

## Teaching Philosophy

What compels me to teach is the opportunity to help students understand mathematics and learn to enjoy the course material along the way. Math is a subject frequently disliked by many students. I strive to bring the material to life, talking about why certain steps are taken in solving a problem, the motivation for the problem, and how both are useful. So often we focus on teaching students to take certain steps at given times, without explaining why. In my experience, skipping the “why” leads to frustration and confusion for many students. Student success is more than gaining the capacity to solve certain problems. It must involve them learning how to approach problems and gaining confidence in their ability to find solutions. I want my students to have this higher level of understanding and to move forward in their academic career with a strong ability to apply logic to solve problems.

What is meaningful and makes sense to each student, and each class as a whole, varies greatly. To reach as many students as possible, I give alternatives for solving or understanding problems. By presenting multiple approaches, I am more likely to cover a method that is understandable to a student. Furthermore, I can deepen the students’ level of comprehension on a topic by encouraging them to think about it differently, or consider how two approaches are the same in the end. While talking about the motivation decreases students dissatisfaction with a topic, many students still appreciate having steps to follow for difficult problems. A great classroom exercise is to develop these steps as a group, discuss why certain steps are included, and determine why the order of the steps may or may not matter. This exercise not only gives students the opportunity to practice approaching problems logically, but also helps reinforce the steps. If a student forgets something while taking an exam or in a subsequent class, they will have the skills to think through the problem and recreate the solution.

A typical day in the classroom for me begins by doing a review of the previous lecture so I can smoothly continue instruction, or discuss how a new topic builds on the previous one. I prefer students to be involved in class while I lecture. To accomplish this, I often have students work on a problem on their own or in small groups to gauge their understanding of a topic. To encourage student participation, a tool I recently learned about and will implement is the classroom poll. In these polls, students can anonymously select or contribute an answer and the results are shared with the class. I also pose questions to the class as a whole, requiring the students to think about approaches and what makes sense for a given problem. The students can then interact and build off of one another’s thoughts to come up with a solution. I regularly summarize what we are doing and why so the students gain a big picture perspective, rather than getting lost in the details. I strongly encourage my students to ask questions, and I periodically pause to give them the opportunity to do so. Nothing is more disheartening as an instructor than students leaving class with questions which I could have answered, and which would have been helpful to the entire class.

I make use of anonymous Google forms in my classes as well. Well before midterms and

exams, I send anonymous forms where students can ask questions about the material or exam preparation, which I then answer in class. For the quiet student who will never ask a question in class or come to office hours, my goal is to create an opportunity for them to have their questions answered. All students benefit from these questions since I cover them in class. Furthermore, if I get many similar questions, I know that a topic may need more coverage or more practice problems. Moving forward, I will explore the use of Padlet, or another similar tool. Students could ask questions more frequently than by only using Google forms, and it would provide the opportunity for students to interact outside of class and help one another.

Anonymous Google forms also allow me to check in with the class a few weeks into each semester to see how things are going. This idea is one that I learned from one of my professors who made the excellent point: while end of the semester reviews can be beneficial moving forward, it doesn't help the students currently enrolled in the course. Every class has its own personality, and if there is something I can change to improve the class, then that is what I want to do.

From recent professional development courses and conferences, I have learned more about flipped classrooms and student centered learning, the use of which I would like to examine as I continue my teaching. While I already encourage student interaction and participation in thinking about problems, having the students develop certain results on their own will instill confidence and deepen the appreciation of problem solving. For example, rather than me just giving them the shortcuts for derivatives, students could spend some time working on deriving the shortcuts for simple derivatives such as polynomials. Students could watch videos on derivative shortcuts or integration techniques and have more time in class to work examples in groups while I answer questions.

I have always sought to expand the courses I teach, including more Calculus courses, discrete math, linear algebra, and modern algebra, as well as higher level courses. In particular, I would like to develop an undergraduate Lie algebra course, or do independent studies with students on this subject. Teaching *Applications of Algebra* has been a unique opportunity for me to work with students. In this course, I implemented research projects, where students have a choice of exploring additional math concepts or delving into real world applications of the topics discussed in class. In response to student feedback, new technology projects this semester exposed students to Maple, giving them experience using software to assist in complex mathematical calculations. I would enjoy continuing this course and have it evolve to cover current student interests. Based on my experiences in this course, I look forward to working with students on more in-depth projects in the future. My approach will be to develop projects based on their goals and interests. These projects may vary from exploring different applications of algebra to studying pure math topics, including assisting me with research into Lie or Leibniz algebras.