Christopher S. Shaw
Fall 2009

Teaching statement

While reflecting on my own teaching experience to write this statement, I was reminded of a conversation I had with a professor from my undergraduate program. He had a successful research program, and several graduate students, and eventually became chair of the department. But he told me the work that had the most impact over his career was probably the one semester per year that he spent teaching a course called Mathematical Ideas. This was a course intended to fulfill the college's core requirement for students who were completely uninterested in mathematics. At the time I just nodded along, but since then I have come to understand more what he meant.

At the University of Maryland, I have had experience teaching students of varied levels of mathematical progress and interest, from first-semester freshmen at the introductory level, to undergraduate math majors, to graduate students. I have found that students who choose to take more rigorous undergraduate courses, become mathematics majors, or enter graduate school in mathematics, are naturally motivated to perform well and do mathematics outside of the classroom. It is usually those students who openly declare an aversion to mathematics that require the most diligent attention and care in order to ensure they succeed. While success in reaching this segment of the student population is often elusive, the reward comes in having students mention that my class has helped them to find mathematics enjoyable, useful, or at least less mysterious. I find that a major obstacle for these students is a voice of doubt asking, "when are we ever going to use this in real life?" As people who have accepted that some mathematics is worth doing even if there is no direct application to daily life, we are mostly immune to worrying about this; but to a student who is in a class solely to satisfy a requirement, this question can be legitimately distracting.

To my mind, the most valuable weapon against this distraction is to drown it out by fully engaging everyone in a respectful and unpatronizing way. Toward that end, I always bring a light mood into the classroom. As much as possible, I face students during lecture, and involve students directly when there is an opportunity. Even with over 200 people in a room together, connecting personally with a single student can often have a remarkable effect on the attention of the rest of the class. The most common compliment I have received from students and observers of my lecture is my ability to engage the class.

When doing applications or examples, I make sure to explain the real-life assumptions that go into the mathematical models. Earlier this semester, I taught a 75-minute lecture on applications of calculus to business. Before embarking on a numerical example, I made sure to spend a good portion of the time in that class describing in detail the economist's meaning of marginal cost. A few weeks later, I heard a podcast from a popular news show on economics and finance which had a lengthy description on the subject, and I made sure to send that to the class as well. Even if after the semester my students forget how to calculate the production level which ensures the minimal marginal cost, hopefully they will be able to call to mind the meaning of the terms involved, and think conceptually about why a business would talk about its marginal cost when they see a news article on the subject.

The philosophical approach outlined above must be supported by the mechanics of the class. I maintain a comprehensive course webpage with assignment materials and links to extra help and ancillary topics. I assign regular and timely homework projects which combine repetition of essential techniques with exploration of concepts. In my courses at Maryland, I use a web-based homework application, which allows homework to be assigned and graded regularly in step with the syllabus. This ensures that students take the time to review the material outside of the classroom, and empowers them to understand subsequent lectures. I design exams to give students an opportunity to demonstrate what they know and what they have learned. As such, my exams generally cover as much of the material as possible, but to avoid bimodal grade distribution, do not contain problems so densely packed that the students cannot attempt the later parts in a subdivided exercise without correct answers in the first parts. While writing lecture notes, I spend time combing through the course textbook, old class notes, and the other resources available. However, for me the most important step in this process is closing those books before writing my own notes, as I find that the examples I create for

myself will be much more in-tune with my own teaching style and will come across with more sincerity than examples I have copied from someone else. This allows me to choose examples that I think will fit the class interest. This also engenders a running dialogue, where I can revisit examples from previous lectures about which the students already know some detail, and develop them as their mathematical tools become more sophisticated. As a natural consequence, the exams I write for my students are more in-tune with the style of the lectures I have given.

Of course, class preparation should not be confused for an exact science: invariably some factor will conspire to halt the flow of a lecture, be it an unexpectedly thoughtful student question, a mistake in the notes or on the board, a fire alarm, or even students behaving disruptively. A good lecturer must be able to deal with such factors while maintaining the role of authority figure, mathematically or otherwise. Two examples of this in my own experience come to mind. On the second day of my large lecture class in Spring 2008, there was a commotion at the back of the classroom near the exit doors, and the students were yelling my name. When I got to the scene, there was a student passed out on the floor with a good portion of the 130-person class crowding around her. Even absent EMT training, it fell to me as the local authority figure to disperse the class crowded around and call for an ambulance to be dispatched to the scene. After the student was treated by the medical staff, I followed their request to accompany her to the dining hall to make sure she ate some food before going to her next class. While this is not a mathematical teaching exercise, I view it as a part of the job that simply comes along with standing at the front of the room as the person in charge.

The second example is lighter in spirit, but also provided an important lesson. This semester, while discoursing to an Elementary Calculus class on sketching the graphs of curves, I happened to finish my prepared lecture more quickly than expected and had ten minutes left. Rather than go on to the next chapter, I decided to present a more challenging example, and went through the steps to graph $y = \frac{1}{x} + \sqrt{x}$, which I had not prepared in advance. The calculations involving fractional powers and solving non-polynomial equations drew some expected groans from the audience, but I was surprised to find in the end that the inflection point for this function occurs when $x = 4$. I admitted then that I had done this example on a whim, and really had no idea that the inflection point would be an integer, but was happily impressed that it was. Although some of the students had not liked the process it took to get there, the resulting mathematical kismet had a kind of power over them that I believe would have been impossible had I prepared the example beforehand. In other words, it is good for students at any level to see the whole process of mathematics, which relies on sometimes going out on a limb, even for practicing mathematicians.

In this brief statement, you have a glimpse into my teaching philosophy mostly as it applies to the education of reluctant mathematics students. The skills and tools for teaching more enthusiastic and advanced students are equally worthy of conversation, and I have discussed this topic at length with colleagues. I relish the opportunity to continue on this topic in another forum. As my teaching skills and experience evolve, I find myself consistently excited and satisfied by all aspects of the teaching profession, and I look forward to continuing to develop my style throughout my career.

Christopher S. Shaw
Department of Mathematics
University of Maryland, College Park
schris@umd.edu
www.math.umd.edu/∼schris