

STATEMENT OF TEACHING PHILOSOPHY

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Mathematics is the language of human thought, understanding, and intuition. For example, if thrown a piece of chalk, any student can instinctively anticipate its path and extend their hand to catch it. They have an automatic understanding of the dynamics of the projectile's path. Calculus is a way to write that understanding down. I believe everyone can have a deep understanding of mathematics because mathematics is the articulation of the human way of thinking. This view of mathematics motivates me not only to teach, but to teach to every student in my classes. Not all learners are the same and I always endeavor to find ways to engage and reach every student in some way. I also feel that as the world becomes more and more technical, a basic command of mathematics will be as important as a basic command of written language for success in the professional world. As a result, I feel duty bound to find ways to bring an understanding of mathematics to all of my students.

In addition to the auditory, visual, and kinesthetic classifications of learners I find that, in mathematics, there are also the math-timid and math-intrepid students. The math-intrepid students engage in class and coursework with a fearless, conquering spirit while the math-timid are silent and suffer from a self defeating belief that they are destined for eternal mathematical ignorance. It is important to address both the math-intrepid, through challenging and illustrative problems, and the math-timid, through a confidence building course structure. My favorite way to address both groups is through weekly quizzes. Quizzes not meant to intimidate the students into study, but to encourage them to practice. At the beginning of each week I post a list of 5-10 problems and tell the students that I will choose 3, which I will not change, to be on the quiz. Most have solutions in the back of the book and some I will do as examples in class. For the math-intrepid it is just another challenge and a chance for me to give them practice on the concepts I believe are most important for that week. For the math-timid it is a surmountable task, after all they know exactly what will be on the quiz, and this motivates them to study rather than procrastinate out of fear. I also like to give practice exams, typically longer and harder than the actual exam, with extremely detailed hand written solutions. I do this for two reasons, to motivate the math-timid to study and to show the students what mathematical thinking looks like. I think of these solutions as an opportunity to show the students how to approach a given problem and illustrate solution techniques. I accomplish this with little "thought" bubbles next to the work explaining why I take a specific approach or employ a specific theorem to a given problem, I also like to draw lots of pictures. To help the math-timid become more engaged I like to designate one of my office hours as a discussion session run in a classroom setting. This gives students who might not like one on one engagement an environment to still get the help they may need. It also allows me to engage and encourage them in an interactive setting.

If an environment of inclusion can be established it is then important to get the right content into the hands of the students. In my time as a student I found that taking notes distracted me from lecture, I would get so wrapped up in copying down what was on the board that I was effectively not listening, only writing. While I could look at my notes later they often felt incomplete as I was not fully present during class time. I have friends though who swear by note taking, it helps them pay attention and internalize new information. In my classes I have always posted my lecture notes online, so that if a student does not wish to take notes they will still have a transcript of the lecture. Lately this practice of mine has

evolved to the posting of a set of “before notes,” skeletal notes to be printed the night before lecture, and “after notes,” fully filled out by me during lecture, serving as a transcript. I accomplish this by projecting the skeletal “before notes” using my tablet and writing on them with a stylus. It is effectively a virtual white board specifically setup for that day’s class. There are many advantages to doing this. Having important theorems or equations pre-written saves time during lecture, this allows for a more thorough working of examples, skipping no steps, and hopefully allowing the students to truly follow along. Since we are using a computer this also allows for the display of helpful animations, for example, a volume of revolution animation or computerized demonstration of successive approximations. The use of a virtual white board like this allows for the creation of content that can reach any type of learner. It has also allowed me to record my lectures so that students can re-watch them or catch up on any missed material. The videos are simply comprised of what was on my screen and my voice and I have received only positive feed back in my teaching evaluations on their use. One student comment from a complex analysis class in particular summarized why I like to record the lectures “The whiteboard format that Christian used felt really groundbreaking. This class very much felt like a hybrid of a flipped classroom and a regular one. The lecture notes were VERY neatly structured and proof-oriented, but watching Christian write on them live in the classroom still created the ambiance and depth of an interactive math class. There was an impeccable balance of theory and example.” My goal is to give each student what they need to succeed in my classes, I feel I can do this by creating a class room where each student can choose their approach to learning. If they want to take notes, they can, if they don’t, I post them. If they like a flipped classroom, videos will be available and they can participate in the discussion sessions. I truly believe that mathematics is for everyone and that everyone can do mathematics, it is only the path to learning that varies.

I believe that there is great potential in the use of technology, like my tablet and recorded lectures, to find new and creative ways to give students the materials they need to succeed. I have enjoyed using WebWork, an online homework system, in many of the classes I have taught. One great feature of this system is instant feed back for the student. They know right away if they have done a problem correctly and if not, they are allowed to try as many times as it takes to figure it out, up until the due date. Systems like this also allow for streamlined communication between the instructor and the student, with a click of the “email instructor button” in the system, a student can ask for help and I receive their request along with a link to the problem they are working on. I then can respond easily with suggestions or even hand drawn diagrams using my stylus to help them along. This proves especially useful in the online classes. Finding ways to engage students in a class they take from home can be difficult. To foster an engaging environment in my online courses I have taken to running online office hours fostered through Canvas and Big Blue Button which provides an online whiteboard and conference room. I also have the students vote each week on three problems they would like to see me do in a video from their online homework. I then choose the three most popular problems for the videos. This voting is a part of their participation grade and is meant to keep them engaged. It is also meant to let them know that I am actively working to help them and to provide a human element to the course, even if they never see my face.

I really enjoy teaching and sharing my love of mathematics, I also believe teaching helps me to grow as a mathematician and gives me new appreciation for the material of each course I teach. I have enjoyed finding ways to help others see mathematics as I do and I’m always looking to improve my methods through experimentation and collaboration with others in my field. I love learning my self and like to keep an open mind, to try new things, and to improve myself. I’ve never been afraid to admit when I’m wrong as that helps me to grow, so that I can help others to grow as well.