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Teaching Statement

People love watching buildings get demolished; I love watching learning barriers get demolished. Math is a subject rife with barriers. The fixed mindset of 'not being a math person', math anxiety, inaccessible material, long monotonous lectures, large impersonal classes—these all plague the math classroom and are barriers to learning. Incorporating classroom mindfulness, universal design for learning, and technology that brings the class together help bring these barriers down.

Students struggling with math can believe that they are incompatible with math. This is an example of a fixed mindset. Developing a growth mindset is not instantaneous, but begins with introducing to students what these two models are. After this, and throughout the semester, I provide examples of what a growth mindset mentality looks like. One example is explaining the difference between trying to not make mistakes versus acknowledging that mistakes get made and practicing ways to check answers and search for mistakes. It also looks like encouraging students to reframe the statement "I'm bad at math" to "I haven't learned this yet".

For students with math anxiety, this might not be sufficient. Math anxiety, a kind of anxiety or dread about one's ability to do math, negatively impacts a student's math performance. This can lead to a math aversion, which can further compound a student's exposure and knowledge of math subjects. There is a growing body of research about how to lessen math anxiety and one result is that mindfulness practices in the classroom and before tests have a measurable positive effect. In a teaching workshop I recently attended, mindfulness excersises were shown to have a positive effect on student outcomes and that students overall enjoyed using them. In this workshop, these results were not connected to math anxiety, meaning that incorporating them in the classroom can benefit all of the students.

An inaccessible classroom will also impede learning. To make my lectures more accessible I included scanned copies of my lecture notes. On average more than 85% of the enrolled students access these notes throughout the semester. I intend to supplement these with recordings of my lectures so that students can have more ways access past lectures. To increase ways the students have access to me I incorporate a light daily question that gets answered on an index card and is passed in at the end of the lecture. Students are encouraged to additionally write on these questions from the class that they have for me. This also helps normalise the process for when I ask for midsemester evaluations and course feedback.

To keep students who have strong backgrounds or have seen the material before engaged I provide more challenging questions to be worked on as I present introductory methods. Worksheets I make similarly include a range of difficulties and have contributed to my averaging above the departmental mean in course evaluations on the topic of course materials being valuable aids to learning. To help keep lectures engaging I present material in roughly 10 minute chunks separated by a small 2 minute break. In these breaks students are given problems to work individually, told to share thoughts in small groups, or told to brainstorm questions they could ask. These breaks help prevent monotony and provide time for new information to be absorbed. They also provide me time to move around the classroom and check in with students.

With an interest in computer programming I create digital assets to assist in teaching. When introducing the concepts of experimental and theoretical probability I use a digital example of relative frequency of dice rolls and coin flips for any given number of trials. By using larger and larger trial sizes the graphs

showing the experimental probability demonstrate that the probabilities converge to theiirr theoretical probability. This is implemented in javascript and can be viewed in any web browser and on mobile or desktop devices. When teaching definite integral approximation using rectangles I show graphically how changing the number of rectangles changes the width of the rectangles and the accuracy of the approximation. When students point out the tediousness of using this method by hand for a large number of rectangles, I show them a SageMath example of how the calculation can be automated and how to use it themselves. This has the added benefit of adding interdisciplinarity to my course and introduces students to the notion that computer programming can be used to solve math problems.

To increase the access students have to these examples I host them on my personal website, where any student can use it. Students can refer to these after they finish the course and so can anyone who never formally took the course to begin with. In the future I plan to incorporate these into complete OpenCourseWare lessons. In a similar vein, being familiar with the added burden high textbook costs can have on students, I intend to contribute to the open textbook library by authoring or coauthoring an open textbook for a non-calculus introductory math course.

Technology can also be used to make classes with a large number of students more manageable and personal. In the last large section I taught I used the section's online course space to create a forum where students can ask and answer each other's questions. Whenever I received emails with questions about homework problems I anonymized it and posted it along with its solution to the online forum. This provided an answer that other students could see and learn from. To the student asking the question it also reinforced that the forum is the place to go to find answers. This helped reduce the number of emails I had to respond to and it helped other students take on the role of answering questions. Having recently learned about an implementation of automated formative assessment I am interested in bringing it to my own classes. This would provide every student with a personalized email after every exam outlining which topics they scored well in and which they didn't. Without this automation I would be limited to doing this with students who directly asked for it or that came to office hours.

All together my teaching strategies create environments that help students uninhibitedly learn and leave knowing that they can succeed in math. My effectiveness is attested to in my quantitative evaluations in which I have averaged above the departmental mean in 10 out of 12 questions over all the courses I have taught. By regularly attending teaching workshops I expose myself to new ways to demolish barriers to learning.