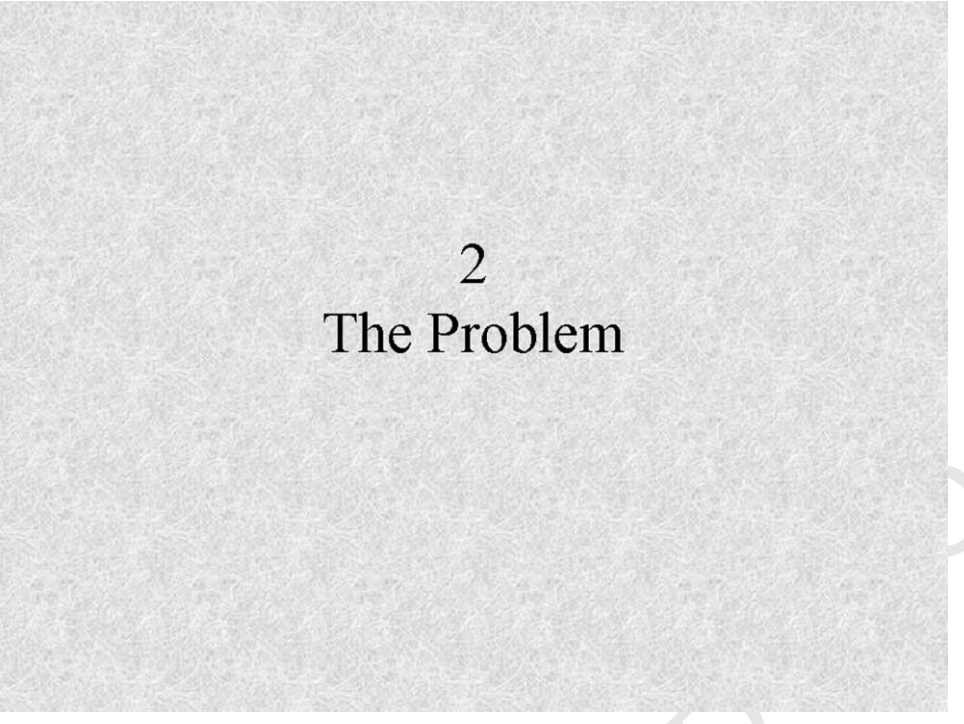

Figure 12. Slide 11 of 33 in the presentation.

occurred. PowerPoint does not invite authors to create transitions of content due to the primacy of the slide as the unit of display, so authors must make use of whatever external skeleton can be constructed. We should note that Seligman did well to support his audience as much as he was able. While more could be done with creative exploration of the affordances available, it appears that even reflective authors can be overwhelmed by the nature of PowerPoint as an inscriptional system.

Summary

This brief analysis suggests that, even for a mindful author, using PowerPoint effectively is not easy or intuitive. This analysis suggests that PowerPoint is an inscriptional system with expressive and logical limits. The confines of the slide as a display unit have an impact on the logical presentation of ideas. As was noted above, the material was complex and required a series of slides to explore it. The author made efforts to logically organize or chunk the contents, but the limited repertoire of external skeleton cues was too weak to be effective. On the other hand, the internal strength of association of ideas within slides, at points, was too strong. At numerous points, the necessity of a verbal gloss was noted. The central rhetorical problem is control of interpretation, and in the common form of posted slides, control is minimized. In fact, the residual logic of design powerfully functions to *reorganize*

relationships of ideas. The potential certainly exists that students, being present for a presentation, seeing slides and hearing the commentary, may be led to reinterpret the content when accessing the naked slide show at some later time.

The analysis illuminates some of the invisible qualities of PowerPoint, but it serves merely to point them out—more is needed. The multimodal nature of the PowerPoint presentation is evident from language and graphics on the slides, and the necessity of a verbal gloss is constantly reinforced by the analysis. However valuable that discussion may be, it is limited in its insight and generalizability. What is needed is a program of research that answers extant questions and reveals new ones. That concern completes this essay.

PowerPoint in a New Key: A Research Agenda

The surprisingly limited amount of research on PowerPoint so far has employed, for example, managerial (Bartsch & Cobern, 2003; Susskind, 2005), psychological (Carrell & Menzel, 2001), or aesthetic approaches (O'Neil, 2005/2006). Research in the key of communication that is framed by a broad semiotic, rhetorical approach is essential for confronting PowerPoint in new and insightful ways. As Salomon (1994) argues, "media's symbol systems or 'modes of appearance' (Goodman, 1968) are the primary, most essential attributes of media" (p. 3). He further argues, "all cognition and learning are based on internal symbolic representations" (p. 3). More studies explicitly attentive to the systemic, symbolic, communicative qualities of PowerPoint may help to move past the polemics that now exist or past the frustrating findings of *no significant differences* in learning. The analysis above raises at least three related research themes regarding the communicative nature of discursive and presentational codes; the effects of and effects with the pervasive use of PowerPoint as a pedagogical tool and, finally, the inherent affordances and limitations of PowerPoint.

As noted earlier, inscriptional systems require that new users be taught how to use them. The example of labanotation illustrated *in extremis* the opaque quality of some inscriptional systems. However, PowerPoint masks the necessity for induction into its use because it seems to be understandable enough syntactically. For example, Downing and Garmon (2001) did a study of which training methods increased students' confidence levels when using PowerPoint. There was recognition that PowerPoint required some training in manipulating the software, but there was no evidence of understanding PowerPoint as a transformative medium or as an inscriptional system. Similarly, Levasseur, Dean, and Pfaff (2004) reported that instructors of advanced public-speaking courses taught students how to use PowerPoint, but questions of effects of public speeches seemed to be limited to discussions of persuasion theory (p. 243). As these cases suggest, and as the extended analysis above made clear, the semantic dynamics of PowerPoint are not immediately evident to its users. This is no small concern as Tufte (2003b) made clear—meanings resulting from PowerPoint presentations often matter greatly. In order to approach this broad concern, we may start with analyses of how the dual codes of discursive and presentational symbol systems interact within the context of electronic,

pedagogical presentations. The common practice of posting PowerPoint notes on VLEs or stand-alone webpages raises questions about the effects of context on meaning. Apart from the verbal gloss of a presentation, PowerPoint notes are messages of a different sort, but they are often expected to function as fully and effectively as the presentation they were intended to augment. The presentational and discursive nature of stand-alone PowerPoint presentations merits study as well as the effects of the gloss in presentation or in the form of written or audio commentary. Increasing demands for accessible online material will change how PowerPoint slides are posted in as much as commentaries (written or audio) are essential for the visually impaired; use of video streaming will include or invite a verbal gloss for the presentation for the hearing impaired. Thus, the age of the *naked* slide show is nearly over. Investigation of the logical effects of PowerPoint on content and how it is interpreted will remain primary, since the inherent design structures remain. However, use of related applications such as PowerPoint 2007 (which now includes Producer), SMIRK, and LecShare will connect presentational and discursive codes more seamlessly. This will necessitate more attention to *context* or when and where PowerPoint presentations are consumed, and why students use them or do not use them (Cramer, Collins, Snider, & Fawcett, 2007). Given the increasing enthusiasm for podcasting instruction and learning anytime, anywhere, the effectiveness of instruction in noisy environments, delivered using symbol systems that are little understood, certainly merits research.

DCT (Sadoski & Paivio, 1994) expands the research agenda by focusing on humane concerns such as the role of affect in the complex processes of composing and reading. As noted earlier, research in writing and reading remains limited to the essentially silent and usually individual process of composing and typically individual act of reading. A broad approach is needed—one that attends to how people *interact* in the process of making meaning. For example, O'Neil (2005/2006) argues that while PowerPoint actually makes messages less clear, it does serve to build relationships between audience and presenter. O'Neil's hypothesis invites testing regarding the nature of the relationships created and the affective and cognitive effects of them. As Jahandarie (1999) noted, little is known about the modality effect attributable to choices of media. What has been done treats PowerPoint as a kind of conduit wherein it is assessed on the basis of changes in student test scores (Bartsch & Cobern, 2003; Kunkel, 2004; Mantei, 2000), and the modal effects related to how students interpret content remain unexamined. The complexity of PowerPoint as a writing system and reading system coupled with listening invites equally complex research. A multimodal model developed by Kress and his associates may provide a relevant and multidimensional approach to the study of PowerPoint and similar presentational tools. Presently, more needs to be known about the specific effects of PowerPoint on how information and its interpretation are constrained by its complex coding and decoding requirements in a variety of contexts of use. A complementary research thread focuses on the cognitive effects of PowerPoint and the effects achieved with it in pedagogical contexts of all sorts. The residual design logic of PowerPoint seems to influence, more or less, the syntactic, semantic, and pragmatic outcomes of

communication events wherein PowerPoint is the medium. Exploration of the effects of PowerPoint on patterns of thinking would provide important information that would guide choices for use of PowerPoint in classrooms or training rooms. The multimodal capabilities of PowerPoint demand that we understand at what points we overload students' cognitive resources (Lang, 2000) and in what places those dimensions become affordances for purposes of distributing complex cognitive tasks for use by students.

It is important that students have rich content about which to think, but equally important is understanding how our pedagogical choices and devices shape habits of mind. For example, a study by Gunel, Hand, and Gunduz (2006) suggests that students' comprehension of content is enhanced if PowerPoint is used to write reports rather than traditional prose essays. Their findings are provocative; however, the unique quality of the subject population (132 eleventh-grade students in an elite Turkish high school) probably necessitates larger studies using more generalizable populations. Nevertheless, investigation of such suspected positive effects of PowerPoint merits serious analysis. A related concern is examination of the effects of PowerPoint on how faculty authors tend to think about content when using PowerPoint. Differences between mental schemas developed by instructors via the rigors of graduate study and logical schemas as reflected in PowerPoint presentations would provide important insight into the effects of PowerPoint, specifically, and inscriptional systems generally on how we organize and understand complex content in university courses and elsewhere.

Finally, exploration of the affordances and limitations of PowerPoint would provide important information for practice. Although a great deal has been written about how to use PowerPoint, nothing that specifically examines in a systematic fashion the affordances of PowerPoint has been published. While the analysis of PowerPoint earlier in this essay featured problems with it, some real affordances were noted. Given the ubiquitousness of PowerPoint in pedagogical settings, a systematic inventory of affordances of the technology would raise the level of discussion about when and how to use PowerPoint and facilitate more mindful use of it.

The complexity of the various communication events involving PowerPoint invites a wide variety of approaches, such as rhetorical/critical, ethnographic, content/textual analytic, and quasi-experimental, that focus on the nature, role, and effects of symbol use relative to PowerPoint as an inscriptional system as it affects what students and instructors know and how they know.

Conclusion

A goal of this essay was to approach PowerPoint in a way that moves the discussion away from advocacy to investigation. While descriptions of practice, both good and bad, are important, they risk blinding readers to concerns that are not immediately obvious. In communication contexts, what is often most significant within the system is *invisible* in everyday practice. Descriptions of everyday use provide sometimes useful guides, but they can also direct attention to less important concerns. A goal of

this essay was to reconfigure our approach such that some significant and interesting questions emerge.

Another goal was expansion of the body of theory that may be applied to a research program. Understanding PowerPoint as an inscriptional system that affects interpretation of content also increases the significance of examining PowerPoint, especially as it is used in instructional contexts. The shift in the theoretical *key* to a communication perspective provides a frame that is wide enough to accommodate the diverse functions PowerPoint serves, and it invites investigation from a variety of related disciplinary perspectives.

Finally, the research agenda proposed should be understood as preliminary; it is intended to seed thinking about PowerPoint in multiple dimensions. The topics raised here are intended to be heuristic and in no way represent a complete enumeration of the class of potential questions. Just as Langer (1959) characterized her work as the "beginning of a line of thought" (p.v), so, too, the ideas offered here are a beginning.

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