

I've had the pleasure of teaching mathematics to a wide range of students in a variety of settings for the past decade. Whether volunteering with middle school outreach or interacting with undergraduate researchers, lecturing to a hundred non-majors or to a small class of engineers, I've found that students learn best when they have a chance to be actively involved with the mathematics. I expect students to not only to follow someone else's arguments, but also to create their own. The level of understanding and depth of argument vary depending on the group of students, but doing this even on a small scale can be useful.

I do many things to create a productive class. I teach using a combination of interactive lecturing and examples attempted by the students. I want to create a learning environment where students feel comfortable asking questions and making mistakes. To increase their comfort, I make a point of learning who my students are. At the start of the semester, I have everyone fill out an index card with his or her name, a picture, some mathematical background information, and a fun fact. This helps me to learn names and gives me a sense of everyone's background. I communicate my expectations for the class both in the syllabus and verbally throughout the semester; this helps decrease student anxiety. As the semester progresses, I keep track of where students are having difficulty by having them try a problem or a part of a problem during class. While they try the example, I wander around the classroom looking over their shoulders. Afterward, we go over it as a group. This technique has the benefit of keeping students focused on the material during class time; it is especially useful this semester because I'm teaching in a computer lab. It also allows me to respond to difficulties in real time, rather than after I've looked at the homework and quizzes.

I want my students to have an opportunity to express what they know during exams as well as in class. I design exams that are slightly shorter than the allotted time, so that everyone has a chance to answer questions fully. When I return the graded exams, my students can gain a small amount of credit by doing exam corrections. As a part of the corrections to the first exam, I explicitly ask, "Is there anything you'd like me to know?" This gives me an opportunity to respond to their comments and concerns individually. The exam content is highly dependent on the course. This semester, I'm teaching Differential Equations to engineers. Because they need to be able to use various tools in their engineering careers, I allow them to use an index card; they'll have access to mathematical references in their jobs. The exams focus largely on the tools used; I want to know: Do they know what technique is appropriate for a given situation? Can they apply it successfully? I am also interested in whether they understand the concepts involved. The majority of the conceptual problems appear on take home quizzes and homework,

where the students are not under time pressure.

For outreach, my teaching style is activity-based. Each year I get together with one or more colleagues to lead an *Expanding Your Horizons* workshop. We have a group of 12-20 junior high girls for 45-75 minute long workshop. The student group has a mixed ability and interest level, so the activities involved need to be engaging for both high and low achievers. There are a few important considerations when picking material: Are there small goals that everyone can accomplish? Is it open ended enough that more advanced students can explore new things? We've used many different topics, such as topology, symmetries, game theory, probability, and minimal surfaces. For each workshop, there are short two to three minute long lectures to introduce activities and summarize them. For example, in the game theory workshop, we start by introducing a two player game and demonstrating it once. Then the students pair up and try to develop strategies. My colleagues and I circle around the room, clarifying things and providing helpful hints. For the more advanced students, we suggest more complicated variations of the game. Then we have the group of students challenge one of the adults to demonstrate their strategy. We spend a few minutes talking about how we developed our strategies and then move onto the next game.

Students need to believe that they are capable of learning mathematics. There comes a point in everyone's life when math transitions from being easy to hard, when they need to begin to think carefully about what to do next. For some people, this transition occurs well before college. Many people come into a class believing that they are either "good" or "bad" at math, and that this designation is immutable. They must learn that these distinctions are counterproductive, inhibiting them from exploring the possibilities that mathematics has to offer. In both a class and in outreach, a careful choice of activities helps students break through these distinctions and enjoy the mathematics.

As a teacher, I am motivated by the desire to help my students learn how to think clearly and creatively while enjoying the material. Through discussions with colleagues, reading educational literature, and reacting to student feedback, I've developed a teaching style that allows for mathematical interaction inside and outside of the classroom. Although I have found a general teaching style that works well for me, I eagerly anticipate the chance to develop further!