

I am a fourth-year Ph.D student in mathematics. My research interests are symplectic and contact topology, low-dimensional topology, and algebraic topology. Benefited from a liberal arts college education myself, I also aspire to become a teacher who commits to the humanity aspect of math learning by interacting closely with my students, promoting collaborative and active learning, and fostering a comfortable and inclusive learning environment where everyone's voices can be heard. Throughout my doctoral training, I have been practicing and reflecting on these values with my colleagues and teaching faculties in the Instructional Training Program of the math department and the Certificate of College Teaching Program of The Graduate School. The department has trusted me with more teaching responsibility than the average graduate student. I have been the instructor of record twice for multi-sectional calculus classes, the discussion leader and lab TA for three classes, the math help room TA, and the project manager for two undergraduate summer research. This range of experience has shaped my teaching to balance challenge, accessibility, and engagement, pushing me to anticipate stumbling blocks for first-time learners, connecting abstract ideas to familiar contexts for students with varying disciplinary backgrounds, and offering depth for students who seek it.

## A1 & A2

Learning math is growth, not ability. I believe that mathematics is just like any other discipline or skill: anyone can improve more and more with practice and collaboration in a welcoming environment. This philosophy was first strengthened by my lab TA experience for the single-variable calculus and linear algebra courses, where I facilitated weekly sessions for 24-32 students working on problem sets based on the previous lecture. Each time, I randomly assigned students into groups of three so that everyone can contribute [V1, V2, V3, K1, K2]. Then, I asked students to hold markers of different colors and collaborate on boards like mathematicians [V2, V3, K1, K2]. Students felt much more immersed and stayed focused, presenting their work and responding to peers' ideas in real time. The board work also made the collaboration visible, and I could quickly identify both progress and points of confusion across the room [K3]. To ensure that students with different backgrounds and levels of preparation were participating meaningfully, I asked students to rotate responsibilities for each problem with one discussion leader. Seeing one color dominate the board also prompted students to reflect on participation and make space for others [V1, V2]. Consequently, students often arrived with partial understanding of lectures – fragments of definitions and examples – and the lab helped them synthesize these pieces coherently and take ownership of the material. As reported in course feedback, “the class was made stimulating by the lab practices, as these questions were typically

harder than the homework and tests, but we work collectively so we managed to figure them out." [K5]

## A1 & A2

As the instructor of record, I began the syllabi by communicating my teaching philosophy directly to students with encouragement of building mathematical persistence and community guidelines of respecting each other [V1, V2, V4]. When teaching the single-variable calculus class for 31 students in spring 2025, I drew on my lab experience and collaborated with my teaching fellows across four other sections to replace purely lecture-based instruction with structured in-class group activities embedded in guided handouts [V1, V2, V3, V4, V5, K5]. In small groups of 3 and 4, students were motivated by hands-on examples and experimental data from graphical software and spreadsheets to apply their prior knowledge and "discover" math that are new to them [V1, V2, K1, K4]. When learning the derivative of exponential function, for example, students attempted the limit definition to find out that the derivative is proportional to the original function and used spreadsheets to numerically approximate the proportionality constant. In facilitating the group work, I was able to identify common misconceptions to address with the whole group, and respond immediately to individual points of confusion [K3]. To achieve productive and inclusive group work as in lab, I worked with my students to develop a set of communication guidelines that were included in the syllabi and revisited throughout the semester [V1, V4]. I also coordinated with two undergraduate lab TAs to ensure that the lab component of the course aligned with the approach I had previously used by sharing my experiences [A4, V5].

## A4

I believe that many lightbulb moments in learning math happen outside the classroom, and I actively engage with students to help them realize these moments. In the math help room hours and office hours, I helped students identify peers (potentially from a different section of the same course) with the same questions and encouraged them to work together [V2, V3, K1]. Often, the partnership continued to last for the entire semester. It was also in these spaces that I was able to connect with the students on a human level and provide individualized guidance. For example, I learned after class that a majority of students were rusty with some precalculus knowledge due to the instructions during the pandemic, and the instructional team designed a lab worksheet to capture them [V1, K2, V4]. On another occasion, after learning a student's economics background and desire to understand integral beyond displacement from velocity, I explained the concepts of Lorenz curve and Gini coefficient, which was later integrated

as a brief lesson into the course due to broad interests [V1, K2, V4]. It was evident that students became more familiar with the materials and me after office hours and were more likely to speak up in class. Beyond the coursework, I was also supportive of math enthusiasts exploring the subject further. As a project manager of MATH+, I facilitated undergraduate math research for 3-4 math majors mentored by a faculty for two summers. In addition to teaching the background knowledge for the projects and suggesting possible strategies to attack the problems, I communicated with the mentor to structure the collaboration by managing concentrations of different aspects of the projects among the students depending on their interests, such as drawing examples, developing proofs, programming, etc. [K1, V5] During the breaks, we had many simulating discussions about navigating math courses and math research career paths [V4]. Two of the students graduated and are now attending math graduate school.

#### A5 & A3

I am constantly seeking new ways to improve my teaching practices. By participating in the workshops and coursework in the annual departmental training weeks and the Certificate of College Teaching program, I have learned new tools and teaching methods that I have since implemented in the classroom. In an “effective and inclusive teaching practices” workshop, for example, I learned the inclusiveness aspect of assessment techniques and how it improves student engagement [V3, V4]. It inspired me to use thumbs up/down to check students’ understanding in all my classes to include students who were reluctant to speak up. Similarly, I asked students to score their understanding of each class on anonymous exit cards. [V1, V2, K2, K3, K5] I recognize that teaching is a transformative process for both students and teachers, and feedback from diverse perspectives has played a central role in this process. Besides the quick in-class responses, I conduct mid-semester reflections, as part of test corrections, to check in with my students and make timely adjustments to my instruction. In the surveys, I asked students to acknowledge their strengths and top two areas for improvement in the course, to reflect on what they would do differently for the remaining semester, and to share how to improve their experience of the course [K1, K2, K3, K5]. In response, I discussed the feedback openly with students in class with a collective agreement on course revision. I have also benefited from faculty observers visiting my classroom and providing written and verbal feedback on specific aspects of my instruction. In the early stage of my teaching, for example, one observer noted that while my explanations were clear, students would benefit from more time to process problems before I stepped in to guide them. In response, I began building intentional pauses using the “think-pair-share” technique, allowing students to wrestle with ideas before I offered clarification [K1, K2, V2, V3, V5]. In addition, I have also exchanged

peer feedback with graduate instructors and colleagues from other disciplines through the Teaching Triangle program. These conversations exposed me to perspectives of diverse learners and alternative strategies to support them. I recognize that teaching is itself a learning process, and I will continue to seek out opportunities to develop as an instructor.