Teaching Statement
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The growth rate for Science, Technology, Engineering, and Mathematics (STEM) occupations is 76% faster than non-STEM occupations. The average starting salary of a STEM position is more than two times higher than the one for non-STEM positions. The STEM job market continues to grow despite economic crises and the current COVID-19 pandemic. Over the past decades, STEM programs have designed policies to increase diversity and access; however, interest in these fields is still concentrated among white and Asian men. Underrepresented groups continue to experience barriers that keep them from the benefits of a degree in STEM-related fields. Due to the aforementioned reasons, I believe that teaching is a social justice issue and that mathematical literacy is a civil right.

I have experienced first-hand the benefits of an access to a STEM education. I come from a low-income socioeconomic background, none of my grandparents attended middle school, and my mother had to attend night high school because I was born when she was a fifteen-year-old. My life is very different from those of other members of my family, and it is from my personal experience that I have learned how social mobility can be achieved through education.

I am also very privileged; I attended private school and started learning English in preschool; I earned my bachelor’s degree at a public university subsidized by the government and never had to pay for tuition. I had teachers and professors that would say “when you go to graduate school” instead of “if you go to graduate school.” I never questioned my belonging in a math classroom and graduating with a bachelor’s degree was a given. Leaving Costa Rica to start graduate school at the University of Utah was an eye-opening experience towards issues of social justice, diversity, and inclusion. My presence in the classroom, either as a student or as an instructor, has marked me as an outlier. This should not be the case.

Promoting opportunities and reducing inequities starts in the classroom. We need to confront our implicit biases of who can do mathematics, reduce students’ isolation, promote excellence, and create peer-networks that emphasize the importance of education. This is about changing the culture in our math community. Therefore, my teaching philosophy is that everyone is capable of doing and enjoying mathematics. I have focused on three main classroom strategies to achieve this goal: inclusive classroom atmosphere, active and collaborative learning, and the idea that presence creates possibility.

1. Classroom Strategies

1.1. Inclusive Classroom Atmosphere. From the first day of class, I want students to feel confident about sharing their ideas without judgement. I included Federico Ardila’s axioms in my syllabus and refer to them throughout the course.

I believe all students can succeed with the appropriate support. In my number theory course, students were assigned to watch Francis Su’s Mathematics for Human Flourishing talk in order to challenge our biases of who we see as a mathematician. I believe that setting an inclusive learning atmosphere goes beyond the classroom so I provide students with opportunities to interact with each other. In my discrete mathematics class, I reserved a classroom for an hour before my scheduled office hours where students could meet to discuss problems or to study. This past summer, I asked my students to set up a Discord server so that they could maintain some of the social interactions that would occur naturally in the in-person setting. I also refer to different university resources available to students like the food pantry, counseling services, financial aid: I added a resource page on my Canvas course with such information, which is essential given our current pandemic circumstances.

1.2. Active and Collaborative Learning. In the last two courses I have taught, students had to complete a written project. For my discrete mathematics course, the objective of the project was to research the contributions of a mathematician from an underrepresented group. In my introduction to number theory course, because it is an advanced course, the purpose was to explore and learn new material related to the course and write a report on it. Another purpose was to prepare students for future courses with different

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2 Ibid.
3 Available here: http://math.sfsu.edu/federico/
formats (like reading courses and independent study), getting used to owning their learning process, and exploring more advanced ideas in number theory.

I included a peer assessment with the objective of providing feedback on their mathematical writing from their peers, and for students to learn what the other projects were studying. Students were able to choose the project that they wanted to work on according to their interests and background. I was honest with them and said that for some of the projects, I would be learning the material alongside them which made the material less intimidating and they were able to witness my own learning process. The collaborative learning has continued beyond my courses. My students have been able to find study groups for their courses and coordinate to take classes together; a group of four students approached me after our discrete math class to set up a number theory reading group in the following academic year. After my course this summer, one of my students set up a Discord server for all members of our mathematics department. The server has channels for different math classes like numerical analysis, algebra, and probability and explicit rules addressing academic misconduct.

1.3. Presence Creates Possibility. As a woman of color in mathematics, I am both a role model and an instructor. Students need to see themselves represented to consider themselves capable of doing mathematics. As mentioned above, my discrete math class contained a project on the contributions of a mathematician from an underrepresented group. I modified this project for my introduction to number theory course; students chose from a list of number theorists who are currently working at different universities. I included number theorists with diverse backgrounds and identities. They have a better idea of what it means to be a mathematician in terms of being a researcher, an instructor, and doing service. They learned about different subareas of number theory and opportunities available to them like Research Experience for Undergraduates, conferences, and workshops.

2. A Typical Day in Class

At the University of Utah, I have taught a variety of undergraduate courses and have had the opportunity to participate in other teaching experiences. I think it is important to motivate every topic and be able to articulate why we are devoting our time to learn it. As a student, some of the concepts and results that I learned seemed very artificial. When my professor wrote the definition of ideal, I remember asking myself how one would come up with such definition. A couple of months later, I read a history of mathematics book which explained the history of the definition of ideal. Everything made more sense. The book explained how to backtrack the definition of ideal to a concrete problem and how the search for a solution was the motivation to define and redefine mathematical concepts.

A typical day in my class starts with a fifteen-minute-long mini lecture in which I talk about the main definitions and main results along with the historical motivation and which kind of questions are being answered. I provide students with partial notes so that they can fill in the details during lecture. After this, students are assigned to small groups to work on a worksheet. The worksheet includes problems that will give students an understanding of the material and will help them develop intuition. It includes examples and asks students if they see a pattern and to make a conjecture regarding the pattern. I include examples for which the hypotheses of our theorem are not met and ask students to explain why the theorem does not apply. This helps students understand the importance of hypotheses, and it provides them with intuition on why they are necessary.

I ask students to work at the board (or a virtual whiteboard) to encourage discussion and participation of all members. It is essential for students to talk out loud about mathematics and this provides information on how they are understanding the material so that I can correct them if needed. Solutions to the worksheets are posted on a learning management system, such as Canvas, and they are graded for completeness. This allows students to explore new concepts and ideas without negative repercussions on their grade.

3. Mentoring

Throughout my career, I have benefited from having mentors and people who advised me. During my first four years of graduate school, there were no female faculty in pure mathematics; I was able to find mentors through our AWM Speaker Series. I would like to encourage similar mentorship for younger generations of mathematicians. I facilitated a number theory reading group for undergraduates during Fall 2019 and Spring 2020. There were four students in the group and we met weekly to discuss exercises and assigned readings; the students were learning elementary number theory. I also supervised a graduation project for
an undergraduate student, Hannah George, on computational aspects of elliptic curve cryptography. We met weekly in the Spring 2019 to discuss assigned exercises and readings, and to discuss the implementation of the different algorithms.

The Department of Mathematics at the University of Utah holds a Math Instructor Training Workshop for incoming graduate students every August. In 2019 and 2020, I co-facilitated this workshop with other experienced graduate students and faculty members. Some of my responsibilities included doing teaching observations and providing feedback, discussing inclusive teaching practices, providing guidance to international students with the transition to the U.S. education system, and giving a talk about social justice in the classroom.

4. University Teaching Assistantship

The University of Utah awards between twelve and fifteen University Teaching Assistantships (UTA) each academic year with the purpose to enhance undergraduate teaching and graduate student development. I earned two UTA’s corresponding to the academic years 2019–2020 and 2020–2021.

My first project consisted of doing research on how to build an inclusive classroom environment. I gave talks on inclusive teaching practices in our math ed/teaching seminar and I gave talks about social justice in the classroom aimed at incoming graduate instructors. I have developed teaching materials for discrete mathematics and introduction to number theory and have shared them with other members of the department. I also created resources for observance months which include information about scholarships and student groups on campus, and also a small biography of mathematicians with those identities.

My second project consists of designing a curriculum and teaching a course on history of mathematics. I want to take advantage of this course as a “math meets humanities” course. Students will learn history of mathematics from a critical history perspective. I want to focus on the contributions of small-scale cultures through a culturally-aware curriculum. We will challenge our definition of what we consider to be mathematics and who gets to be a mathematician. Both project proposals are available on my webpage.

5. Reflections

It is important to reflect on our teaching practices to become better instructors. I gather anonymous feedback from my students throughout the semester and adjust my teaching style to their needs, when possible. I have designed my own survey with questions about the classroom atmosphere and inclusive teaching practices. I use this informative feedback to make adjustments to my teaching strategies; this includes revisiting topics, redesigning assessments, and finding new approaches to the material to accommodate all types of learners. I also participate in seminars and discussions about inclusive teaching practices.