

TEACHING PHILOSOPHY

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I taught a large number of courses in graduate school, and had decided when I graduated that I was a reasonably good lecturer. It was my philosophy when I started my career as a tenure-track faculty member that my classes would be lecture-based, but interactive. I very much believed in the sage-on-the-stage philosophy of teaching, where I would stand in the front of the room and impart knowledge to my students.

In the past few years, I have realized that I have many other options for engaging students, and that there are other ways to keep students involved in the classroom and have them be active learners. My goal is to have the students own the knowledge they gain in class and to have them develop critical thinking skills. This last is especially difficult for students if I am lecturing and not helping them become self-reliant.

In particular, my teaching style has evolved to include more and more student-centered methods. That does not mean that I do not lecture - I do - but that I also give students an opportunity to be the focus of the class. To this end, I employ a number of techniques, depending upon the class and the students involved. In all instances, the goal is to guide the students to where they can discover the important points and the big ideas, so that they remember the “a-ha” moment, and therefore the mathematics as well.

In upper level courses, such as *Introduction to Proofs* and *Abstract Algebra*, the course is designed in a modified Moore method manner. To me “modified Moore method” means that the students may have textbooks, but are not allowed to discuss problems with anyone other than the professor. It also means that the students are not to use any other outside references for the exercises. In these courses, students are responsible for preparing solutions for homework and then sharing them in class. They are also responsible for thinking critically about the solutions presented, and for asking questions of the presenter. I will interject with comments about the format of the presentation or with questions, but I emphasize that it is the class’s responsibility to determine the validity of arguments presented by their classmates. In particular, since each student has to submit complete solutions of every problem, I will occasionally allow incorrect solutions to be presented in class and left on the board to allow students to discover the errors while writing up their individual solutions. By the end of the semester, students have discovered how to create a cohesive argument and how to examine the veracity of arguments presented to them. These skills stay with them and help them in future mathematics courses.

In lower level courses, like *Calculus*, I have begun using worksheets in the style of an Emerging Scholars Program (ESP). The idea behind these worksheets is that students who need extra help with concepts (such as solving equations) cannot master the prerequisite material and the new material (the calculus concepts) by moving more slowly through the material. The ESP-style worksheets force the students to work in groups at the board in order to solve problems that solidify concepts, preview upcoming material, and ask them to apply theory they have learned in order to solve application problems. I circulate through the room, asking questions about the board work to members of the group (usually not to the member holding the chalk, since they are supposed to be keeping all members of the group involved) and answering questions by asking questions in return. These worksheets allow the students to practice concepts while I am in the room to answer questions, to develop critical thinking skills as they critique ideas suggested by other members of the group, and learn mathematical language. Many of these problems are more challenging than those normally assigned as homework, and therefore encourage the students to perform at higher levels than a traditional calculus course.

In both of these situations, I continue to assign traditional homework, give in-class quizzes to make sure that basic vocabulary and computational skills are being mastered, and give exams. However, having the students involved in their learning makes them feel more responsible for their mistakes and their victories. They seem less likely to say “You never taught me how to...” and more likely to say “The exams were fair” on student evaluations. I have received comments such as “This is the hardest math course that I have ever taken” and “I never worked so hard for a B,” both of which I believe to be compliments. Students understand that they are responsible for learning the material, and that they EARN their grades in my courses.

I am continuing to examine my teaching techniques, and look for better ways to engage students and have them understand and retain information. To this end, I frequently attend MAA Section Meetings and have attended five Legacy of RL Moore Conferences, designed to provide information and support for instructors using inquiry-based learning techniques. In fact, I served as one of the emcees at the 2009 Legacy of RL Moore Conference, and am serving on the advisory committee planning the 2010 conference. Good teaching constantly evolves, and the techniques that constitute good teaching depend upon the course and the student population. Understanding this and being willing to adapt and learn new techniques increases my efficacy and helps me reach more students.