

TEACHING STATEMENT

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I have been a teacher of mathematics for over ten years. I have taught algebra and analysis to math majors at Harvard, calculus and statistics to many different kinds of students at Harvard and Berkeley, and number theory to gifted high school students at the Ross Young Scholars Program. Each situation brought new perspectives to my teaching, and each class taught me its own lessons, some of which I will summarize here.

One of the most important skills a teacher can have is the ability to answer questions well. A successful lecture is a dialogue, whether it occurs in a freshman calculus discussion section or a talk at a seminar. A fundamental part of my teaching philosophy is to encourage questions, both vocally and by example. I tell students repeatedly, “If you have a question or are struggling with something, then you are not the only one.” When explaining difficult material, I look for signs that the class is having trouble understanding me, and pause frequently to ask for questions. When questions are patiently and openly treated as a natural part of a lecture or discussion section, students soon gain confidence and join the dialogue. Students consistently praise this particular aspect of my teaching in evaluations.

Another integral part of good mathematics pedagogy is group work. Most people learn better and are more motivated when they can share their knowledge and questions with their peers as well as their teacher. The Ross Program encourages beginning students to work in groups; this is how I learned the basics of algebra and number theory. Berkeley’s mathematics department also encourages group work, and the Professional Development Program (PDP) for disadvantaged students, for which I taught, emphasizes group work inside and outside the classroom. It is very difficult to design group work that engages and challenges students, but that is at the same time not too difficult or obscure. I have tried to do this both as a teaching assistant and as an instructor for summer school classes, with some success.

It is not enough to give a group of students a list of problems and read them the answers at the end, or to simply do the problems myself on the blackboard. Motivation is a fundamental problem in virtually all introductory college mathematics classes. Many students are initially interested only in their grades, or simply what they need to know for their particular field of study. The enthusiasm of the teacher must be infectious enough to transmit to the students, and moreover students must be taught to think for themselves.

A good example of my approach to teaching and group work is the way I conduct the first discussion section of the semester as a teaching assistant. Being a student myself, I know how important the first few classes can be in determining students’ opinions and enthusiasm for the rest of the semester, which is why it is so important to show the students immediately what I think should happen in section. After the usual administrative preliminaries, telling the students what will be expected of them and answering questions, I break the students up into small groups and give them “brainteasers” designed to stimulate discussion—for instance, one question I always ask is the famous “Monty Hall Problem.” After the groups come to an internal consensus about the answer, I bring them together and ask several people their

opinion. Then I tell them the correct answer, which usually provokes a general discussion—I try to encourage the students to explain themselves whenever they speak.

Generally, the students are not convinced that my answer is the right one when they leave (though I give them references and tell them a bit about the history of the problem), but they have learned a great deal about how my sections will be conducted. They learn that they will be asked to speak and defend their arguments, they meet and argue with their fellow classmates, and they have a chance to feel comfortable speaking with me and asking me questions. All of these things are very important, and need to be reinforced as often as possible.

Mathematics is about solving problems, and years of teaching experience has taught me that different students see problems differently. My perspective can be very different from a student's perspective, which is why I am very careful to explain each problem from as many different viewpoints as I can. An elegant proof that convinces a senior analysis student will often simply bewilder a freshman in a calculus class, while a less-rigorous argument based on an example or a picture may satisfy the freshman but not the senior.

A teacher who merely solves problems rather than teaching students to solve problems is not doing his job, so a good teacher will also try to show his students how to find the proper perspective without his help. The Ross Program emphasized this very strongly: students who could not discover the answers to problems themselves were encouraged to ask their peers and counselors for advice but not answers, and also to work at their own pace, thinking deeply and working things out on their own rather than hurrying to catch up. I believe that this is truly the best way to learn mathematics; as a teacher, I try to act as a guide rather than an oracle.

When I began teaching calculus at Berkeley after two years of teaching upper-division mathematics at Harvard, I tried to implement these ideas every day, especially in my office hours. When students who were not used to detailed, rigorous mathematical arguments came to office hours asking me to explain or “go over” a concept or example, they were not usually enlightened when I sat them down and went line-by-line through the book or their notes. What the students wanted, even if they did not know it themselves, was a different perspective on the problem—a picture, or an example, or an explanation in words. Once they attacked their question from two or three different angles, they could often find the answer or explanation on their own.

This sort of self-sufficiency is the goal of every serious student and every good teacher. It is what I strive for when I design course materials, give lectures, and answer questions, and I will continue to teach with this goal in mind throughout my career.

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