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# COMPUTER SLIDE SHOWS

## A TRAP FOR BAD TEACHING

W. R. Klemm

**Abstract.** Slide shows presented with software such as PowerPoint or WordPerfect Presentations can trap instructors into bad teaching practices. Research on memory suggests that slide-show instruction can actually be less effective than traditional lecturing when the teacher uses a blackboard or overhead projector. The author proposes a model of classroom teaching that capitalizes on the advantages of slide shows without the pedagogical disadvantages.

**Keywords:** *PowerPoint, slide show, technology*

I am a technophile. Fifteen years ago, I was so enamored with PowerPoint slide shows that I became trapped into bad teaching practices. Many of my colleagues have also fallen into the trap. All college classrooms at my institution are equipped with a computer and projector, making it easy to depend on slide shows for teaching. Your school might be like this, too.

The trap, as I will explain, interferes with students remembering content presented in slide shows. I recently became a student of memory research literature, which convinces me that misuse of slide-

show presentations can actually interfere with learning.

### Advantages of Slide Shows

Before explaining why slide shows can lead to bad teaching, let me first concede that using PowerPoint or WordPerfect Presentations for classroom instruction does have advantages. These handy programs organize content and can display all slides at once, making it easy to spot ones that would be better positioned elsewhere. Slide shows are also slick—it is relatively easy to use attractive fonts, photos, clip art, tables, and graphs. Finally, slide shows are adaptable to many teaching environments, including face-to-face, televideo, and online.

Although slide shows are undeniably useful for showing animations and illustrating intricate graphics or photographs that would take too much time to draw in class, these advantages paradoxically lie at the heart of creating bad teaching practices. Later in this article, I present an instructional model that capitalizes on these two advantages of slide shows without the disadvantages.

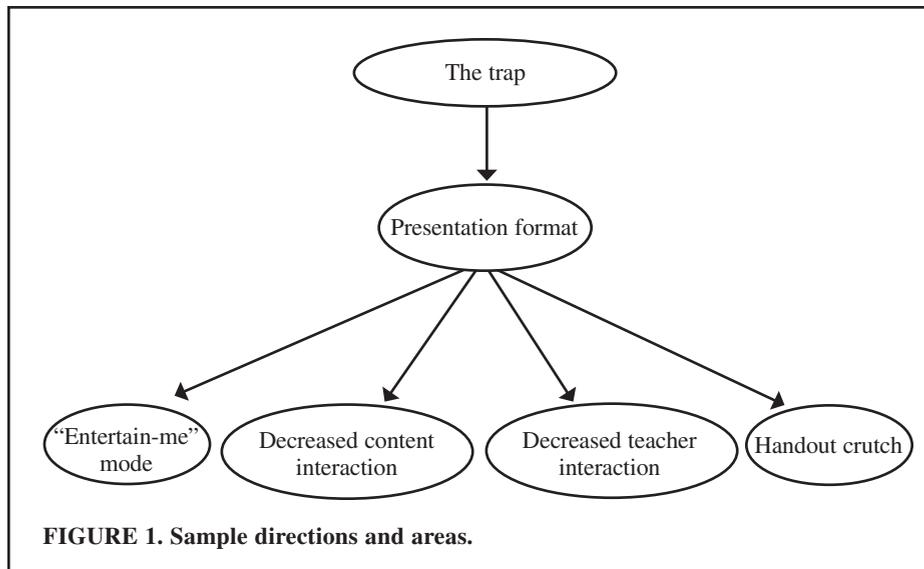
### The Trap

Some instructors are opposed to using slide shows because of the difficulty of sustaining reasoned consideration and discourse of complex material. Critics argue that slide shows lead to sound-bite thinking, sloganeering, and a pitch culture. The data and evidence that can be presented in a slide show are limited and of low quality compared with alternatives such as spreadsheets and relational databases, and slide shows are not good for coping with ambiguity or for evidence-based decision making. Serious decision errors in government have been made as a direct result of the culture that relies heavily on slide-show briefings.<sup>1</sup>

From the teaching perspective, slide shows ensnare instructors into lecture mode. But lecturing with slide shows can be worse than traditional lecturing with a blackboard or overhead projector because many teachers present content by stringing together thirty to fifty slides in a class period. Instead of encouraging this information dump, the slide-show lecture should clarify what

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needs to be learned, motivate students, point them to good reference material, illustrate and explain difficult concepts, and engage them in active thought and application of the information.

There are four problems with slide shows as they are most commonly delivered (see figure 1). First, students can easily be lulled into an “entertain-me” mode, exacerbated by a passive environment in which the lights are dimmed when “the show” begins and do not turn on again until it is over. The slicker the graphics, the more mesmerized students are likely to become. Teachers who have spent more than twenty minutes on a slide-show presentation have probably seen many eyes glazed over. Television has accustomed students to be passive viewers—but at least with television, viewers get a commercial break every few minutes to think about the information that was just presented to them.

Second, students are not obliged to interact with the content being delivered. Students are easily overwhelmed with information that they may falsely assume is being digested. All students have to do is look at the screen as the instructor describes what is on the slide, and the instructor often simply reads what is already on the slide. Passivity is a reflex response to the presentation format in which the instructor is in a “stand-and-deliver” mode. Indeed, students may find it impossible to interact with the content in a typical slide show because more information is being dumped on them

than would usually be possible in a traditional lecture. In traditional instruction, the teacher has to draw the illustrations or write on the blackboard and students actively engage in copying them; in slide shows, such visuals are preprepared.

Third, because instructors are so easily attracted to a slick-presentation mode, there may be little interaction between them and students. Slide shows must be interrupted to allow time for interaction, and it is too easy for slide-show instructors to zip through large series of slides. Human nature often makes people dislike being disrupted.

Finally, students compound the problem by insisting they receive a hard copy of the slide show. The handout becomes a deceptively useful crutch that allows students to avoid taking notes, reflecting on the meaning of what is being taught, making their own diagrams, and reorganizing the material to fit better with their academic background and personal learning style. Slide-show printouts are a handy way to create lecture notes for the teacher, but they should not be the primary medium of instruction for students.

When slide shows are used for tele-video teaching, they compound the already difficult problem of interacting with the class. Students are even more likely than in face-to-face environments to be lulled into passivity. Posting slide shows on a teaching Web site magnifies the problem of students thinking they know it all because it is easy to scan the whole series in gallery mode. Full interaction with the

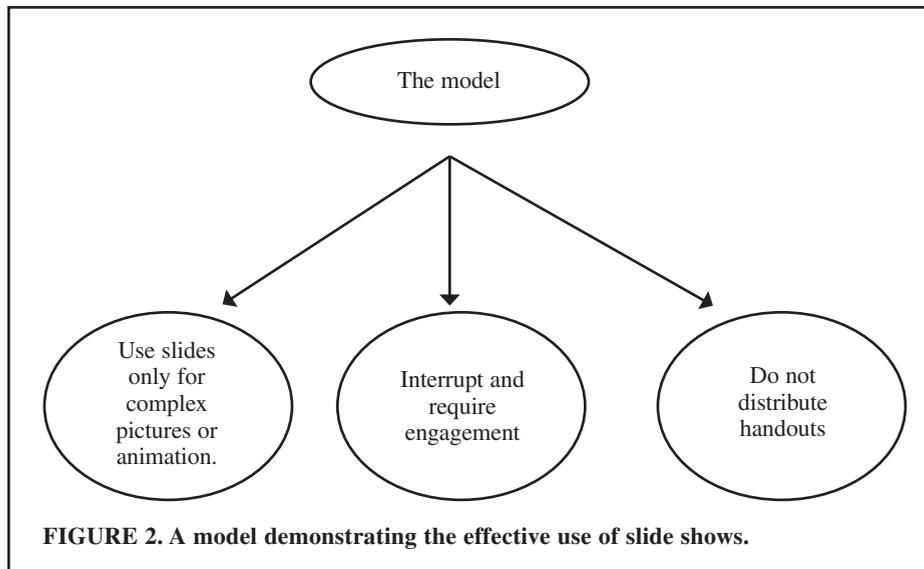
content will not occur unless the teacher inserts questions, problems, and tasks into the slide show.

Slide-show teaching violates several key principles of good memorization practice (Klemm 2004). Optimal memory occurs when students pay attention and focus. Attentiveness is diminished when the learner is in a passive, “entertain-me” mode. Memory also works best when instruction is delivered in short segments. The ten-minute rule for optimal learning mandates that instruction be provided in short epochs of about ten minutes, followed by immediate application in which students think about the material and use it in some way. An application can be as simple as polishing the lecture notes, making personal drawings, or solving a problem based on its content. Students also need this ten-minute break to identify learning cues and make visual associations that will facilitate the formation of lasting memory. They also need this time to consolidate temporary memory into more permanent form. Consolidation is also time dependent (McGaugh 2000). Interposing new information or stimuli while other information is in the process of consolidation can interfere with consolidation. In a typical slide show, motivated students try to learn everything at once and get a misleading impression that they really know the material.

It is important for several reasons for students to remember as much as possible from the first presentation of a slide show. First, what is remembered greatly facilitates what can be learned in later study and reflection. What resides in working memory—retained from first exposure to the slide show—provides associations for the new or unmemorized material and enriches the students’ thinking process. Efficiency is also important, so that material learned during a slide-show class does not have to be relearned during study time.

### Effective Use of Slide Shows: A Model

Teachers do not need to completely abandon the use of slide shows, but they should use slides judiciously—not as a “show” (see figure 2). The first rule is to show only one or a few slides at a time, limiting their content to pictures or diagrams that would take too long to



draw on a chalkboard and illustrations with animation. When a teacher draws and writes the instruction, teaching slows down enough so students are not overwhelmed and can think about the content being presented. Presenting instructional material should not be a race: you want students to remember what you are showing and telling them. What good is learning if students do not remember it? Less can be more, in the sense that slowing down facilitates reflection, comprehension, and memory. Moreover, instead of racing through a slide show, give the students time to make their own rendition of what you say and draw. Students are far more likely to remember information from their own notes and drawings than from an instructor's. They not only take ownership, but they can customize the content in ways that are meaningful and memorable. Remember, this approach is similar to what many of us did when we were students: show a transparency or two on the overhead projector and then interact with the class on what was just presented. That technology is primitive by today's standards, but the pedagogy is sound.

The second element of the model is enabled by showing slides either one at a time or in blocks of only a few. This way, you can pause and engage the students in discussion, questioning, and application activity—all of which facilitate memory formation. This interactive engagement provides key cues to assist memory and allows students to integrate and rehearse

the content that was presented in the preceding slides. This presentation style accommodates the ten-minute rule. Human working memory is limited (Cowan 2005), and if too much information is presented at once, previous information is overwritten on the brain's "scratchpad" memory by the later information. Scratchpad memory has low capacity and is volatile. To be remembered longer, scratchpad memory must be rehearsed before new information overwrites the scratchpad. Therefore, immediately after ten minutes of presentation, students should apply the instruction uninterruptedly for about ten minutes. This application can take many forms, but the application keeps the student thinking about the content, which provides many cues and rehearsal time to help form a memory of the content. Such focused activity prevents distractions and interruptions that otherwise would prevent consolidation of scratchpad memory into more permanent form. Note that for memory purposes, new information qualifies as distraction and interferes with retention of preceding information.

Content in slide shows is typically much more effective if pictures, rather than words, are used. Humans are visual animals: our brains have some fifty-fold more neural tissue devoted to vision than to hearing. Of the tissue devoted to vision, only a tiny patch of cerebral cortex is devoted to seeing words. Basic memory theory holds that the best way to remember something is to convert the content to mental pictures. This is how ancient

Greek orators delivered speeches for hours on end without notes and how today's memory wizards deliver astounding feats of memory in seminars and workshops (O'Brien 2000). As a child, I could learn the general content and number of every page in a magazine within about thirty minutes using image gimmickry.

In a slide-show environment, it is effective to have some slides with no text at all. The pictures are vastly more memorable than any words the teacher could put in bullet points. Of course, bullet points are sometimes necessary because not everything can be easily represented by a picture. But we need to get beyond the common belief that a slide should have no more than seven lines and seven words per line.

Slides can also be used in more creative ways than a series of bullets. Some slides can be constructed as interactive quizzes, the answers elucidated as part of the teaching process. Some slides of structural information, such as an electronic circuit diagram or a drawing of a cell, can be left with blank lines pointing to discrete structures that students need to know. Icons may be used to link to a movie or sound clip. Hyperlinks can take the student to other slides in the show or to Web sites.

Another problem is that most classrooms are designed on the assumption that teachers want to present a continuous stream of slide shows. Light switches are usually situated away from the podium, making it awkward to run back and forth to adjust the lights while showing slides and interacting with students. Even so, moving around the room and away from the podium may help keep students' attention. During the student interaction and application period, it is important to get the last slide off the screen so it will not be a distraction. Students need to be engaged with you, each other, and the application task—not staring at the screen. However, taking the last slide off the screen can be awkward. You can manually place the cover over the lens of an LCD projector, but the projector may be mounted in the ceiling or otherwise inaccessible. In that case, have a blank slide (black is best) at the end of each content slide set. The blank slide also reminds the instructor that it is time for a learning activity to reinforce what has just been presented.

Yet another room-design problem is that lights have to be dimmed near the screen so the slides will show clearly. However, many classrooms do not allow selective dimming of lights. Rooms that do allow selective dimming create another problem: there is little light on the teacher, who also is usually at the front of the room. In such cases, it is even more imperative that the teacher not be chained to a podium but rather able to move around the room. This article will not delve further into issues of classroom design and the commonly inadequate collaboration between teachers and architects, but schools need to pay more attention to their physical environment.

The last element of the model is to resist the temptation to distribute slide-show print-outs. Tell students in advance that handouts will not be forthcoming, except perhaps for a few select slides, because handouts consti-

tute a crutch that will actually interfere with remembering the material. Expect students to make their own notes and drawings, which will keep them engaged with the content.

“Well, what *can* I hand out?” you might ask in exasperation. Certain content-rich slides can be distributed, and you should also hand out hard copies of slides that have pictures with special mnemonic value. Outlines, supporting documents, data sheets, worksheets, assignments, and practice quizzes may also be appropriate to hand out. You must also provide students with guidance on access to appropriate resources to complement the classroom experience, such as pages in a text, journal or magazine articles, and Web sites.

### Conclusion

Teachers can experience similar problems with slide shows during regional and

national professional meetings and conferences, where they are in the students' place instead of in front of the classroom. These meetings can easily become a blur of ill-remembered presentations. How much content do you remember from your last teacher meeting?

### NOTE

1. See <http://www.edwardtufte.com>.

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