

When students are able to appreciate the beauty of mathematics they are able to utilize its strength and rigour to achieve their potential and solve complex problems. Over the past ten years, I have accumulated more than 10,000 hours of teaching experience. There are three main pillars to my philosophy of mathematics education. First, math is inherently accessible but must be taught in a way that addresses each student's way of thinking. Second, the opportunities that open up through studying mathematics easily help motivate students to continue and love math. Third and last of all, I believe the biggest hurdle to learning mathematics is internalized anxiety about the subject being difficult. Once students are able to overcome this anxiety they are able to grow and discover math on their own.

Accessible Explanations in Mathematics

Throughout the years, I have learned to assess the need of students from the front of the classroom whether I am working with a handful of students or in front of a 100 person lecture. Whenever I am in front of students, I make sure to use a variety of techniques and explanations in order to address every learning style. Through examining facial expressions and frequently asking for precise feedback (eg. "what is the definition of continuity", and not "do you understand"), I am able to gauge the level of understanding and tailor explanations and examples to the needs of the classroom. In particular, this leads to further accessibility of deep rigour in mathematics. In the first day of pre-calculus, I always begin with a discussion on the Fundamental Theorem of Arithmetic – that every integer has a unique prime factorization. This complex sounding terminology occasionally scares students, but learning the simple concept in an accessible way sets students up for success. They are able to realize that they are capable of learning difficult concepts.

The feedback loop that is created in my classrooms means that each time I am in front of the class, my explanations and my examples will be different. There are many different ways students prefer to absorb knowledge [4]. By consistently varying my teaching and including a balance of note writing, activities/examples, and verbal explanations, many different students will be able to follow and understand. Additionally, the idea that students are exclusively verbal, kinesthetic, or aural learners is outdated, it is important to encourage students to continually explore a variety of study strategies [4].

Mathematical Motivation

The beauty and usefulness of mathematics can be utilized across disciplines – from using the logic and critical thinking to analyze court cases and criminology studies, to applying differential equations to understand the growth of populations in biology. Every student that signs up for a math course has some motivation for showing up on that first day. Once they arrive, I work hard to encourage students to continue striving for success in mathematics. This often comes in the form of encouragement and understanding in the classroom. From the front of the class I show students that I am friendly and approachable, and from there help to bridge the gap of encouragement. These ideas are supported in the research [1,2,3].

Additionally, I always provide students opportunities to give me feedback on my lessons. In doing this, students find that they have more connection to the material and feel a greater sense of responsibility which helps foster motivation [2]. During my System Programming course in Winter 2019, I began the course by asking students what they wanted to learn throughout the semester. This helped me guide the lessons to what students needed to know. By the end of the semester I made sure I covered every single topic at some point. In fact, one student wanted to learn how to "hack the pentagon," and on our last day of class we combined every main topic from the term to

create a program that ran graphics of fake hacking. This engagement with curriculum and connection to learning helped students stay connected to the material and take ownership of their own learning. Throughout the semester, just before the midterm, I asked the students to submit an anonymous survey to evaluate my teaching and ask for improvement. Students noted that I did not leave my slides up for long enough to copy down and that by not posting the slides they had a hard time reviewing material they may have missed. This led to me posting small summaries of my lectures at the end of each week of class. Students found this helpful and supportive.

Increasing Confidence and Self-Assurance in Mathematics

I always foster a safe and supportive environment for asking questions and making mistakes. Making mistakes is, in my opinion, the best way to learn math and to investigate the world around us. For many students, making mistakes is the scariest part of mathematics, so I always encourage new ways of looking at mistakes as stepping stones to success. Encouragement aids in learning [3]. I do this through student self-evaluations and test error analyses where I ask students to step through their solution, figure out where the mistake occurs, and how to avoid the mistake in the future. This was particularly useful in MA238 in Fall 2020 during the pandemic. The error analysis was revered by students as a huge support after the first midterm. After this assignment, students performed significantly better on the second midterm. Students gained accountability for their own learning, and gave them a pathway to success. This method of addressing one's own strengths and weaknesses helps students take responsibility of their learning while encouraging further study, which has been shown to increase overall success [2,3].

Overall I have three main philosophies when it comes to teaching. First, I believe that every student has some intrinsic math ability that, with the right teacher, can come out and help the student succeed even beyond the walls of a math classroom. Second, math is a beautiful subject that can help us unlock truths from the world around us. Lastly, I believe that the best way to teach is to help students on their own journey to discovering the beauty of math. A good math teacher can become a great math teacher by listening to students and trying to understand their solutions from their point of view. There is never just one way to come to any math conclusion, and that is true in every level of math class.

References

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