Rethinking the Design of Presentation Slides

Michael Alley, Harry Robertshaw

Virginia Tech

Summary and Introduction

The new presentation slide goes up in class, and the students immediately give it their attention. Do the students quickly grasp the main assertion of the slide? Does the slide actually help students understand and retain the material? If the slide is posted as part of a set of notes, do the students understand it two weeks later? In the past decade, presentation slides have become a common addition to the teaching of technical subjects. Ideally, these slides can emphasize key points, can show images too complex to explain in words, and can reveal the organization of the presentation. In addition, well designed slides can increase the retention of the audience from 10 percent, for just hearing, to 50 percent for both hearing and seeing the material [1]. However, are the designs that most engineering instructors use, and that programs such as Microsoft PowerPoint offer as defaults, the most effective at communicating technical information? This paper argues that they are not.

Specifically, this paper challenges the typical designs that rely on phrase headlines and bulleted lists and offers a dramatically different design. Having its roots at the national laboratories [2], this new design quickly orients the audience to the main assertion of the slide with a succinct sentence headline (no more than two lines) and then supports that headline primarily with images and, where needed, with words [3].

Recommended Design of Slides

When slides are chosen to communicate the images and results of a scientific presentation, their design becomes important for the success of that presentation. Typically, as soon as a slide is projected, the listener shifts attention from the speaker to the screen. When the slide has words that cannot be read, the listener is distracted with the question of what those words are. Likewise, when the slide does not quickly orient the listener, the listener becomes confused, wondering what the point of this slide is. If the presentation does not allow for questions or if the listener is not confident enough to ask a question, then these questions fester in the listener. Finally, if the slides as a whole package do not have a recognizable beginning, middle, and ending, then the slides do not serve the audience after the presentation when the audience reviews those slides as notes. Given these hurdles, presenters should strive to design slides that are easy to read, that quickly orient the audience, and that can stand alone as a set of notes.

Despite the importance of designing slides with these goals, many presenters appear to have designed the slides with the opposite intentions. For instance, in one recent lecture, the engineering professor used a thin serif font (Garamond) that was hard for the audience to read, even for those sitting in the front row. Even more problematic was that the professor chose type sizes between 10 and 12 points—far too small given that the room seated thirty. Causing even more problems was that the professor chose a color combination of bright red lettering against a white background, a combination that would have been difficult to read even with a bold sans serif typeface, such as **Arial**, at 24 or 18 points. Worst of all, the professor had placed by far too many words and almost no images on the slides. For thirty minutes, this engineering professor flipped through these presentation slides, most of the time with his body turned to the screen reading what he had created. Meanwhile, the audience listened halfheartedly and regretted that they had come.

Few slide designs used in engineering classrooms and at technical conferences communicate as effectively as they should. One reason is that the typography and layout defaults in the most common program used for creating these slides (Microsoft's PowerPoint) do not produce the slide designs that are read most efficiently. This paper not only challenges these defaults and templates, but also proposes specific guidelines for format and content of slides for engineering presentations.

As mentioned, in a presentation, the audience remembers on average about 10 percent of what is said and 20 percent of what they read on projected slides. However, when the presenter both says details and shows those details on well-designed slides, the retention by the audience can climb to about 50 percent [1]. How close to 50 percent this retention reaches depends on how well the slides are designed. This design includes both the slide's format (layout, typography, and color) and what information the presenter decides to place on the slides.

Format of Slides. A slide's format consists of its typography, layout, and color. Given in Table 1 is a summary of these three aspects recommended for a presentation slide [3]. These recommendations concur with the recommendations of graphic designers at Lawrence Livermore National Laboratory [2] and Sandia National Laboratories. In regard to typography and color, the goal is to have a slide that is read as quickly as possible by the audience. In regard to layout, the goal is to have a slide for which the audience can quickly discern the point of the slide and then can divide attention between the speaker and the slide as the speaker discusses the slide.

Some guidelines, such as numbers 1 and 2 on typography and number 1 on layout, go against the defaults of PowerPoint and therefore against what are commonly projected at conferences, meetings, and university lectures. Unlike the default guidelines of PowerPoint, the guidelines of Table 1 are designed specifically for technical presentations. In such presentations, the content is typically specific and complex, the audience is usually challenged to understand the content, and images are essential for that understanding. Accompanying Table 1 is Figure 1, which gives a template for slides. Detailed discussion about each of these design criteria occurs in *The Craft of Scientific Presentations* [3].

Table 1. Guidelines for slides at an engineering presentation [3].

Typography
Use a sans serif typeface such as **Arial** [4]
Use boldface (**Arial**)
Use type sizes at least 18 points (14 points okay for references)
Avoid presenting text in all capital letters [4]
Color
Use either light type against a dark background or dark type against a light background
Avoid red–green combinations (many people cannot distinguish) [5]
Layout
Use a sentence headline for every slide, but the title slide; left justify the headline in the slide's upper left corner
Keep text blocks, such as headlines and listed items, to no more than two lines
Keep lists to two, three, or four items; make listed items parallel; avoid sublists, if possible
Be generous with white space
Style
Include an image on every slide
Make the mapping slide memorable; for instance, couple each section of the talk with an image that is repeated in that section
Limit the number of items on each slide
Limit the number of slides so that you can dedicate at least one minute to each

An assumption for both Table 1 and Figure 1 is that the primary goal of the engineering presentation is to inform or to persuade an audience about technical results. In doing so, the presenter strives to have the audience remember those results after the presentation and to understand the steps for how those results were reached. Not all engineering presentations have those goals. Sadly, some engineers present so many slides and pack them with so much detail that the goal seems to be neither to inform nor to persuade the audience. Rather the goal appears to be to impress the audience. For such speakers, these guidelines and this template do not apply.

A secondary goal for the kinds of slides advocated here is that the slides will stand alone as a set of notes for the audience long after the presentation is finished. Such is often the situation in a university course in which the instructor makes the presentation in January and the students review the slides in early February before the first test and again in May before the final exam. Yet a third goal for the kinds of slides advocated here is that someone else, another instructor perhaps, could use those slides to make a presentation that would communicate the same main points as communicated by the first presenter. That is not to say that the presentations would be identical. Different tangential examples and anecdotes would be brought in by the two speakers, but the main assertions and evidence for those assertions would be the same.

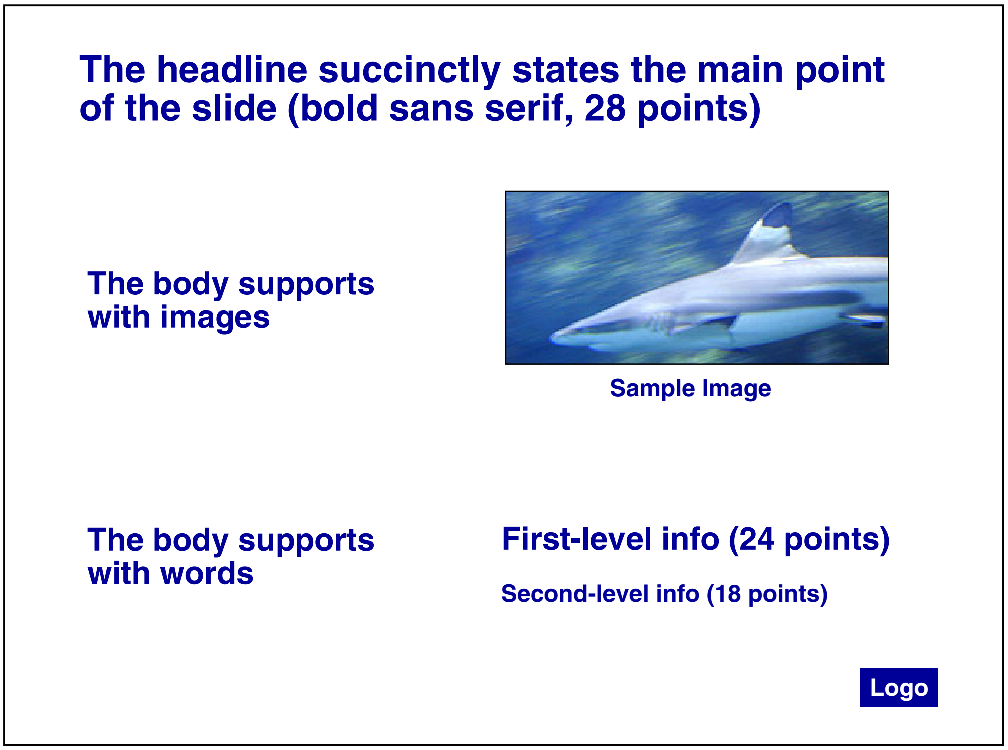

Figure 1. A template for the format of a presentation slide (excluding the title slide).

Given in Figure 2 and Figure 3 are two sample presentation slides that follow this style. Perhaps what most distinguishes these slides from slides typically projected in classrooms and at conferences are the sentence headlines. Although not the norm, sentence headlines have several advantages. The first advantage is that while a phrase headline identifies the topic, a sentence headline can show a specific perspective on the topic. For example, compare the headline of Figure 2 with a headline that simply reads, "Secondary Flows." A second advantage to using sentence headlines is that a sentence headline quickly allows the audience to get back on track with a slide if the audience has missed the speaker's transition to that slide. A phrase headline does not orient nearly as quickly or as well. Yet a third advantage, and perhaps the most important, is that a sentence headline forces the presenter to come to grips with what the main purpose of the slide is. This point might seem obvious, but many engineers, especially students, create far too many slides than are needed [3]. These extra slides tax the audience because the audience then has less time on each slide to absorb the information.

For a sentence headline to be effective, the speaker should follow three principles [3]. First, the sentence headline should begin in the upper-left corner of the slide. That way, the audience sees it first. Second, the sentence headline should be no more than two lines. Blocks of text longer than two lines on a slide are often not read. Third, to make it easier for the audience to read, the headline should be left justified, rather than centered, because a centered headline takes the audience longer to read, particularly if the headline goes to a second line.

Proceedings of the 2003 American Society for Engineering Education Annual Conference and Exposition

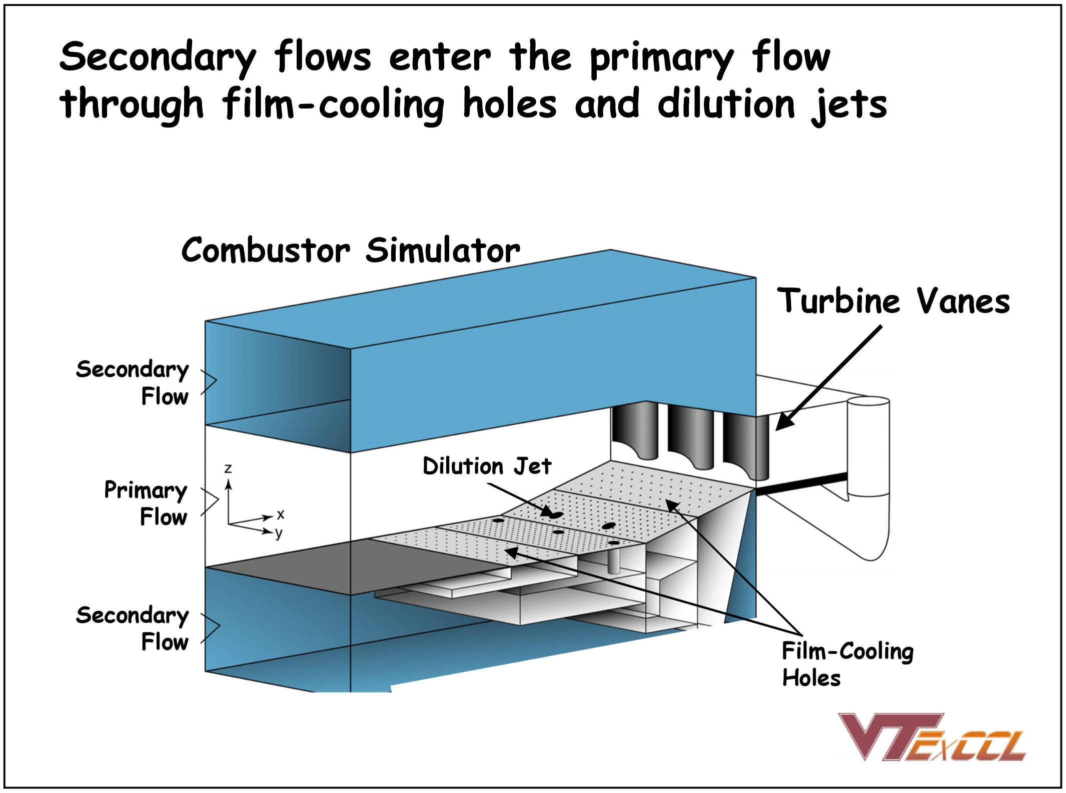

Figure 2. Presentation slide that uses design recommended by this paper [6, 7]. The headline is left-justified and no more than two lines long. The body supports with images and needed words.

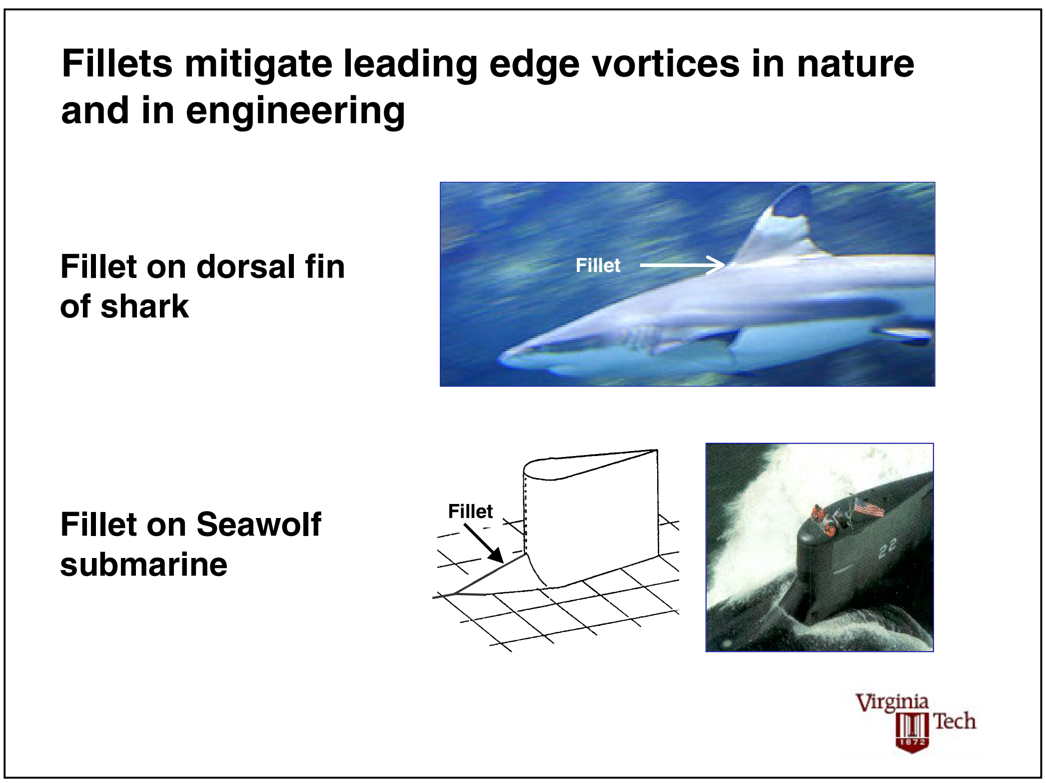

Figure 4. Presentation slide that uses format recommended by this paper [6–8].

Content of Slides. While the discussion for the previous subsection centered on how to format slides so that the retention level is high, the discussion of this subsection centers on what to place on slides so that the audience retains what is most important to remember. If a presenter tries to place all the details of the work onto the slides, then the presenter usually overwhelms the audience, and the audience ends up retaining little [9]. For that reason, presenters have to be selective about what they include. Unfortunately, many presenters place relatively unimportant information onto slides and, in so doing, bury details that the audience actually needs [3].

So what information should you include? The answer lies in the reasons for projecting slides in the first place. One important reason to include slides is to show images that are too complicated to explain with words [3]. A second important reason is to emphasize key results. Given these two reasons, it is easy to see that slides should include the most important images and results of a presentation. Yet a third reason to include slides is to reveal the organization of the presentation. By making the audience aware of the presentation's organization, the presenter keeps the audience more relaxed because the audience knows where they are in the presentation.

Given in Figures 4-9 are key organizational slides of a talk [10-11]. Figure 4 presents a title slide. Figure 5 presents a mapping slide. Figures 6-8 present body slides for each of the three sections of the talk, and Figure 9 presents a conclusion slide. The design of the first slide, the title slide, is interesting because it contains a key image for the presentation. That key image serves to orient the audience to the main topic and to give the speaker the opportunity to speak longer during this slide than during a slide without an image. The extra time spent on this slide is often important because audiences usually need additional time at the beginning of the presentation to become adjusted to the speaker and to grasp the topic.

The design of the mapping slide in Figure 5 is also unusual. Typically, speakers have a bulleted list of five, six, or even more items. Unfortunately, the audience has little chance to remember such a list during the presentation [3]. The slide in Figure 5 presents only the divisions of the middle, as opposed to unneeded listings such as "Introduction," "Conclusions," and "Questions." After all, the audience already knows that those elements will be in the presentation. This slide also anchors each division with an image, which is much more memorable than words [12]. The next three slides are the first slides of each of the three divisions of the presentation's middle. In the actual presentation, each division has several slides. What clues in the audience to which division of the middle is being discussed are the icons in the upper right corners. These icons are excellent devices to keep the audience on track, particularly in a longer presentation [3].

The final slide, Figure 9, is the conclusion slide that repeats the most important results of the presentation. Again, an image appears. In this case, the image shows the material that the speaker wants to emphasize. In a different type of presentation, that image might be a key graph. Also, rather than have a separate slide that announces that the speaker is ready for questions, this slide has the word *Questions* appear at the bottom—this appearance occurs when the speaker is ready for questions. That way, the conclusion slide, arguably the most important slide of the presentation, remains up during the question period.

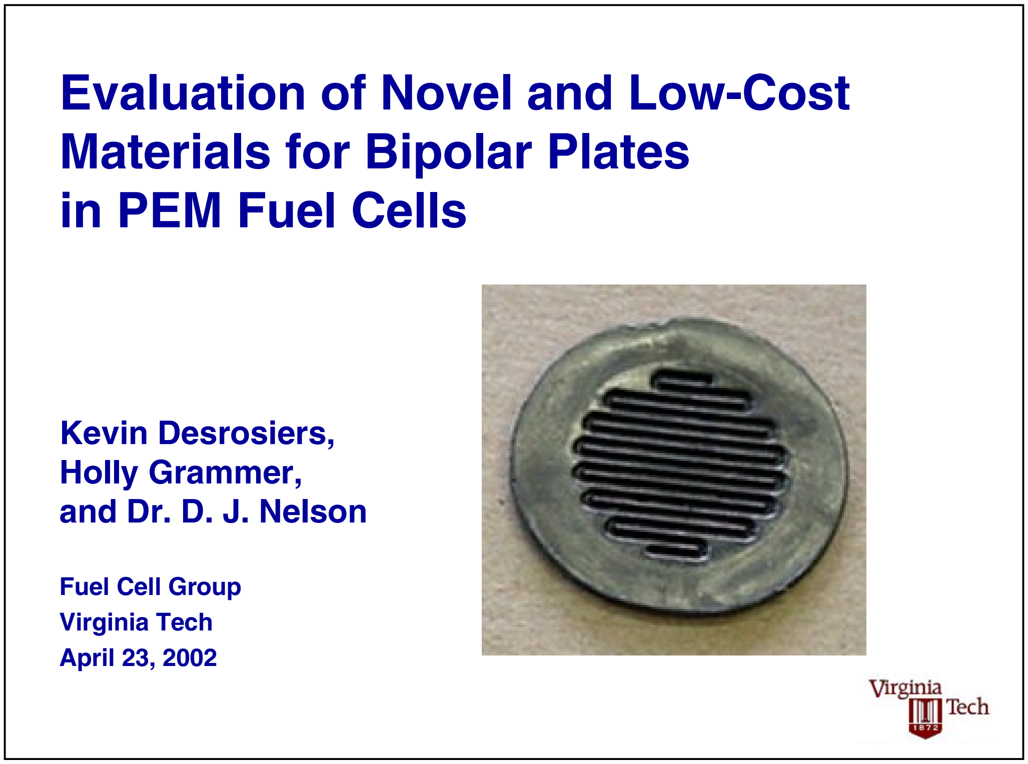

Figure 4. Title slide, which includes an image to orient the audience [10].

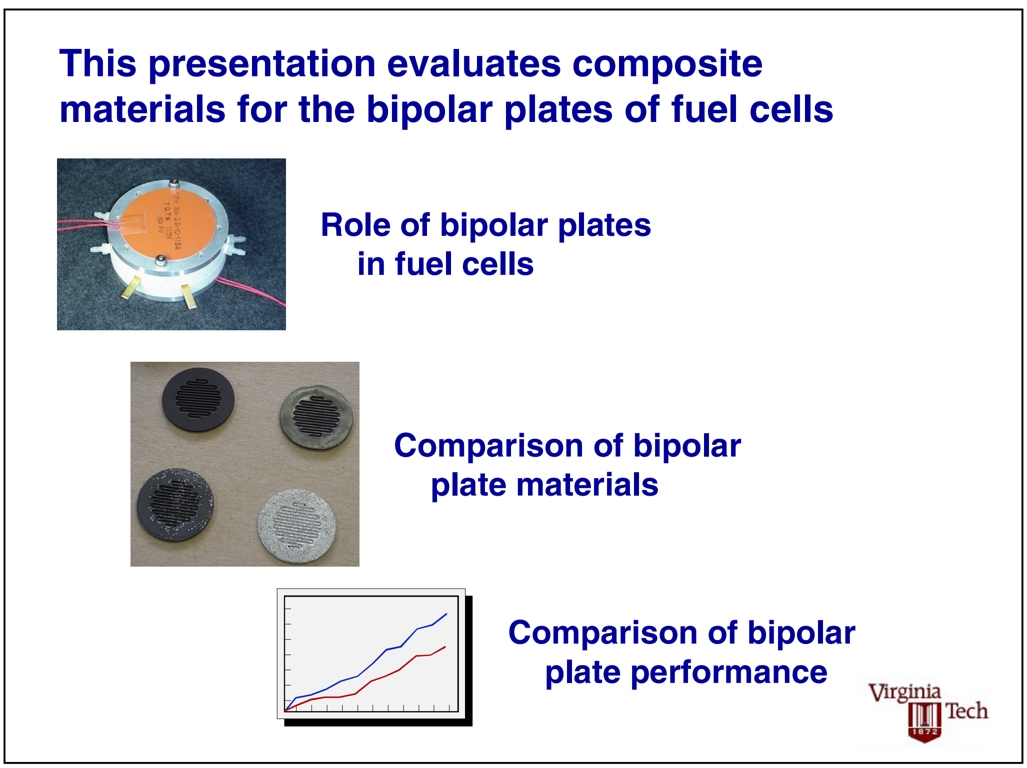

Figure 5. Mapping slide that uses images and words, rather than just words [10].

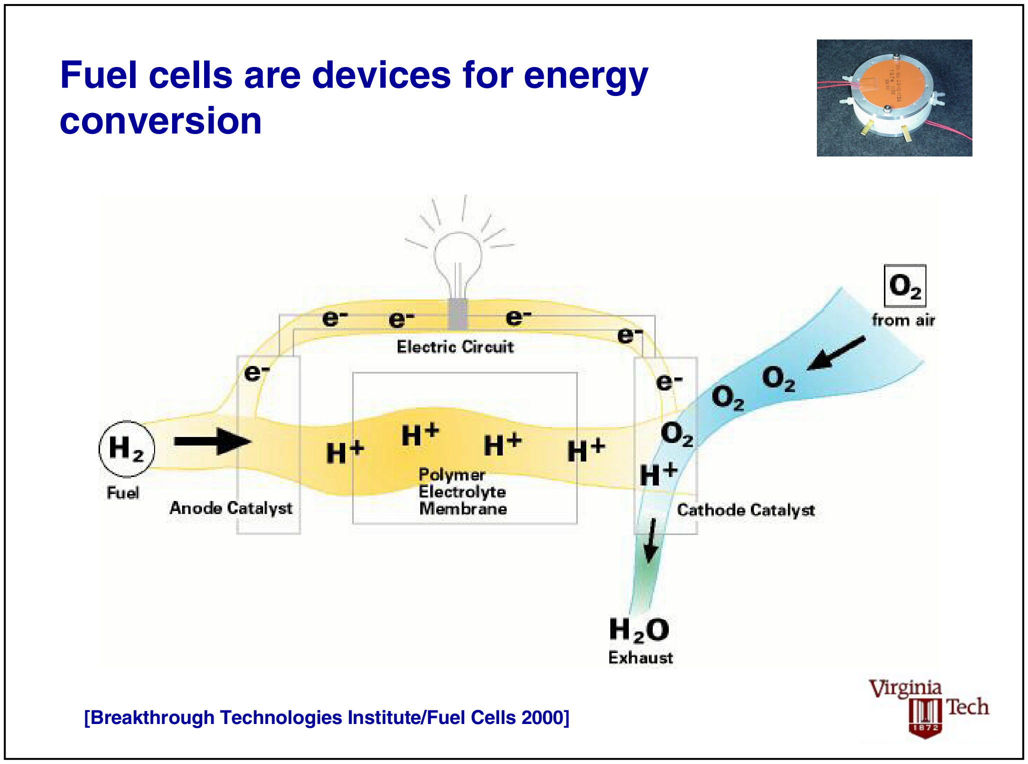

Figure 6. Body slide from the first portion of the presentation [10, 11].

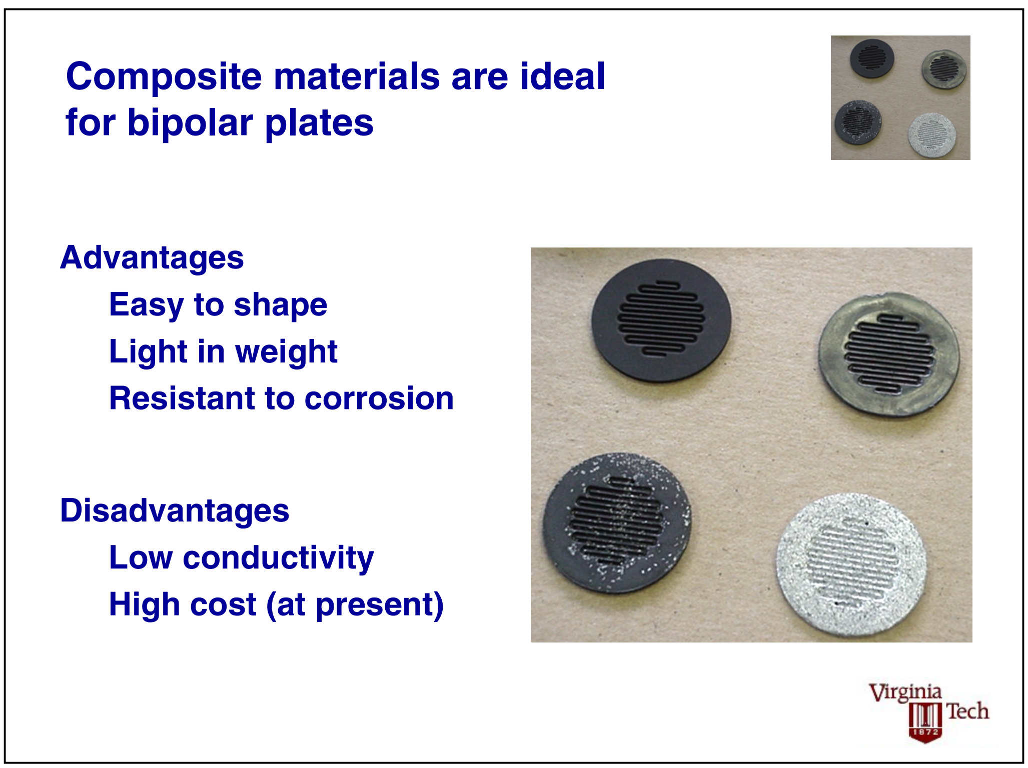

Figure 7. Body slide from the second portion of the presentation [10].

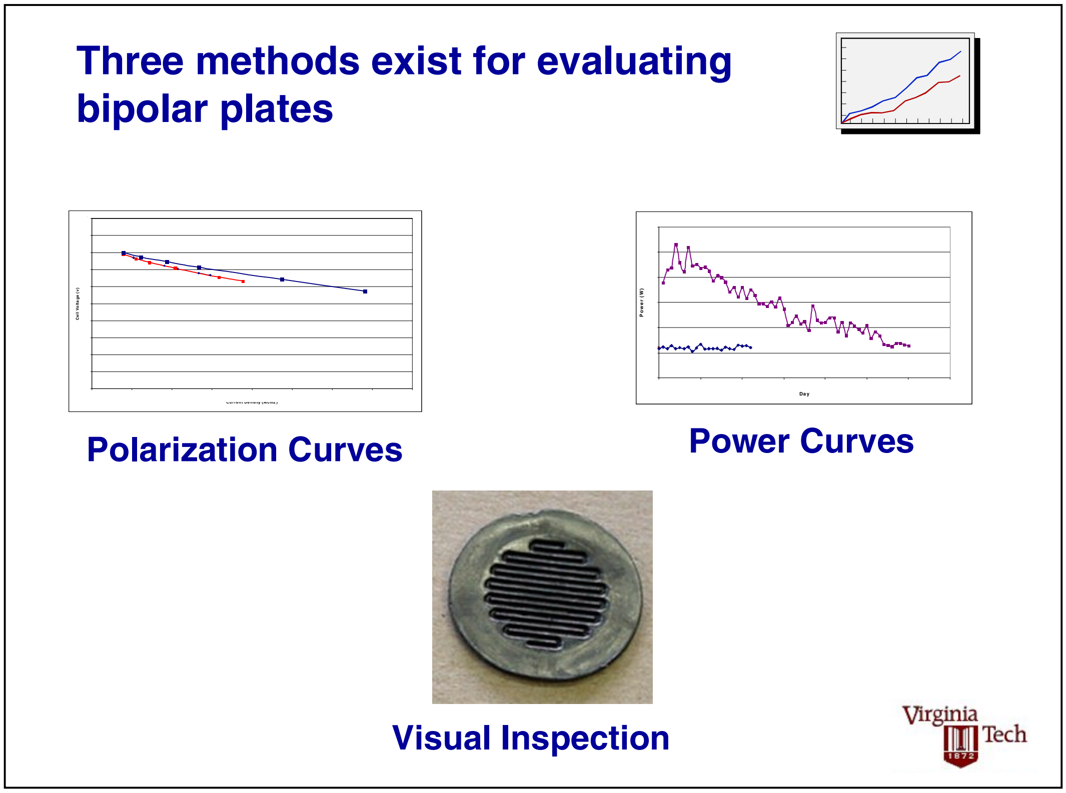

Figure 8. Body slide from the third portion of the presentation—this slide maps the third portion [10].

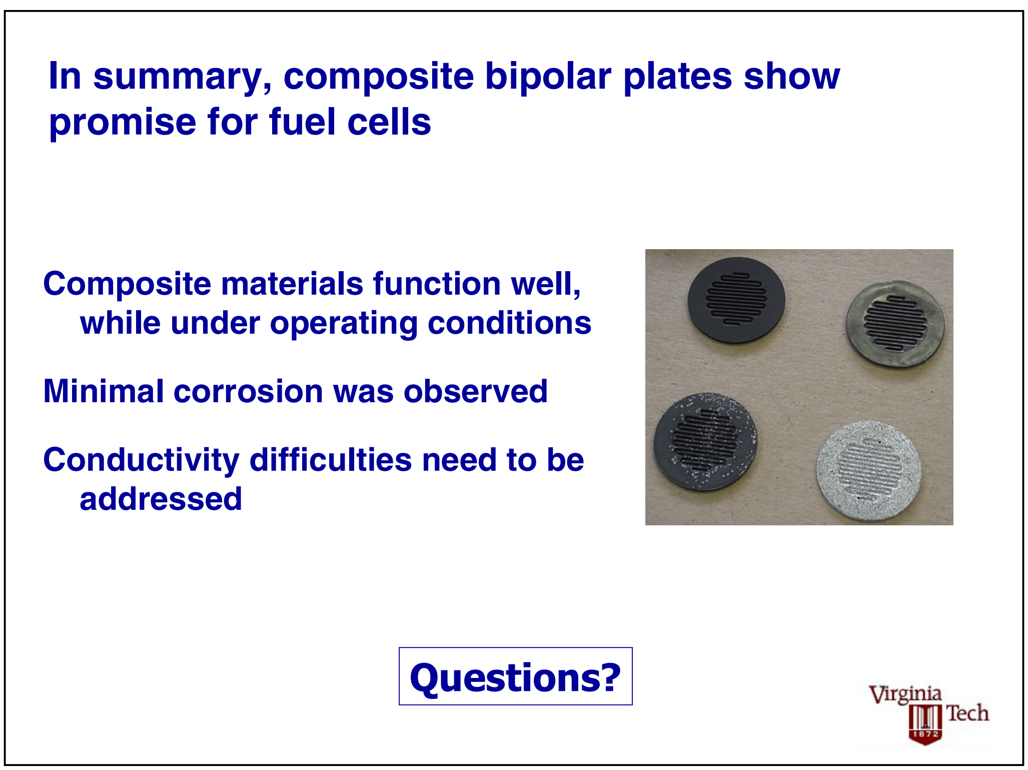

Figure 10. Conclusion slide for the presentation [10]. This slide remains up during the question period.

Conclusions

This paper has advocated a rethinking of the design of presentation slides in engineering presentations. Given how often engineers use slides in their presentations and given how much the design of a slide affects the retention of the audience, such consideration is warranted. Mainly through examples, this paper has argued for a design change from slides dependent on phrase headlines and bulleted lists to slides that are anchored with short sentence headlines (no more than two lines). In this recommended design, these headlines are supported first with images and then with words, if needed. This recommended slide design also counters many of the format defaults of Microsoft's PowerPoint, such as a sans serif type (Times New Roman) and centered headlines, and advocates the format choices shown back in Table 1. These choices include a bold sans serif type, such as **Arial**, and short sentence headlines that are left justified in the upper left corner. A much more detailed argument for and description of this design appears in *The Craft of Scientific Presentations* [3].

Although the design advocated in this paper is commonly used at Lawrence Livermore National Laboratory [2] and Sandia National Laboratories, it is seldom seen on university campuses. That is not because technical communication specialists have not tried to teach the design. For instance, I [Alley] tried for four years to promote this design at the University of Texas at Austin and then another four years at the University of Wisconsin–Madison, but the design did not take hold outside of my classes. At Virginia Tech, though, Harry Robertshaw and I are making progress. In the Mechanical Engineering Department, all senior undergraduate students use the design in a laboratory course, and the lion's share of students continue using that design in their senior design course. In addition, many graduate students and several faculty members in the department have begun using the design. Given the success that these students and faculty have had in their presentations,[*] students and faculty from a number of other departments have become interested in the designs, and we have been running workshops to teach the design to other faculty. One difference in the success at Virginia Tech compared with what has occurred at other places has been that a number of engineering faculty at Virginia Tech have become advocates for the design. Their use and support of the design has given credibility to the design among the students and other faculty.

References

[1] Regina Koligin, *Effective Business and Technical Presentations* (New York: Bantam, 1996).

[2] Larry Gottlieb, "Well Organized Ideas Fight Audience Confusion," article (Livermore, CA: Lawrence Livermore National Laboratory, November 1985).

[3] Michael Alley, *The Craft of Scientific Presentations* (New York: Springer-Verlag NY, 2003), pp. 113-152.

[*] For the undergraduates, one first-place finish and two third-place finishes in the regional ASME presentation competition in the past two years. For the graduate students, two first-place finishes and two second-place finishes in the College's best presentation competition during the past three years. For faculty, several very successful presentations to present research and propose funding.

[4] Adobe Systems Incorporated, “Type Is to Read,” poster (San Jose, CA: Adobe Systems, 1988).

[5] Department of Optometry and Neuroscience, “The Vision Centre,” *http://www.umist.ac.uk/UMIST_OVS/* (Manchester: University of Manchester, April 4, 2002).

[6] Gary Zess and Karen Thole, “Computational Design and Experimental Evaluation of Using a Leading Edge Fillet on a Gas Turbine Vane,” paper no. 2001-GT-404, *ASME Turbo Exposition* (New Orleans: ASME 5 June 2001).

[7] Gary Zess and Karen Thole, “Computational Design and Experimental Evaluation of Using a Leading Edge Fillet on a Gas Turbine Vane,” *Journal of Turbomachinery*, vol. 124, no. 2 (2002), pp. 167–175.

[8] Andrew Rader Studios, photograph of Blacktip Reef Shark, *http://www.kapili.com/b/blacktipshark.html* (1997–2002).

[9] Greg Jaffe, “Slide Fatigue: In U.S. Army, PowerPoint Rangers Get a Taste of Defeat—Top Brass Orders Retreat from All-Out Graphics Assault,” *Wall Street Journal* (April 26, 2000), p. 1.

[10] Kevin Desrosiers, “Evaluation of Novel and Low Cost Materials for Bipolar Plates in PEM Fuel Cells,” master’s thesis presentation (Blacksburg, VA: Mechanical Engineering Department, August 2002).

[11] Breakthrough Technologies Institute/Fuel Cells 2000, “How Does a Fuel Cell Work,” http://www.fuelcells.org/ (Washington, D.C.: Breakthrough Technologies Institute, May 2002).

[12] Rich Williams, “Did You Know?” Infocus Systems (Wilsonville, OR: 2000).

MICHAEL ALLEY (M.S. in EE, Texas Tech, 1979) is an instructor in the Department of Mechanical Engineering at Virginia Tech. He is the author of *The Craft of Scientific Writing* (Springer, 1996), *The Craft of Editing* (2000), and *The Craft of Scientific Presentations* (2003). He is also the lead editor of the *Writing Guidelines for Engineering and Science Students* (http://www.me.vt.edu/writing/).

HARRY ROBERTSHAW (Ph.D., UVa, 1972) has been in the ME Department of Virginia Tech since 1970; he is presently the Assistant Department Head for Graduate Studies. His present research interests are in developing distributed control strategies for structures. Having taught ME lab and communication classes for 25 years, he and Michael Alley have run the lab course, discussed here, for the past 5 years.