Teaching Statement

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The first time I felt out of place in a math class was in my introductory real analysis course. I had never taken a proof-based math course before, and I was completely lost. I remember listening to my classmates answer the instructor’s questions, and thinking “Wow - everyone else in this class is a genius!” I was terrified that these genius classmates of mine would realize that I wasn’t like them, and that I didn’t really belong. In order to prevent them from discovering me, I never spoke. During lectures I never made eye contact with the instructor, looked only at my own notes, and sunk into the background. As a result, I barely learned anything. Only now do I realize how typical my real analysis experience was. One of my primary goals as an instructor of university mathematics courses is to prevent my students from feeling the way I felt in that course. In my classroom, I work to erase the myth that mathematics ability is innate, and that the only way to be successful at math is to be a “genius.” This myth is deeply ingrained in our culture, and has a particularly strong effect on under-represented groups such as women and minorities. Women are 1.5 times more likely to leave a STEM major before completion than men, and a leading cause of this discrepancy in persistence is lack of mathematical self-confidence [1]. I combat this trend in my classroom through transparency, active learning, and failure tolerant classroom policies.

I find that being transparent with students creates a more equitable environment. I start the semester by explaining how my teaching philosophy guides course structure. Telling students why I structure the course in a certain way encourages them to take charge of their own learning, and allows them to shift from passively absorbing their education to actively engaging in it. I maintain transparency throughout the semester by explaining the purpose of each assignment and giving examples of the caliber of work that I expect. I explicitly praise students for high quality work to ensure that their personal interpretation of success aligns with my view of their progress. I am also transparent about the course material. Before every lecture, I write on the board the objectives for that lecture, the upcoming assignments, and a short review of the previous lecture. Then I start class by explaining where this lecture fits into the “big picture” of the course, and I explain in one or two sentences what I want them to take away from that day’s lecture. These practices emphasize that the path to success is not a secret for them to figure out, but rather a clear set of expectations that all students have access to.

Another core facet of my teaching philosophy is active learning. To promote a supportive and interactive classroom atmosphere, I make a point of keeping my classroom casual. I ask students to call me by my first name, and I learn all of their names. I get to know my students by chatting with them before class or in office hours, and I emphasize that lectures are a classroom conversation involving everyone. These practices create a classroom atmosphere where students are comfortable expressing themselves, and I find that once this dynamic is established, the students will engage in the classroom activities that I use to complement the lectures. One of the main skills that I want my students to take away from my class is an ability to articulate mathematics, so I try to get them to speak as often as possible. Every Friday, we spend class time on a worksheet of challenging conceptual problems that I refer to as “Friday Food for Thought.” These problems are constructed
to initiate discussion, and are difficult enough that most students choose to work together. I don’t want students to get distracted by worrying about their grades on these challenging problems, so I grade them for effort to emphasize the process more than the conclusion. Another assignment that I use to get students speaking are video lectures. I have students give short video lectures on concepts that we learned in class and upload them to the online course management system. I find that this assignment eliminates the stage fright of a class presentation, while still giving students valuable practice in explaining mathematical arguments.

A third component of my teaching philosophy is a failure tolerant classroom. Failure is a valuable learning tool that most students avoid at all costs. Students who experience failure and persist are more resilient, satisfied, and in the long term, more successful. And students who interpret failure as an opportunity to grow instead of a personal weakness are less likely to be influenced by the damaging genius stereotypes associated with math. In my classroom, I promote this growth mindset by emphasizing the process of thinking about math over the memorization of algorithms. I stress to my students that there is no such thing as a “stupid question” and I never brush off a question that is asked in class. If I don’t know the answer to something they ask, I make a point of telling my students that I don’t know, and that I need some time to think about it. I return the next day with the answer and an explanation of how I arrived at that answer. I try to show by example that mathematicians don’t always know the correct answer right away, so that students realize that needing time to think about concepts is natural. I also find that giving students more challenging problems actually helps reduce their fear of failure. When the problems are more conceptual and require a deeper understanding of the material, students see that everyone finds the problems hard, which prevents them from thinking that they are the only ones struggling. By giving my students challenging problems and being transparent about the fact that they are challenging, I send the message to my students that I believe that they are capable of tackling hard problems. I also encourage my students to evaluate their own learning. I return exams with self-evaluation rubrics, which guide students through an analysis of why they missed exam problems. The goal of these rubrics is to help students understand their own learning process and calibrate their studying accordingly so that they use their time and their minds efficiently.

Aside from my own classroom experience, I am also working to increase persistence of underrepresented groups in STEM fields through an ongoing research project with engineering calculus students at the University of Utah. The goal of this project is to provide students with personalized qualitative feedback on exams in order to boost mathematical self-confidence, and in turn, increase persistence of underrepresented groups. Although the outcomes of the project are not yet determined, the process has taught me some valuable lessons in course coordination. As a part of the research, we have worked with three course instructors to develop learning objectives for an engineering calculus II course. These objectives are made available to students in all sections of the course, and exam feedback is stated in terms of these learning objectives. Weekly meetings with instructors and TAs allow for discussion of pedagogy techniques and keep all sections of the course on the same page.

Through these teaching practices, I strive to promote mathematics as a beautiful world accessible to anyone who endeavors to enter. I was lucky after my negative real analysis experience: I had professors reach out to me and show me that I did belong in mathematics. I gradually learned that all math students struggle, and that being afraid to talk about math wasn’t doing me any good. By building conversation into the structure of my classes and encouraging my students not to fear failure, I find that fewer students sink into the background, as I did in my real analysis class.
References