

TEACHING STATEMENT

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Overview. Since the fall of 2003, I have enjoyed teaching math in a variety of settings to diverse groups of students. I have developed a sense of which strategies I am able to effectively employ while remaining flexible enough to try new techniques. In the classroom, my goal is to make both the problems and the methods as transparent as possible. I believe that this is key to helping my students succeed. It is also my goal to help students develop an appreciation for the subject. I believe that the ability to think mathematically is a powerful and versatile tool and that a teacher should strive to train students to precisely define their problems, identify important components, and apply sound logic towards a solution.

Experience. My first formal teaching experience was as a NSF Graduate K-12 (GK-12) fellow. As a participant in the GK-12 program, I developed application-oriented activities to supplement the standard middle school algebra and geometry curriculum. I worked directly in the classroom with a particular middle school teacher. Together we presented my lessons to his students. I saw for myself what worked and what did not. This was one of my most challenging teaching assignments since I had to learn how to adapt my explanations to eighth grade students whose abstract reasoning skills were just developing. I also had to work at making my lessons engaging.

My assistantship duties as a graduate student at Clemson University included teaching one or two sections per semester of various calculus courses. In particular, I taught courses to both science and engineering students as well as business students. These courses are listed in my curriculum vitae, and so I will not list them here. On several occasions, I taught my advisor's more advanced undergraduate and graduate level classes. The undergraduate courses included an introduction to proofs class, number theory, and honors linear algebra. The graduate courses included abstract algebra, both analytic and algebraic number theory, and a special topics course on elliptic curves and modular forms. Also while a graduate student, I spent my summers mentoring undergraduate students participating in the math Research Experience for Undergraduates (REU) at Clemson. My duties as a mentor included daily meetings with a small group of REU participants to discuss their research problems. In these meetings, we discussed strategies for attacking the problem and any difficulties that arose since our last meeting. Two of my research papers from this period were written with REU participants.

During my year at Michigan Technological University, I taught two calculus courses and one upper level undergraduate number theory course. The calculus courses at Michigan Tech were "multisection coordinated courses" taught with a fixed syllabus. The number theory course was quite different as I will discuss in the next section of this statement.

Lately I have been teaching as a visiting scholar at Concordia University in Montréal. This has been one of my most interesting teaching experiences. Concordia is an inner city university, drawing students from countries and cultures all over the world. While my lectures are conducted in English, many of my students speak French as their first language. In addition, I have many "returning students" who have not been in formal school for several years, and the typical student in my class is not interested in math or science. Rather almost all of them are seeking entrance to the university's highly selective business school. I let them all know that my primary goal is to help them be successful in this endeavor, but that I have a secondary goal that they develop an appreciation for math and problem solving.

Practices. Typically, I dedicate much of the class time to lecture and discussion. I find that lecture is most useful for the purpose of modeling mathematical thinking and writing for my students. I strive to combine lecture with interactive discussion by encouraging my students to

actively participate in asking questions and proposing their own strategies. Discussion has the advantage of giving my students practice and keeping them engaged. Additionally, since each class is different and students have varying abilities, this feedback helps me gain insight into how my students think. Knowing how my students think, I can adjust my explanations to their style of learning.

I also have experience teaching my courses in the Student-Centered Activities for Large Enrollment Undergraduate Programs (SCALE-UP) format, which involves short lectures followed by a longer period of time set aside for students to practice calculus techniques under the guidance of their instructor. In my last few years teaching at Clemson, this style of teaching was required by all graduate students teaching calculus in the science and engineering track. I found that guided practice can be particularly useful when the course objectives are more computational. I have noticed that it is easy for students to agree with me as I work through problems, but then have no idea how to start when they are on their own. However, if I assign work to be done in class, my students quickly realize whether or not they know what to do when they are on their own. Grouping stronger students together with weaker students allows them to talk each other through the problems. This is useful for both the weaker and the stronger students. The weaker students get more individualized help while the stronger students must think about what they are doing and how to explain it. Although, I am nearby during this time, I resist the temptation to merely tell them what to do. Instead I help them summarize where they are in their problem and where they want to go.

Another practice that I have found useful is the use of technology in the classroom. On the advice of a colleague at Michigan Tech, I decided to teach undergraduate number theory in the department's computer lab using a "discovery" or *modified Moore* method. I used materials that were originally developed by Jeff Holt and John Jones that introduced the students to various topics usually covered in a first course in undergraduate number theory. Using the software package Mathematica, my students were able to compute hundreds of examples. They explored topics such as the Chinese Remainder Theorem and quadratic reciprocity, often coming to correct conclusions about what must be true without first knowing the statements of theorems. After using their data to make reasonable conjectures, they worked in groups to construct their proofs. My initial impression of this method was that I would not be able to sufficiently cover enough topics. However, that was not my experience. In fact, we covered most topics that you will find in many popular undergraduate number theory texts. I found that the format was particularly well suited for small classes that contain a large range of abilities. In individual discussions with students, I was able to challenge the stronger students to think deeper about the subject and at the same time make sure that the weaker students were still involved.

Conclusion. The wide variety of experience that I have gained over the last several years teaching math has shaped me into a confident and effective teacher. I have enjoyed teaching diverse, multi-cultural groups of students of varying abilities where I have needed to alter my teaching appropriately in order to engage all of my students. My experience ranges from middle school to university classrooms. I have worked with the very gifted, such as the REU groups that I advised, and with those that have a fear of math. I have lectured to large groups, and I have worked closely with small groups. Through these experiences I have learned and adapted to become a better teacher. This is something I will continue to do throughout my career.