Teaching Philosophy

When teaching mathematics, I think it is essential to engage with students beyond the purely technical content of the subject matter to discuss the possible implications their work can have on improving the world. Before pursuing my master's degree in applied mathematics, I trained at one of Canada's elite acting conservatories - George Brown Theatre school - where I am now the First Year acting instructor. Throughout my training and work as an actor, I ran a math tutoring business, The Math Room, which has been operating for eight years. I have had a dual identity as both student and teacher since I began coaching figure skating at the age of ten. As a student and teacher of mathematics and theatrical performance, it is important to have both disciplines inform each other.

My teaching is student-focused, creating a learning environment that celebrates individual learning processes. I learn the names of my students and familiarize myself with whatever individual educational plans students have by the second week of the semester. To effectively teach mathematics, I motivate technical details with higher-level discussions of context and relevance, foster the importance of well-roundedness in individuals in technical fields, and work with students to address the limitations and paradoxes of previously-learned, simpler mathematics in order to effectively reconstruct the knowledge necessary to understand more complex models.

Creating a balanced student-teacher dynamic in the classroom is critical. When students enter a class for their first lecture, they take cues from the instructor to understand the power dynamic of the classroom. I work against a dynamic that privileges the teacher as the 'most important' person in the room by beginning class by acknowledging the spectre of imposter syndrome, the universal feeling of being 'the outsider,' which is prevalent in the sciences but rarely discussed in a discipline where uncertainty is frowned upon. I give an honest account of my own experiences with this feeling as an undergraduate student of mathematics, and use this to emphasize the importance of process over final results. To further balance the student-teacher power dynamic, I admit openly and call attention to errors made in my work during class. I celebrate these errors as an opportunity to review the concepts. Finally, to create a safe space in the room I give students who feel uncomfortable speaking in front of their colleagues the opportunity to ask me questions individually during our break. As a theatre-maker, I understand the importance of feeling safe enough to 'fail' - which, indeed, has different meanings to different students. By recognizing our common feeling of being 'the other', confidently owning and enjoying my own mistakes, and providing a less public forum for clarification for more introverted students, I create a safe environment which favours student learning over any performance of power. As evidence of my effectiveness in the classroom, I have noticed that a third of the way through the semester students who began the course by only asking for clarification in a one-on-one setting began to open up and ask their questions in front of their classmates.

Motivation is an important aspect of teaching mathematics. When learning complex mathematical tools and methodologies, it is easy to lose sight of the purpose for learning these techniques and allow oneself to get bogged down by special cases, rules, and formulae. By discussing the greater goals in learning this subject matter and how it applies to real-world situations, students feel re-energized to learn challenging material. Pedagogical research shows that desire, initiative, and motivation for students to succeed in mathematics courses is directly linked to the students' understanding of how the material relates to real world applications. For example, in an engineering calculus course, I will often discuss what kinds of engineering students are embarking on and how various mathematical tools we are examining can be applied in their respective disciplines.

I am a firm believer in encouraging students to appreciate the importance and necessity of well-roundedness. The nature of most mathematics courses at the university level is such that students are graded based solely on technical assignments and exams. This method of assessment explicitly omits any need for students to develop oral communication skills. In the real world, scientists, mathematicians, and engineers do not simply work on abstract problems in quiet seminar rooms but live and work as part of an ecosystem of other specialists and stakeholders, people who might influence, or be influenced by, their research and studies. To be a well-rounded student of the sciences, then, is to have the confidence and ability to articulate the nature of their work and participate in the myriad interpersonal negotiations that take place within scientific communities - in the private sector and in the public research lab - every day. To address this, I create oral math quizzes. This method of assessment gives me the opportunity to more fully understand how students think about mathematics, what challenges and strengths they have, while giving them opportunities to practice communicating orally. Each time I do this with a student, I learn that students know more than they think and more than can possibly be assessed by a written test. It also allows me to build their confidence by giving supportive feedback while they are being tested. Students consistently tell me they feel better after oral quizzes than written quizzes.

The nature of mathematics is such that new concepts build upon previously learned, often simpler, mathematical ideas. Before one can learn the most complex approach to a particular branch of mathematics, one must learn the building blocks of the field and then build upon those blocks. Mathematics students are initially exposed to simplified versions of the truth that need to be replaced by new or more complex ones as their education deeps. Studies have shown that new scientific concepts cannot be learned if alternative ideas that explain similar phenomena already exist in the student's mind. It is common practice for mathematics teachers to simply dismiss preconceived notions and ingrained beliefs. Instead, before students can fully embrace newer, more complex ideas, I address the paradoxes and limitations of previously learned ideas, and help students use them to reconstruct and internalize their new knowledge. To avoid using mathematical jargon only suitable to those in the sciences, I'd like to give a simple example of how I approach this idea in my classroom. Recall, if you can, a time when you learned to count to 10. The majority of children begin this process by counting from 1 and gradually increase their maximum counting number to 10, to 20, to 100, and so on. When a child reaches a particular age, the idea of zero is introduced. Instead of just informing the child that zero is the new starting point and that they should replace their preconceived idea of one as the starting number, I would investigate with the child why choosing 1 as the initial value might lead us to some tricky situations. For example, if you were baking cookies and you baked 1, then a second, then a third cookie - clearly, you would have 3 cookies. Now let's get to the fun part and eat the cookies. Some questions to consider would be: How many cookies did you have when you were mixing all of the ingredients in the bowl? How many cookies did you have when you ate everything you had baked? Etc. In a calculus class, of course, this discussion would deal with relative sizes of infinity and why we cannot subtract the square-root of infinity from infinity cubed. But the principle is functionally the same - breaking down ideas in this way allows students to take ownership over their education while gaining a deeper understanding than they would have without this breaking down and reconstructing model.

My teaching philosophy supports my students in becoming well-rounded students of science and technology who critically think about the mathematics they are using and how the work they are doing is beneficial to the world around them. Professional interactions with students allow me to continually grow and develop my own skills as a teacher and learner while fostering a safe environment that favours support and risk-taking over perfection. I think this dynamic approach to teaching is essential in a field that embraces a new group of humans with each course and that is evolving so rapidly.