Teaching Statement

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I have always enjoyed the beauty of a well-structured and delivered mathematical lecture. As an undergraduate student, I remember being amazed by the ease with which my professor delivered his lectures on real analysis, filling board after board with beautiful theorems and proofs interjected with some dry humor. I also remember thinking that I was in way over my head and that this class was not the formula based calculus I was used to. Throughout my academic career and as educational standards and expectations change, I have realized the difficulty of finding the correct balance between the many different ways students learn and the goal of preparing them for success in future math classes. Overall, I find teaching not only a healthy break from my research activities, but also a source of great satisfaction. I enjoy the time spent preparing the lectures as well as the time in the classroom. I really appreciate teaching advanced mathematics courses, where a greater freedom with the material is allowed and challenging questions are raised. Likewise, I understand the fundamental importance of calculus classes and the intuition which they provide.

Recently, I have realized the importance of positive female role models in STEM. Through my experience in teaching the engineering calculus sequence at the University of Utah, I have witnessed first hand the attrition of female students. It is not uncommon for a Calculus I class to have close to 50% female students, while the multivariable calculus or partial differential equations have around 10-20% female students. This trend has been observed nationally [1]. My increased awareness to these issues has shaped my teaching philosophy to focus on **effective learning** and **effective communication**.

The first core aspect of my teaching philosophy is to maintain a positive and friendly classroom by learning my students' names and by chatting with them before the beginning of lectures about everyday subjects like a big exam, a favorite skiing place or the latest football game. I encourage students to ask me any questions stressing that there are no "dumb" questions. I maintain transparency about the learning goals or expected difficulties by starting each lecture with a quick summary of where we are, where we are heading and of the next important deadlines. I have found that following a published and rigorous schedule of graded student activities like homework, worksheets, and quizzes helps in preventing the pitfall of intense studying before an exam and in maintaining class discipline. With the use of online course management systems like Canvas, there are anonymous ways to develop diagnostic tools for assessments during the semester via surveys or quizzes. Additionally, I send an email to students who perform poorly on the first exam inviting them to set up a meeting time to discuss how their learning experience can be improved. With these simple steps, I set clear expectations to the students and I emphasize that with constant work, active participation and taking advantage of available help, they will find their own path to success in the class.

The second core aspect of my teaching philosophy is that students learn better through interactive learning. I have been fortunate to teach classes with dedicated lab sections, but nonetheless I include as many in-class activities like group discussion on a new topic or group work on an example in my lectures. When the class size allows it, I encourage students to come to the board to present their solutions. This proposition is always followed by some awkward silence and side glances, but by forcing myself to not interrupt, someone eventually jumps in. My experience has been vastly different when teaching larger sections as it is easier for students to get lost in the masses and for me to rely on the same few students to answer my queries. Over the last few semesters, many algebra and calculus classes at the University of Utah have been "flipped". In this new learning format, students typically view short lecture videos on the material at home, while working on structured exercises under the supervision of the instructor and

TAs during class. Learning outcomes are reinforced with a discussion led by the instructor. While I have not flipped a classroom yet, it is something that I am interested in pursuing in the future.

During my teaching, my goal is to present students with the tools and intuition necessary to develop general problem-solving skills. Therefore, I do not view mathematics as a succession of formulas, but as a logical structure derived from basic facts. My goal is to cater to the motivated students by giving them an insight into the bigger picture and to develop their mathematical reasoning aptitude, as well as by giving the less motivated students the tools to use when facing a specific problem. Mathematics has its own language that students must learn to understand and use correctly. Therefore, I pay particular attention to enforcing proper notation and basic mathematical rigor on exams.

Although my overall approach to teaching is the same whether I teach a first calculus class to engineers, an advanced undergraduate class or a graduate class, each audience comes with its own set of challenges and rewards. Freshmen care about their current grades, not the big picture and it might be the first time they are struggling in a math. They learn better by actively participating in class and group work. Advanced undergraduate students already have one foot out of the door and care about their next steps in life. They are the most difficult group to motivate and to keep engaged, as the topics and time constraints tend to naturally lead to more traditional board lectures. Graduate students are eager to start on their own research and have very little tolerance for unclear arguments. No matter the audience, I feel that I have made a difference and a positive impacts on students, if I can help them overcome their perceived disinterest in a subject or if I can expand their critical thinking skills.

Teaching is not only one of my responsibilities, but it is also a great opportunity to communicate the strength and power of mathematical reasoning to aspiring students. Achieving these goals takes a time commitment from my part in writing my lecture notes, holding office hours, and being available to students.

References

[1] Ellis, Jessica, Bailey Fosdick, and Chris Rasmussen. *Women 1.5 Times More Likely to Leave STEM Pipeline After Calculus Compared to Men: Lack of Mathematical Confidence a Potential Culprit.* PLoS ONE 11(7): e0157447. doi:10.1371/journal.pone.0157447. (2016)