

Chalk It Up

“As long as there are babies, there will be teaching jobs.
After all, most people are born not knowing a whole lot.”

—Anonymous

Technology has done some amazing things for the teaching profession. Need to remind the students about the time and place of the final exam? The class e-mail alias is instantaneous and works at 3:00 a.m. Need to distribute Homework #4? No need to make 100 copies and hand them out in class. Just post the assignment and let the students download and print it. Need to fix an error in Problem #6? Easy. The efficiencies are amazing, especially for large classes.

Technology can go much further. First there was chalk, then transparencies, and now PowerPoint. In some courses, students can download and print the PowerPoint slides, bring them to class, and augment the printouts with additional comments. Every student has access to a precise and complete set of notes.

These benefits are extremely valuable to students. As a faculty member, I've sat in on two semester-long graduate courses. Using chalk, the lecturers, both outstanding experts in their fields, would write equations on the board, and, upon finishing, would immediately begin to explain the equations. It was challenging to copy the equations accurately while absorbing the explanations. With prewritten notes, I would have been able to listen with complete attention. In many classes today, students have that luxury.

To confirm these observations, I often ask students how they feel about the use of PowerPoint in the classroom. In light of the obvious advantages, their answers are surpris-

ing: not a single student has ever told me that they prefer PowerPoint over chalk. Why? Because 1) “with the lights out I tend to fall asleep,” and 2) “it’s boring.” Yes, but what about all of the advantages? “Yeah, that’s true, but it’s still boring.”

Where is teaching technology headed in the future? On the first day of freshman year, every student will receive a DVD containing every lecture, homework assignment, textbook,

perhaps entertaining) to maintain attendance. Indeed, even now there are students who don't show up to class except (it seems) on the first day to collect the syllabus and the last day to take the final exam. Perhaps these students should get a discount on tuition. (Just kidding!)

Distance learning already foregoes live lectures to some extent. Professionals who can't afford the time to travel to campus can access the Web and watch the lecture, either in real time or recorded. In fact, some courses are already taught completely through the Web. The instructor and students never meet in person.

In this age of outsourcing, it probably won't take college administrators long to realize that not all courses really need to be taught by warm beings. Once the “best” instructor is found, the lectures, readings, and assignments can be packaged, and students can learn at their own pace or through the Web. These trends ought to make

instructors nervous. Why hire hundreds of live humans to teach calculus and circuits when a few will suffice? Of course, the savings in faculty salaries will be passed on to students. (Again, just kidding.)

Technology is the driver behind these trends, but I personally think we're headed in the wrong direction. At the risk of being a total Luddite, my philosophy is to use only chalk, and I do everything I can to make it essential for students to attend class (and inconvenient to skip). My



Dennis Bernstein with his sons Sam (left) and Jason. Sam and Jason are frequent contributors to “On the Lighter Side.”

and course pack for whatever courses the student chooses over the next several years. Alternatively, all of the coursework material might be distributed through the Web. Then, why go to class? While some lectures might illuminate the material, other lectures might be an annoyance that takes time away from other things such as doing homework or working at jobs to pay the tuition (which pays the salary of the instructor teaching the class the student is missing!). Instructors will need to be outstanding (or per-

rationale for this strange approach should not be surprising to control engineers: feedback.

When I began teaching, I thought that all I had to do to teach well was explain everything with such clarity that every student would “get it” the first time. What could be more efficient? Was I ever wrong! Not only did students not “get it” the first time, but I had to explain some things over and over in every way I could possibly think of. What’s more, the great explanations that worked one semester failed in another semester, and I had no idea why. It would sometimes take hours of discussion to hear a student suddenly declare “Oh, now I see what you mean,” and I was left to wonder what my initial explanations lacked.

What I eventually learned was that a good lecture often requires constant innovation in real time. Most importantly, I found that I needed to look at the students’ faces (hard to do in the dark) and figure out from their expressions if they “got it” or not. And that was after I wrote the equations, got



Dennis Bernstein visits the U.S. Department of Energy’s National Renewable Energy Laboratory (NREL) in Golden, Colorado. According to Dennis, “A trip to the top of a 36-m wind turbine provides a great view and a better appreciation for the height of these structures.”

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out of the way, gave every student a chance to copy the board, and only then began an explanation.

Technology does have its place in the classroom. An animated simulation showing what happens in a dynamical system can be extremely informative. If students are expected to *understand* dynamical systems, then it can be extremely helpful for them to *see* some dynamics. But such presentations are merely one part of a two-way exchange between the instructor and the students.

Teaching and learning is a feedback process. In the proverbial classroom taught from a tape recorder, only tape recorders will come to class, and not much learning will occur. Although PowerPoint is great for conferences, this control engineer will hold on to his chalk, at least for now.

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