Random Thoughts . . .

DEATH BY POWERPOINT

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I t's a rare professor who hasn't been tempted in recent years to put his or her lecture notes on transparencies or PowerPoint. It takes some effort to create the slides, but once they're done, teaching is easy. The course material is nicely organized, attractively formatted, and easy to present, and revising and updating the notes each year is trivial. You can put handouts of the slides on the Web so the students have convenient access to them, and if the students bring copies to class and so don't have to take notes, you can cover the material efficiently and effectively and maybe even get to some of that vitally important stuff that's always omitted because the semester runs out.

Or so the theory goes.

The reality is somewhat different. At lunch the other day, George Roberts—a faculty colleague and an outstanding teacher—talked about his experience with this teaching model. We asked him to write it down so we could pass it on to you, which he kindly did.

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"About five years ago, I co-taught the senior reaction engineering course with another faculty member. That professor used transparencies extensively, about 15 per class. He also handed out hard copies of the transparencies before class so that the students could use them to take notes.

"Up to that point, my own approach to teaching had been very different. I used transparencies very rarely (only for very complicated pictures that might be difficult to capture with freehand drawing on a chalkboard). I also interacted extensively with the class, since I didn't feel the need to cover a certain number of transparencies. However, in an effort to be consistent, I decided to try out the approach of the other faculty member. Therefore, from Day 1, I used

transparencies (usually about 8 -10 per class), and I handed out hard copies of the transparencies that I planned to use, before class.

"After a few weeks, I noticed something that I had not seen previously (or since)—attendance at my class sessions was down, to perhaps as low as 50% of the class. (I don't take attendance, but a significant portion of the class was not coming.) I also noticed that my interaction with the class was down. I still posed questions to the class and used them to start discussions, and I still introduced short problems to be solved in class. I was reluctant to let discussions run, however, since I wanted to cover the transparencies that I had planned to cover.

"After a few more weeks of this approach, two students approached me after class and said, in effect, 'Dr. Roberts, this class is boring. All we do is go over the transparencies, which you have already

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handed out. It's really easy to just tune out.' After my ego recovered, I asked whether they thought they would get more out of the class and be more engaged if I scrapped the transparencies and used the chalkboard instead. Both said 'yes.' For the rest of the semester, I went back to the chalkboard (no transparencies in or before class), attendance went back up to traditional levels, the class became more interactive, and my teaching evaluations at the end of the semester were consistent with the ones that I had received previously. Ever since that experience, I have never been tempted to structure my teaching around transparencies or PowerPoint."

The point of this column is not to trash transparencies and PowerPoint. We use PowerPoint all the time—in conference presentations and invited seminars, short courses, and teaching workshops. We rarely use pre-prepared visuals for teaching, however—well, hardly ever—and strongly advise against relying on them as your main method of instruction.

Most classes we've seen that were little more than 50- or 75-minute slide shows seemed ineffective. The instructors flashed rapid and (if it was PowerPoint) colorful sequences of equations and text and tables and charts, sometimes asked if the students had questions (they usually didn't), and sometimes asked questions themselves and got either no response or responses from the same two or three students. We saw few signs of any learning taking place, but did see things similar to what George saw. If the students didn't have copies of the slides in front of them, some would frantically take notes in a futile effort to keep up with the slides, and the others would just sit passively and not even try. It was worse if they had copies or if they knew that the slides would be posted on the Web, in which case most of the students who even bothered to show up would glance sporadically at the screen, read other things, or doze. We've heard the term "Death by PowerPoint" used to describe classes like that. The numerous students who stay away from them reason (usually correctly) that they have better things to do than watch someone drone through material they could just as easily read for themselves at a more convenient time and at their own pace.

This is not to say that PowerPoint slides, transparencies, video clips, and computer animations and simulations can't add value to a course. They can and they do, but they should only be used for things that can't be done better in other ways. Here are some suggested dos and don'ts.

► *Do* show slides containing text outlines or (better) graphic organizers that preview material to be covered in class and/or summarize what was covered and put it in a broader context. It's also fine to show main points on a slide and amplify them at the board, in discussion, and with in-class activities, although it may be just as easy and effective to put the main points on the board too.

► *Do* show pictures and schematics of things too difficult or complex to conveniently draw on the board (e.g., large flow charts, pictures of process equipment, or three-dimensional surface plots). *Don't* show simple diagrams that you could just as easily draw on the board and explain as you draw them.

► *Do* show real or simulated experiments and video clips, but only if they help illustrate or clarify important course concepts and only if they are readily available. It takes a huge amount of expertise and time to produce high-quality videos and animations, but it's becoming increasingly easy to find good materials at Web sites such as SMETE, NEEDS, Merlot, Global Campus, and World Lecture Hall. (You can find them all with Google.)

► *Don't* show complete sentences and paragraphs, large tables, and equation after equation. There is no way most students can absorb such dense material from brief visual exposures on slides. Instead, present the text and tables in handouts and work out the derivations on the board or—more effectively—put partial derivations on the handouts as well, showing the routine parts and leaving gaps where the difficult or tricky parts go to be filled in by the students working in small groups.[1,2]

If there's an overriding message here, it is that doing too much of *anything* in a class is probably a mistake, whether it's non-stop lectures, non-stop slide shows, non-stop activities, or anything else that falls into a predictable pattern. If a teacher lectures for ten minutes, does a two-minute pair activity, lectures another ten minutes and does another two-minute pair activity, and so on for the entire semester, the class is likely to become almost as boring as a straight lecture class. The key is to mix things up: do some board work, conduct some activities of varying lengths and formats at varying intervals, and when appropriate, show transparencies or PowerPoint slides or video clips or whatever else you've got that addresses your learning objectives. If the students never know what's coming next, it will probably be an effective course.

References

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2. Felder, R.M., and R. Brent, "FAQs. II. Active Learning vs. Covering the Syllabus, and Dealing with Large Classes," *Chem. Engr. Ed,* **33** (4), 276 (1999). On-line at *<http://www.ncsu.edu/felder-public/Columns/FAQs-2.html>* ❏

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