

Teaching Statement

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I consider teaching and communicating mathematics a primary responsibility of being a mathematician. I have had a wide range of teaching opportunities during my graduate education including being the primary instructor for many courses, supervising students working on a project, and mentoring undergraduate students working on research. Through these teaching experiences and others I have developed a pedagogical style based on providing an abundance of mentoring opportunities and challenging projects to students in addition to traditional lecturing wherein content is presented with an emphasis on pragmatism and professionalism.

My first teaching experiences included undergraduate tutoring through the mathematics department and housing department at the University of Colorado. Tutoring provides an intimate teaching environment wherein I became aware of how diverse students' learning processes can be. It was during this time that I developed an interest in working with students outside of the traditional classroom setting. This has led to my interests in mentoring undergraduates working on projects and research. During my first few years of teaching lower division courses as a graduate student at the University of Arizona, I made every effort to provide challenging projects for my students that go beyond traditional homework assignments. This provides me with a chance to work with students as a mentor. More recently, I have had opportunities to mentor and work with undergraduate students on large scale mathematics projects and REU's.

Mentoring provides an environment where I can provide an intense concentration of information to students successfully that traditional lecturing is usually incapable of accomplishing. The small mentoring setting allows the mentor to fully understand the learning processes the student(s) are most comfortable with and adapt the presentation of the material accordingly. Also, communication from student to teacher is amplified in a mentoring setting, which allows the mentor to identify the strengths and weaknesses of the student rapidly. I incorporate mentoring into the courses I teach by providing challenging projects and laboratory exercises for the students. I utilize office hours extensively to provide a one-on-one setting for these challenge projects and lab exercises.

In the Fall of 2006 I had my first opportunity combine mentoring with a precalculus course using weekly laboratory projects. These laboratory projects provide the students with a much larger problem than they would see in a typical homework assignment that involves the relevant mathematical content. In subsequent years teaching calculus courses I modified this approach by developing a list of "super-challenge" problems and having each student complete a few of them during the semester. Calculus courses provide the students with an abundance of content that allows for some fantastic challenging projects involving such topics as optics, number theory, economics, and physics. This approach has the advantage of interfering minimally with the tremendous amount of content that needs to be presented in the classroom. Instead, students regularly consulted me during office hours on their challenge problems wherein I am able to play the role of mentor.

Through these experiences at the beginning of my teaching career I noticed how students flourish in the mentoring and project-based setting. Students in the precalculus course were energized while working on a project because it provides a story-line and goal beyond that which traditional homework exercises can provide. For calculus students, the challenge

projects and mentoring allowed me to effectively communicate to my students how powerful their mathematical skills are. After completion of a challenging project, the students are extremely proud of their solutions and have greatly improved their problem solving skills. Moreover, I have never seen students more passionate about mathematics than when they are making progress midway through a challenging project.

From Summer 2008-present, I have been mentoring and working with a team of undergraduate mathematics students on a large discrete geometry project called GEOCAM (geometric evolutions on computationally abstract manifolds). This project involves many advanced topics in geometry and analysis as well as a great deal of computer programming. This opportunity has allowed me to sharpen my mentoring skills and participate as a long term mentor. Over the years I have been involved with GEOCAM, the undergraduates have developed impressive software and were exposed to many active areas of research. During Summer 2010 we utilized the software that the undergraduates had developed during the Arizona Summer Program REU wherein I mentored another team of undergraduates working on research projects in discrete geometry. The work done by the undergraduates I mentored included some exciting new results that we are preparing for publication.

In all of my teaching roles I emphasize pragmatism. Not only does this approach have obvious benefits to efficiency, but I have found that it greatly improves the problem solving and learning processes of my students. I often spend a majority of each lecture bombarding my students with examples. I follow this up by narrating my presentation with a storyline containing potent practical information about problem solving, methods, visualization, etc. My goals are twofold:

1. Streamline the techniques and mathematical operations so that the student can focus their energy on the creative and structural components of solving problems.
2. Provide students with enough experience so that they can see the common themes in the problems they are solving.

Bringing professionalism to all of my teaching roles creates a respectful and productive learning environment. Simple gestures such mandatory attendance, absolute silence when someone is speaking, and not wearing casual clothing communicate to the students that the classroom is a place to learn and work. This sort of discipline is especially valuable when the students are working on projects during class. Professionalism ensures that the classroom is a place where all students are respected and are sure to find a comfortable learning environment.

My teaching experiences as a graduate student have had a profound effect on my mathematics communication skills. I have found that providing abundant mentoring opportunities and challenges for students is particularly valuable and effective. I look forward to working with more undergraduates on REU's and in other mentoring capacities. Additionally, I would enjoy teaching topics courses, math modeling courses, etc. wherein students work on (semester) long projects. I am enthusiastic to continue teaching and working with students to develop their mathematical skills in all teaching roles.