Teaching Statement

Matt Hin

Teaching Philosophy: Collegiate calculus is the most difficult and frustrating class to teach well as an instructor. It poses some unique challenges like a wide variation in student backgrounds with mathematics, it marks a paradigm shift away from procedures to axioms, and it serves as an early introduction to the analytical side of mathematics. My first class as an undergraduate was single-variable calculus and while I excelled at framing a problem as a calculus problem and finding a solution, I felt frustrated at having to communicate my process. At the time, I had naively believed that it was sufficient to compute the correct answer and communicating the logic of the solution was unnecessary. This frustration was neatly complemented at Cornell University, when I found myself instructing a similar course in calculus and found that my students shared my old perspective.

Ultimately, this frustration drove me to question what it really meant to teach a calculus course at the collegiate level. In most cases, it was the first mathematics class taken by an undergraduate and often times the student experiences a shock in how limited their secondary education in mathematics has prepared them for college. It seems straightforward then, that the collegiate calculus class should give students insight to how a mathematician approaches the world and provide opportunities for them to experience that perspective. It is this realization that informed me about how to approach teaching not only calculus but any undergraduate course.

Inclusivity: As an applied mathematician, I approach problems in three ways: by developing proficiency with mathematical frameworks, by collaborating and communicating with others, and by applying my knowledge to new situations. It is important to me that my students experience this as well and I structure my classrooms around this idea. In order to develop proficiency, students need to be readily able to engage with me and their peers in the classroom. This requires establishing avenues for students to access accommodations and working to increase the ease of the process to obtain them. At Cornell University, I worked closely with Student Disability Services to develop an inclusive classroom that was accessible to all of my students. They helped me establish an environment that encouraged students to request and access accommodations from the University. At one level, this means I dedicated time at the beginning of each semester to inform and encourage students to seek assistance and to continue to reinforce their availability as the term progresses. At another level, I coordinated with proctors to ensure students would obtain extra time or a distraction-free space.

Students should also feel comfortable in engaging with me and their peers, so I treat my students as capable diverse individuals and demand that perspective of everyone in the classroom. It is not so that my students are treated uniformly, but so that students feel like they are treated fairly and respectfully. A truly inclusive classroom should just be a classroom where students feel comfortable engaging with a mathematical concept or model regardless of their identity or background. One of my most challenging experiences as an instructor was taking the time to learn and use the correct pronouns when referring to my first transitioning student. Despite how minor the task seemed, I was later thanked by the student that the courtesy helped build a comfortable rapport and reassured him that his transition was not an obstacle in my classroom. In turn, I am reassured that these straightforward efforts serve as an important baseline student engagement and mastery of the coursework.

Collaboration: Collaboration is an important aspect of my research and the ability to communicate my ideas to others is a skill that I cherish. As such, the classroom should provide students cooperative opportunities that emphasize communication as well as proficiency. As an instructor this means having transparent class policies that are repeatedly reinforced during each class session. It also means that the instructor structures the classroom around compelling group activities. Instructors can realize this by preempting each session with specific learning objectives, which enables students and instructors alike to evaluate the coursework mastery. For example, I have found that students often struggle with the difference between the

existence of a limit and continuity of a function at a point. To address this confusion, I preempt the session by stating the objective: "Students will be able to explain the difference between continuity at a point and the existence of a limit at a point." During the session, students form small groups and experiment with various functions in search of the difference between the two concepts. Within these groups students have the opportunity to hypothesize, experiment, and reevaluate their understanding in a comfortable setting. The session concludes with a debriefing, allowing for students to share their insight with the class and as a classroom achieve the learning objective. In this example, the session focused on experimentation to collaboratively develop a framework around continuity and because of the explicit communication of the objective allows both student and instructor to gauge proficiency.

Applications: The application of mathematics to other subjects is not only a compelling way to learn mathematics but also to test one's mastery. By acknowledging the interests of the students in the classroom, it informs the instructor on more effective ways to engage with their students:. Aspiring scientists should be taught calculus through models that are relevant to their field, pre-medical students should understand the worth of the coursework to their expertise, and eager mathematicians should begin to appreciate the analytical underpinnings of calculus. In my single-variable calculus class at Cornell University, I always bring context to the material, whether it be through a geometric visualization of derivatives or an optimization problem that draws from Ithaca's surroundings. One of my favorite course projects to assign is one where students form small groups to design a roller coaster that meets certain continuity and smoothness requirements and challenge them to build physical models of their designs. I find that creating room for student creativity and contextualizing my classroom with their interests helps students garner a stronger appreciation for the mathematician's perspective.

Future Plans: I appreciate the Math Department at Cornell University for noticing my efforts and awarding me with the Graduate Teaching Assistant Award for continued excellence in teaching and faculty assistance. In my time working with the faculty of the Math Department, I have developed the confidence to teach a number of undergraduate courses beyond calculus like differential equations, numerical methods, and analysis for students in either technical or humanities fields. While I am proud of my accomplishments and efforts, I feel like there are still important issues in my teaching as well as higher education that I can address. One aspect of my teaching that I want to continue to develop providing students more ownership in the classroom. Design projects like the roller coaster assignment and other inquiry-based exploration activities give students opportunities to truly invest in the material. I also want to emphasize the importance of developing mathematical writing. A large vehicle for mathematical communication relies on effective and compelling writing and I believe that such skills can be introduced and reinforced in the calculus classroom. Straightforward steps like allocating time for a course discussion on mathematical writing and assigning work that requires continued practice are essential. From my experience with medium-size classes, I am ready to scale my classrooms up and teach large classrooms. It is important to translate effective practices from small-scale classrooms and modify them so they remain effective for a larger population. Regardless of the scope, it is important to test these beliefs with well-constructed pedagogical studies and analyzed by modern mathematical techniques such as natural language processing and rigorous statistical testing. It seems fair play that if the collegiate calculus classroom provides insight into a mathematician's perspective of the world, then how the calculus is taught in the classroom should also benefit from a mathematician's perspective.