

## June, 2004 - Brian Hopkins, Mathematics

### Lecture Less

"I taught the material, but the students didn't learn it."

Define the meaning of "teach" in that sentence.

(attributed to Al Shanker, long-time president of American Federation of Teachers)

That provocative quotation serves as a touchstone for my teaching, a reminder that education is a mutual endeavor involving me and the students. In this teaching tip, I want to explain how I have deemphasized classroom lectures and incorporated active learning in their stead.

My own experience of learning is not a very helpful guide. I love mathematics and will glean content from even the driest lecture. But research suggests that such "passive learning" is not very effective in general. In fact, I think all true learning has to be "active" - engagement is a necessary ingredient for understanding - the question is just how that necessary action is spurred. We faculty have been trained to supply that action ourselves, working through examples, thinking of connections, considering generalizations, etc. To develop those same habits of mind in our students is a wonderful goal; we can help by being more directive, using active learning in the classroom.

In most of my classes, including core, I lecture once a week (and the lecture is fairly interactive). Another day is devoted to going over homework problems (with students putting proposed solutions on the board). The third day is devoted to a collaborative project. The content is sometimes an extension of what we have discussed, sometimes an in-depth application, sometimes groundwork for a future topic. The students work in groups of three or so, often assigned randomly. I circulate through the room to answer questions and check on progress, but I emphasize that the students in a group are each other's best resource.

Colleagues have wondered whether this method sacrifices too much content. Certainly, I could cover more material by lecturing all the time. But I believe that the coverage given by lectures, even well-organized finely-polished lectures, is shallow compared to what students can learn through active classroom engagement. In the collaborative setting where they explain ideas to one another, students must master the material at a much deeper level than what happens when they just copy things from the board and take notes from what I say. My belief is supported by research in a relatively young field called learning science. "Active learning increases the overall quality of functioning of the brain." (From Lori Breslow of the Massachusetts Institute of Technology Teaching and Learning Laboratory, which produces a series of Teach Talk articles, URL below, much like our Teaching Tips.)

Even students recognize the quality of these collaborative projects. Certainly there are complaints about the work required (much more than is necessary for taking notes), but on evaluations there is often grudging acknowledgement of how the projects helped them master the material. On the faculty side, it takes significant time to prepare a good project, providing enough direction while requiring synthesis and creative thinking from the students. But I have found it be time well spent toward the goal of overall student learning.

There are many ways to balance passive and active learning; weekly projects may be too much for you. For reference, though, there are teachers who do more of it than I do. A colleague at Portland State University, for example, teaches calculus without ever giving a lecture. And a professor from the College of St. Benedict/St. John's University in Minnesota recently gave a provocative and well-received talk at a national conference: "No Lectures, No Tests, No Tears!" We'll save the idea of no tests for a future Teaching Tip.

[http://web.mit.edu/tll/published/teach\\_talk.htm](http://web.mit.edu/tll/published/teach_talk.htm)