TEACHING STATEMENT
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1 Introduction

One of my favorite aspects of being an educator is getting to know my students. While teaching my first course at the University of Maryland, my student Jody told me that she loved my teaching style so much that she was going to sign up for my course the following semester. Then, she promptly wanted to know what I would be teaching next! She was a treat to have in several of my courses, and I was privileged to meet her mom last summer, apparently she had heard a lot about me.

I love being a mathematician, and I enjoy sharing my passion for the subject with students. That enthusiasm has always shown through me and affected the students in my classroom. I expect my students to work very hard on rigorous mathematics problems and my expectations are high. My students are willing to happily meet and exceed my goals for them, in part, because they see that I am there working for them just as hard. Not only do they oblige me in fully committing to the course, they even give me thank you cards at the end of the semester. I feel deeply rewarded at the end of a semester when the students have worked hard and learned a little bit more about what mathematics is all about. The list of students who have asked me to be their academic advisor has continued to grow during my time as a postdoc. Students ask me for career advice in these meetings, and I always tell them that I have the best job in the world; I get to work on cool, hard problems with colleagues and students everyday, as well as teach the students in my classes how to think critically. What could be better?

2 Teaching Experiences and Philosophy

I relish getting students excited about mathematics and helping them discover material on their own. I am channeling some of that enthusiasm into an undergraduate research project that I am supervising this semester. The project involves the study of the degree of nondeterminism in nondeterministic finite automata. My student and I meet once a week to talk about the material that he is learning from a textbook and research papers. The collaboration is going well and I look forward to many more experiences with future students.

During my time as an educator I’ve taught a variety of courses, including Calculus I Honors, Introduction to Dynamics and Chaos, and Introduction to Mathematical Proofs. In all my classes, I incorporate three pedagogical practices - interactive lectures, active learning in groups, and class projects.

In each class I aim for interactivity between my students and me. As I am presenting new material, I ask students several questions along the way, which helps to keep an open dialog with students and supports an environment where they feel comfortable asking questions. This interaction in turn helps me assess how well students understand key concepts; when necessary, I adjust explanations and amend examples. I have found that interactive lectures work best if there is a mutual respect for one another in the classroom; to cultivate that respect, I also make a point to learn each student’s name within the first week of class. Communication, however, is not just about clearing confusion; it also provides an opportunity to challenge students. Before presenting a proof of a theorem, for example, I like to engage the class in a discussion where we
brainstorm possible techniques and sketch the proof, an approach that was particularly important when I taught Introduction to Mathematical Proofs. I like to tell the students that proving a theorem is like solving a puzzle. I think this helps them relax and focus on the given information to see how it fits together. Similarly, when I taught an honors section of Differential Equations for Scientists and Engineers, the goal was for the students to understand why various methods worked for different problems and how the methods were developed: the logic of this approach was that if in their work they were presented with a problem that involved new or unfamiliar differential equations, they would be able to develop an approach of their own. Thus, to introduce a new method for solving a differential equation, I would apply the theoretical proof to a specific example, which allowed the students to slowly build intuition for the technique before I presented them with a formal algorithm.

Collaborative work is a second factor distinguishing my pedagogy: I believe that students benefit greatly from working in collaborative teams. My courses involve group-based active learning characterized by two different types of activities: (1) guided inquiry-based lessons and (2) group exercises. I first discovered the value of this approach five years ago while teaching a MERIT section of Calculus II, a program that targets students from groups underrepresented in the areas of mathematics, science, and engineering. In this MERIT class, students worked in groups of 4-6 on a challenging worksheet that I designed specifically to meet the needs of that day. Since teaching that course, I have incorporated an active learning component into every course that I teach. The first type of group-based active learning that I employ is guided inquiry-based lessons. For these lessons, I design a guided worksheet, which outlines the protocols students are to follow, to aid them in the self-discovery of material. With the worksheet in hand, each group of students works at the chalkboard as they navigate their way through the problems. The second type of group-based active learning that I use is group exercises. Here, I design worksheets reinforcing difficult concepts from lecture that students complete in groups either at the chalkboard or at their desks. In my current class, an honors section of Calculus I, these approaches are implemented weekly for one hour. During this hour, students work in groups of 4 at chalkboards on challenging problems related to the material covered over the week, which helps them solidify their knowledge of concepts and learn new techniques. Likewise, in last year’s Introduction to Dynamics and Chaos, I used a group activity to lead the students through a proof of a difficult theorem that pushed the boundaries of our class. I broke the proof down into seven key components, each of which they were able to tackle in the group setting. At the end of this activity, the students were proud of what they had accomplished and felt ownership of the material. Typically, as the students work on problems, I move between groups, questioning and guiding them as they work together to help each other; this group-based active learning has the added benefit of allowing me to assess each student’s knowledge of the course material as I circulate. In addition, while I am listening to the mathematical dialog between peers, I frequently intervene to give positive feedback (usually in the form of high fives) on thoughtful explanations. I have found that with confidence, students more freely share their ideas with one another.

Formal communication of mathematics is the third feature defining my pedagogy. Because a crucial skill in the technical world is for people to be able to break down important concepts and convey the main ideas to a general audience, I design students’ class presentations and projects to build those skills. These projects require three steps: (1) identify key components of the problem; (2) understand each element of those key components; and (3) demonstrate that knowledge. During my first year at the University of Maryland when I taught Differential Equations, I engaged the students in a mathematical writing project intended to foster understanding and intuition for the mathematical material. The project was titled “A Love Affair with Differential Equations.” In
this project students modeled Romeo and Juliet’s relationship using concepts from class and the computer program Matlab; they were asked to determine how different initial levels of attraction would affect the long term stability of the young couple’s love and then choose a model to analyze. In my recent senior level course, Introduction to Dynamics and Chaos, a major project combined an oral presentation and a written project; the students, working on a project to be completed outside of class, presented their findings to the class during the last week of the semester such that the class had exposure to a variety of material not covered, and, in addition, each student turned in an individually written report. The project topics included chaos in the double pendulum, hyperbolic toral automorphisms, and the Gauss map and its relation to continued fractions. In my current Calculus I Honors course, students are completing two smaller written projects. Each project assignment comes in the form of a letter to the students from a company asking for their mathematical expertise on a real world problem, an adaptation of an assignment in Crannell et al.’s “Writing Projects for Mathematics Courses: Crushed Clowns, Cars, and Coffee to Go.” The students decide what mathematical techniques and formulas are required to solve the problem, implement those techniques and formulas, and then write a letter back to company explaining the solution. My hope is that through completing these projects, students will develop a deeper understanding of the material.

It has been my experience that students do well with a student-centered approach that values communication, and my teaching evaluations reflect this. My teaching evaluations can be found in the next section. I won the Department Teaching Assistant Instructional Award during the 2011-2012 competition at University of Illinois and my performance as a teacher is also indicated by student performance. As one example, the students in my section of Differential Equations scored the highest among all sections (including another honors section) on the common final. To compare, my course average on the common final was an 82.5%, while the average across all sections for 800 students was approximately 65%.

In teaching I aim for more than positive evaluations: my goal is to help students develop mathematical thinking and be able to employ that thinking both inside and outside of the classroom. I plan to use my passion for the subject and enthusiasm as an educator to aid in my growth as a teacher-scholar and look forward to opportunities that can help me achieve this goal.