

TEACHING STATEMENT

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Mathematics is a subject that has a “complex” nature. Therefore, I believe that careful and elaborate reflection can lead to effective teaching in mathematics. My experience as an educator began when I started as a graduate teaching assistant for a calculus class. I quickly realized that teaching is something I enjoy. Those “aha” moments that the students have when they understand something new are the most rewarding moments of teaching for me and my motivation to pursue a career in teaching. As a beginner in instruction, I had a somewhat steep learning curve, but five years of teaching experience in different roles as an instructor and teaching assistant equipped me better for the job. I learned from my mistakes, student feedback, and experienced professors at George Mason University (GMU). My teaching style and philosophy are based on the following ideas.

Motivation. To have the students accept information with enthusiasm, it is necessary to provide the motivation for learning the same. Relating the lecture content to real-life examples whenever possible is an excellent way to achieve this. When explaining a new idea, I try to tell a story by providing analogies and connecting it to what they have studied before.

Engage. Sustaining the attention of students throughout the lecture is a challenging task. To engage the students, I give them easy problems to solve, which takes about five minutes in between the class. This prevents the class from being monotonous. Even simple things such as modulating the voice and directing questions to the students throughout the lecture go a long way. I also repeat new concepts multiple times to reinforce the idea.

Practice. The best way to learn mathematics is by practicing it. After explaining a concept, I make sure to solve a problem or demonstrate a related example. I give regular homework problems that are to be graded and short quizzes to ensure that students are practicing the concepts continually. When I was an instructor for Calculus 1 and Discrete Math courses, I also assigned additional practice problems. These questions were not graded, but as an incentive to solve the problems, I used these as a pool for quizzes.

Inquiry Based Learning. While solving a problem in class, I break it down into smaller sub-problems and then elaborate on how to proceed while focusing on one part at a time. I want the students to develop the ability to take complex problems and dissect them on their own to solvable easier problems. To this end, I use Inquiry-Based Learning (IBL) worksheets in recitation sessions while teaching Calculus 1. As a student coordinator for the NSF-IUSE (Improving Undergraduate Stem Education) program at GMU, I co-organized biweekly seminars for graduate teaching assistants (GTAs) of Calculus classes. I also assisted in implementing active learning and inquiry-based learning in calculus recitations.

As a Graduate Learning Assistant (GLA) for the graduate algebra course at GMU, I developed IBL worksheets for the weekly prelim problem-solving sessions. The aim of the sessions was to help the graduate students prepare for the preliminary exams in graduate program. My goals while creating the worksheets were to help the students develop skills to break down complex problems into simpler steps/parts, brainstorm ideas to solve the problem, and manage the time. I have noticed that students often have trouble knowing how to approach the solution of a given question. So I scaffolded the question with a series of guided shorter problems, usually starting with a definition involved. Towards the middle of the semester, I asked the students to write the scaffolding on their own. The last question of each worksheet is to think of alternate ways to solve the problem and other situations where the same technique could be used. This encourages them to think of the concepts and techniques they learn as a toolbox to solve a

variety of problems rather than a single one. The insights from this experience led to a joint preprint titled *Graduate Learning Assistants in the Mathematical Sciences: A new approach to core graduate classes*.

Active Learning. When I taught Calculus 1, I had the students solve the IBL worksheets in groups during the recitation sessions. The opportunity to work in groups added a component of *collaborative learning* that is useful in aiding the students to get over ‘the fear of math’ to some extent. Engaging in discussions and explaining their work to peers helped students develop a more positive outlook towards math. Additionally, *active learning* shifts the role of the student from a spectator to that of a participant, which makes it harder for them to be separate from the process of learning for long. In my Calculus 1 class, I noticed that this encouraged the students to engage in informal study sessions with the group members outside the class.

I also employed group work for the problem-solving sessions in my graduate algebra class. At the end of each worksheet, I encourage them to get feedback on their solutions from group members. Additionally, I asked the students to revisit their solutions one month later and grade their own answers. I have served as a facilitator for active learning in the graduate algebra classes and calculus courses, which involved walking around the classroom helping the students who are working in groups. This experience provided me with valuable insights into strategies that are helpful in active learning. For example, when I see students make an error, I try to guide them to the mistake by asking questions rather than pointing it out directly. Having the students working in groups could make the classroom more welcoming and inclusive for the students. When I implemented group work in classes, I requested informal mid-semester feedback from the students on how to make this a better learning experience for them.

Summarize. In one of my classes, I had the students take the first five minutes of each lecture to summarize what they learned from the last one. I gave participation credit as an incentive, and it seemed to better prepare the students for the lecture. In addition, glancing through what the students wrote gave me an understanding of the concepts they were struggling with and helped improve my teaching.

Technology. There are two ways in which technology can aid teaching. The first is using technology to teach virtually. I have conducted online discussion sessions for both undergraduate and graduate classes during the Covid-19 pandemic. This experience helped me explore different aspects of online learning and teaching practices for virtual instruction. For example, facilitating group discussions require different strategies when the class is online compared to in-person. Online teaching allows improved interactive instruction through visualization tools such as graphs, pictures, or even short movies to explain a concept better. Making recorded videos of lectures available to the students as supplementary learning material gives them an option to go over the lecture multiple times, which could be helpful to some students. This could be particularly beneficial to students with certain disabilities or even those from underrepresented groups.

The second option is to use technology in the process of teaching. One way to do this is to teach the students to use the technology to visualize the math they learn. For example, in Calculus 2, students can be taught to use simple commands in Mathematica to do a 3D plot of a surface, which can be further explored and rotated to understand a problem better. If possible, using 3D printed objects to assist teaching could be very effective. For example, having models of solids while teaching how to calculate volume using the slicing method in Calculus makes learning more tangible for the students.

Course Design and Assessment. I was the instructor for the courses Business Calculus, Discrete Math 1, and Calculus 1. While designing the course, my goal is to optimize the learning experience while reducing the element of stress for students. I often try to provide different options for the students to get credits through homework, quizzes, assignments, participation grades, etc. When structuring the class, I try to make the class inclusive and welcoming to all students, particularly those from underrepresented minorities. On the first day of one of

my classes, I gave the students a questionnaire asking for information regarding the grade they wanted, their major, and any problems/hurdles that might affect their academics. By providing the option to be anonymous, my goal was to understand the classroom climate and convey that I want to help them do their best in the course.

Outreach and Mentoring. Another significant component of teaching is mentoring and advising. I have been part of numerous research projects at MEGL as a graduate mentor for groups of two to three undergraduate students for eight semesters. As a graduate mentor, I met weekly with the undergraduate students, explained any concepts they were struggling with, directed them to the right reference materials to learn, and discussed their ideas. Though the fundamentals of teaching involved are the same, this experience helped me think about tailoring my teaching to suit the needs of individual students. I believe the role of a mentor is to guide the mentee along the path that they want to take while helping them grow and develop their own style of learning, teaching, and sharing mathematics.

I have volunteered for and helped organize outreach activities for school children and high school girls as part of my involvement with Mason Experimental Geometry Lab (MEGL) and the Association for Women in Mathematics (AWM). I find this new dimension of explaining math satisfying and would like to continue being part of such activities that intend to instill a love of math in children and underrepresented groups. I was the student coordinator of the Student Research Talks (StReeTs) at GMU, a platform for students to present research or give expository talks. I want to continue encouraging student-run seminars that allow students to share their mathematical knowledge with their peers.

Summary. I endeavor to inspire the community around me at different levels. In the classroom, my goal is to help students learn better and efficiently by building confidence and developing a positive outlook towards math. I try to tell a story by connecting new ideas with what the students already know and employ strategies that use active learning and inquiry-based thinking through group work. On a secondary level, I want to engage the student community around me by being involved in seminars and student organizations. Finally, I hope to reach the community outside the university through outreach activities. Teaching is an experience where I also learn alongside the students. I hope to learn from my mistakes by revisiting and evaluating my teaching tactics. Above everything else, what is most important is the driving force behind teaching. For me, teaching provides a chance to contribute back to the community and share what I find beautiful in mathematics with others.