

## TEACHING STATEMENT

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There is no doubt that enjoyment of teaching and excitement for the material can go a long way towards winning over a class. But to be an effective teacher one has to think long and hard about the goals for the course and the best way to achieve those goals. In eight years of teaching I have come to believe that a key issue is finding the right balance between setting high expectations for the students and maintaining a supportive classroom environment. The expectations are crucial because only the most motivated students put forth their best effort regardless of what is asked; most do just enough to get by. On the other hand, when a teacher makes unreasonable demands and fails to provide the necessary support many students become overwhelmed and intimidated.

In my time in graduate school I have had the opportunity to work with a wide variety of courses. My responsibilities have included among other things designing and implementing computer workshops, running tutorials on proof-writing, and lecturing a large calculus course for students majoring in the biological sciences. But the task of balancing the two considerations mentioned above was especially challenging in a course I taught last year for elementary-education majors. In what follows I will discuss my experience teaching this particular course.

High expectations can be conveyed in several ways. At the beginning of the semester I try to be as specific as possible about the quantity and quality of work I am expecting. In this instance I gave an algebra self-test on the first day. I assured the students that while algebra was not going to be a major focus of the course there would be numerous places where difficulties with computation might obscure the deeper significance of a problem. I asked those students who found themselves struggling on the test to speak with me privately. Out of twenty-two students about five or six took me up on this offer. It turned out that several of these students were taking their first mathematics class after many years away from school. If I had seen serious gaps in a particular student's algebra skills I was prepared to recommend that he or she first step back and enroll in a refresher course. As it turned out I did not have to do this, but by giving the test and then following up on it I was able to communicate some important information, and in the process get a better sense of the individual skills and confidence levels of my students.

A major component of this course involved working in groups. To be effective, group-work requires that students truly work cooperatively, discussing each problem and not moving on until every group member is satisfied. It is dangerous to assume that students have experience working in groups, or that they can easily adapt to this style of instruction. Bad habits formed early in the semester can be very hard to break. In order to tackle these issues head-on I gave each group a challenging multi-part problem to work on. After twenty minutes or so we stopped and went over the problem, then embarked on a class discussion about working in groups. We discussed how their first instinct should be to ask each other questions, rather than looking to me for the answers. We also talked about how those who understand a particular question need to be careful not to rush ahead, while those who are having trouble have a responsibility to keep asking questions rather than simply giving up and going along with the group.

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If I am going to ask a lot of my students, it is vital that they understand and accept my reasons for wanting them to work so hard. When teaching the elementary-education class this was especially important as the material we were learning went well beyond the level of what the students themselves might someday teach in elementary or middle school. I had to constantly emphasize what it was I wanted them to get out of the class: a deeper understanding and appreciation of mathematics, improved problem-solving skills, and an improved ability to communicate mathematically. I also told them I thought it was important they have the experience of struggling with unfamiliar mathematics, in order to better understand how their own students might feel.

Setting high expectations and sticking to them can cause a good deal of anxiety among one's students. While a certain amount of anxiety can be a positive thing, too much is clearly counter-productive. Maintaining a supportive atmosphere in the class can go a long way towards alleviating this problem. To this end the students must be brought to feel that even though I am asking a lot of them I am on their side, wanting them to learn and succeed. I did several things at the beginning of the semester to try to get this point across.

I strongly encouraged students to attend the scheduled office hours, and told them if they demonstrated that they were serious about working hard I would be willing to meet with them at other times, too. I showed them the course web site I had created, which included hints (and later, solutions) to homework problems, review material for exams, and a message board where students could post questions anonymously. This message board was particularly useful; I would post my responses to the questions, and even if only five or six were posted each week, they typically addressed difficulties that many people were having.

I tried to emphasize from the beginning that it is okay to make mistakes; the key is to have the right attitude and not to get frustrated. I talked about how I make mistakes all the time in my own work, and once I see the faulty reasoning that led to the error I find I understand the problem better than if I had done it correctly in the first place. Students sometimes fall into the bad habit of making a single attempt at a problem, waiting for the teacher to tell them if they have done it right or wrong, and then moving on without a second thought. We agreed to not let each other get away with this.

The fear of making a mistake was particularly evident when I asked students to present their work at the board. As with the group-work, these presentations were an important component of the course and it took a while to train the students to the point where it was effective. I also had to train myself not to interrupt during a presentation unless it was absolutely necessary. Of course this runs the danger that the class will be confused by an incorrect or confusing explanation, but I found the presentations improved once students were not constantly fearing (or hoping!) that I would stop them if they went wrong. To make things go more smoothly I also discussed with the "audience" their responsibilities when someone else is presenting. Their job is to really think about what is being said, to ask questions if something is not clear, and above all to be supportive of the student at the board. I was lucky to have some students who were wonderfully good at this last part.

In summary, even though each student brings his or her own work habits and attitudes into a course, there are a lot of things a teacher can do to make the class work productively. I feel that I am a demanding teacher, and by being up-front and consistent with my expectations, and by providing help and encouragement where needed I can also be an effective one.

A list of my teaching and tutoring experiences follows.

- **Spring 2004, Spring 2005. Head workshop leader, University of Minnesota Talented Youth Mathematics Program (UMTYMP).** Led workshop section for Introduction to Combinatorics.
- **Fall 2004. Lecturer, U. of MN Dept. of Math.** Lectured Excursions in Mathematics; supervised graduate student teaching assistants.
- **2002 - 2004. Mentor, Assoc. for Women in Math Mentor Network.** Advised and tutored several undergraduate math majors.
- **Fall 2003. Workshop curriculum coordinator, UMTYMP.** Developed curriculum for Introduction to Combinatorics; mentored post-doctoral instructors teaching linear algebra and multivariable calculus courses.
- **Fall 2002, Spring 2003. Instructor, U. of MN Dept. of Math.** Taught Topics in Elementary Mathematics, a course for elementary education majors.
- **Spring 2002. Lecturer, U. of MN Dept. of Math.** Lectured Calculus with Biological Emphasis; supervised graduate student teaching assistants.
- **Fall 2001. Teaching assistant, U. of MN Dept. of Math.** Led discussion section for Calculus with Biological Emphasis.
- **Fall 2001. Head workshop leader, UMTYMP.** Developed curriculum and led workshop section for multivariable calculus course.
- **Fall 2000. Teaching assistant, U. of MN Dept. of Math.** Led discussion sections and proof-writing workshops for Sequences, Series and Foundations of Proof.
- **Fall 1999 - Spring 2000. Teaching assistant, U. of MN Dept. of Math.** Led computer-based workshops for Institute of Technology linear algebra and multivariable calculus courses.
- **1996 - 1999. Instructor, U. of MN Institute of Technology Center for Educational Programs (ITCEP).** Developed and taught mathematics enrichment workshops for students in grades 3-12.
- **Fall 1998 - Spring 1999. Teaching specialist, U. of MN Dept. of Math.** Designed and supervised workshops for the Calculus Initiative, a calculus sequence for engineering students; led two workshop sections for the same course.
- **Fall 1998 - Spring 1999. Instructor, UMTYMP.** Taught a single-variable calculus course for gifted high-school students.
- **Spring 1998. Student teacher, Southwest High School, Minneapolis.** Completed eleven weeks of student teaching. Taught four classes of 9th-grade algebra and one class of 11th-grade integrated math.
- **Fall 1996 - Spring 1998. Teaching assistant, U. of MN Dept. of Math.** Led discussion sections for the Calculus Initiative.
- **Fall 1996 - Spring 1998. Teaching assistant, UMTYMP.** Assisted with single-variable calculus course for gifted high-school students.
- **Summer 1997. Instructor, U. of MN ITCEP.** Taught Multivariable calculus in an eight-week residential program for gifted high-school students.
- **Fall 1996 - Spring 1997. Mathematics tutor, U. of MN Institute of Technology Tutoring Center.** Tutored undergraduates at all levels of mathematics.
- **1995-1996. Mathematics tutor, Carleton College Math Skills Center.** Tutored undergraduates in calculus and various upper-division mathematics courses.

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