Teaching Statement

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As a teacher, my goal is to enable students both to appreciate the beauty of mathematics and to think more critically in other fields. I strive to emphasize *why* rather than *what*, and to help students see how mathematics is relevant to their lives. Student comments such as, "Your explanations are really clear," and "Please teach calc 3 next semester!" lead me to believe that I am an effective teacher. Moreover, I believe I received an *Excellence in Teaching Award* because I establish a rapport with my students, and inspire them to share my enthusiasm for mathematics.

Many students are scared of math because they believe it is a subject you either "get" or "don't get." Those who "get it" are all nerdy intellectuals born with some special talent. As a teacher, I think the key to dispelling this myth is to emphasize *why* rather than *what*. When I first began teaching, I would try to engage my students by asking a question like, "Who can tell me the answer to problem number 5?" To my dismay, the room would fall silent. Probably my students were all sitting there, staring down at their desks, thinking, "Either my answer is right or it's wrong. I don't want to risk being embarrassed if I say the wrong thing."

I now realize that the question, "Who can tell me the answer to problem number 5?" is a *what* question. It suggests that, when we think about problem number 5, we should focus only on the final answer–that's all that matters. Instead, I have learned to say, "Tell me something you notice about problem number 5 that you think is important," or "How do you think we should begin to approach a problem like this?" or "Why do you think we should multiply these two numbers, as opposed to adding them?" I call questions like these *why* questions. For one thing, there is no right or wrong answer to a *why* question. Because *why* questions focus on the process of solving a problem rather than the solution itself, I find that emphasis on *why* leads to lively class discussions. Further, I find that emphasis on *why* is good for retention: A student with a *why* state of mind is interested in learning from past mistakes, and is less likely to give up based on a feeling that he or she just doesn't "get" math. On a personal level, the *why* is what I find beautiful about mathematics, and I would like my students to see that beauty as well.

A major challenge I face in teaching is to communicate to my students that mathematics is an essential discipline which is relevant to their intellectual development. This is particularly challenging in calculus courses where I interact with a wide range of students. Some students are majoring in journalism or history and need a good grade in a math or science course to complete their major. Other students are majoring in biology or engineering, where a strong math background might help them in their career. Still other students are testing the waters to see if a major in mathematics is right for them. While the engineering student might

immediately see the value in learning to use integration to calculate areas and volumes, the journalism student might ask, "How is this going to help me to write articles?" The aspiring mathematics major might think, "This is boring. Is math just a bunch of calculations?"

To communicate the value in learning a concept such as integration, often I discuss applications to other fields. A student majoring in journalism or history can appreciate the fact that discoveries in math and science affect people's world view. On a more practical level, journalists and historians often use probability and statistics to analyze past and current events. So, for example, in discussing Riemann sums I like to begin with a step function which represents the results from a political poll, and then discuss what we can learn about the prevalence of certain political views by finding areas under portions of the graph of the step function. Moving on to integration of continuous functions, I can further point out the relationship between area and probability in real world situations by using as an example a function in the shape of a Bell curve.

One semester, when I taught Introduction to Probability (a course designed for non-science majors), the first homework assignment I gave was the following:

> Introduce yourself to me in an email. Describe to me your past experiences with math, why you are taking this course, and anything else you would like me to know about you.

While I had intended this assignment merely to be an ice-breaker, an unexpected phenomenon occurred. The entire semester there was a steady stream of email back-and-forth with students. Students would write to ask questions about homework problems, to set up times outside of class to meet with me, and even to share their reactions. One student wrote, "Class today was really fun. I actually think I understand it all. I never thought there could be so much laughing in a math class like ours! Thanks!" I became aware of the concepts that were especially challenging for my students, and also I learned to empathize with my students on an emotional level. By listening to their questions and their perspectives, the subtext to each class became, "Let's work together to understand this," rather than, "I'm going to tell you how to do this." This rapport set the stage for a semester-long journey into the *why* of mathematics. In the end, we all had learned a great deal.