

## TEACHING STATEMENT

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I enjoy teaching mathematics because I see it as an opportunity to help students develop reasoning skills which they will continue to use, even if they are no longer applying them to any of the concepts they learned in my calculus course. My main goal in teaching is to help the students develop critical and logical thinking skills, as well as the ability to effectively communicate their ideas. In the process, I try to show how mathematical concepts have developed over time to address problems in the real world, and their relationships with and applications to other sciences. Below I have outlined the essential principles behind my teaching style. I conclude with some remarks on undergraduate research.

**Interaction during lecture:** In the past two years, I was the instructor for three Calculus courses. Each class had roughly 100 students, meeting three times a week in a large lecture hall. My experience from teaching these courses was to inform the students that they should rely on the course material, such as textbooks and course notes, to cover the basic definitions of the course. I would then use class time as an opportunity to interact with the students to further their understanding. I found that it was effective to focus on student interaction, including going over examples and having students work in groups. I found this to be a more effective means than a standard lecture in both keeping students engaged in the material and identifying topics that were especially difficult for the students to understand.

**Relating Mathematics to the real world:** I find that motivating mathematical concepts through applications is an essential part of the instructing process. Often this motivation can be a brief aside, with a website link for students who wish to learn more. In my multivariable Calculus course I mention how the cross product is used to express Maxwell's equations in electrodynamics, as well as how they can be used to express rotations in three dimensional space. In my Calculus course for Commerce students, I emphasized the importance of optimization methods, especially constrained optimization via Lagrange multipliers. For most of the students, this was the most important concept they would learn in the course. I pointed this out to them, and spent a lot of time in class on this subject, with several examples and applications.

**Extended projects:** In my Calculus for Commerce students course, I had the students work in groups on an extended group project at the end of the term. Each project dealt in

depth with an application in calculus by mathematical modeling. Topics included income inequality, the battery life of portable electronic devices, and estimating the change in the price of oil. Each project gradually introduced the subject and the mathematics involved over the course of 20 questions. The students enjoyed having an extended period time to work on these problems, and the chance to explore a topic in depth. Often the last questions asked the student to summarize the work leading up that point, leading the student to synthesize their calculations into a qualitative statement about the problem. This was a new experience in a mathematics course for many of the students, and the questions and conversations stimulated by these projects were excellent. In future courses, I plan to include similar projects, and have students present their solutions to their peers at the end of the term.

**Feedback:** I learn a lot student feedback and from fellow instructors, and so I make sure to get detailed feedback early on in the course, rather than waiting for the end of the term. In addition to the evaluation forms students fill out at the term, I have them also fill out informal evaluations a few weeks into class. This helps to gauge the level of the students understanding, ensuring plenty of time for adjustments or corrections.

#### UNDERGRADUATE RESEARCH

Undergraduate research opportunities are very valuable, since they allow interested students to get a glimpse of what a career in mathematics would be like. This experience is often very different from their experience in the classroom, and launches many students into a productive research career. In the Summers of 2006 and 2008, I worked as an assistant for the University of Washington Math Department NSF Research Experience for Undergraduates, run by Professor Jim Morrow. During this eight week program, the students conducted original research on Inverse Problems in Electrical Networks. My role was to meet with each student one-on-one multiple times a week, to help direct them in their original research. These meetings started from their initial ideas to their completed paper at the end of the program. It was very exciting working with gifted, hard-working students, assisting them in what was for them a completely new experience in producing original mathematical research.

I am currently working on developing code for **SAGE**, an open source mathematical software program created by William Stein at the University of Washington. I am currently working on contributing code to SAGE that deals with root systems, Cartan matrices, and Weyl groups. These topics are excellent for undergraduate students pursuing research, especially those interested in group actions and combinatorics. Furthermore, these topics expose students to computational methods in pure mathematics, and are extremely useful in developing skills in both mathematics and programming.