

Teaching Statement

Douglas Pfeffer

Mathematics is a beautiful subject that blends together the abstract and the concrete. My goal as a mathematics instructor is multi-faceted. I endeavor to not only educate the student, but do so in a motivational, enticing manner that also convinces the student of both the utility and beauty of the subject. My favorite ways of doing this is through the use of history in the classroom, as well as the use of group-learning, self-discovery, and technology-based techniques. Additionally, I stay versatile as an instructor by not only seeking opportunities to teach new coursework across the curricular spectrum, but also opportunities to teach in new ways like lecture-hall styles, standards based grading, and flipped classrooms. With this in mind, my methods of teaching are always changing and, more importantly, always improving.

History in the Mathematics Classroom

A key way I keep the students motivated and enticed is through the integration of history. The history of mathematics is a rich one and introducing it into a classroom can have many benefits. For example, when teaching Calculus and Analytic Geometry 2, my class was about to discuss the integral of $\sec(x)$. The traditional way such an integral is computed is by multiplying by $\frac{\sec(x)+\tan(x)}{\sec(x)+\tan(x)}$, then applying a u -substitution. This unintuitive trick only serves to demotivate the average student. Instead, before showing them this solution, I discussed the history of such an integral – dating back to the late 1600's with the use of Mercator projections. Not only did this intrigue the students, but it illustrated a very clear application of the material. We then rediscovered the original, three-hundred year old solution. This solution utilizes intuitive applications of trigonometry and partial fraction decomposition – something every student felt confident they could do. Thus, a historical approach can sometimes serve to motivate both the material and the student. Further, it can showcase both the utility of mathematics and its beauty.

Group-Learning, Self-Discovery, and Technology

Group-learning and self-discovery are important ingredients in my teaching style. Mathematics and the general art of problem solving is not always a solo-sport and developing working solutions is all part of the discipline. In my classrooms, I actively employ small activities that are designed to guide the students to discovering new concepts such as limits, derivatives, integrals, and series. Realizing that wrestling with the unknown can be *fun*, many students respond positively to such activities. Getting my students into groups and participating in at-board work and competitions then illustrates that collaboration is beneficial to the advancement of ideas. Finally, in an age that is constantly advancing technologically, it is my belief that integrating online tools like Desmos helps develop students into mathematicians that can apply their ideas to the world around them. Employing all of these techniques into my classes, I have received overwhelmingly positive results.

Teaching Across the Curricular Spectrum

Part of being a quality instructor is being a well-versed one. I have actively pursued opportunities to teach both a broad array of mathematical coursework as well as a variety of different types of students. As a result, I have had a hand in teaching everything ranging from Developmental Mathematics to Pre-Calculus Algebra to Calculus 3 to proof-based Linear Algebra. A great example of how this benefits my instruction is my hand in the teaching of Linear Algebra. This proof-based course had a large number of mathematics majors as students and therefore warranted a very different style of instruction than, say, Calculus 3. Focusing less on computation, the course focused more on abstract concepts and proof writing. However, when in need of a good, concrete example of a particular concept, it was often useful to recall an example from Calculus 3 and extend it into the desired setting. In this manner, my experience with a variety of coursework helped provide intimate examples for the students to work with. I intend to continue teaching a spectrum of coursework in order to better help my students see the beautiful world of mathematics. In particular, I welcome opportunities to teach new coursework – both pure and applied.

Lecture Hall, Standards Based Grading, and the Flipped Classroom

Mathematical pedagogy is always changing and I endeavor to always improve my teaching with it by taking advantage of opportunities to try new education styles such as lecture hall, standards based grading, and the flipped classroom. In the Spring of 2018, I pursued the chance to teach Calculus 2 in a lecture hall style. My classroom had roughly three-hundred students – about ten times the normal classroom. Having to lecture from a projector, I could reach more students simultaneously and my lectures were recorded and available to the students. While this style of lecture was a little impersonal and made questions difficult to take and answer, the experience teaching a course in such a manner helped improve my teaching abilities. I believe it is important to try new techniques and push the envelope of comfort in order to see what works and grow as an educator.

Aside from the lecture hall style, I have also actively pursued opportunities to employ new pedagogical techniques such as standards based grading and a flipped classroom. In Summer 2018, I taught collaborated with two other Calculus 2 instructors to design and implement both teaching styles. Standards based grading removes the usual lecture-homework-exam cycle of a course and instead organizes a list of twenty to thirty standards that a given course covers. Then students take small assessments on only one or two standards at a time. Unlike a usual course, these assessments are graded as pass/fail and the bar for passing is set high. The objective is to have a student demonstrate true mastery of a given topic and do so for every topic in the course – only then can the student earn their ability to pass the course. A student can take a given assessment as many times as they'd like until they demonstrate mastery. This type of course removes students 'cramming' for large unit exams and allows the instructor opportunities to improve how a student writes their answers (as opposed to just getting most of the way there via partial credit.) This style of course epitomizes much of my opinions on pedagogy and yielded largely positive results. This paired nicely with the notion of a flipped classroom.

The flipped classroom is a technique that aims to improve a students understanding of the material by providing supplementary instruction and more opportunities to ask questions. Borrowing from the structure of an online classroom, the student watches a pre-recorded video of a given lecture before they come to class. The instructor uses the class period to discuss the finer points of the material, go over detailed examples, answer questions, and give opportunities to work

on problems both individually and as a group. I was able to work closely with my students on problems and allowed me to tailor my instruction to meet their needs. This style of classroom meshed well with my pedagogical inclinations. Overall, taking advantage of these opportunities to try new techniques and styles improved myself as an educator and, ultimately, helped me give my students a higher quality education.

Student Reviews

The quality of my instruction and the success of my teaching philosophies is best seen by my student reviews. At the University of Florida, from Fall 2014 through Summer 2018, I have received a total of 566 student reviews. The students answer a myriad of questions on a scale of 1 to 5 with 1 being the worst and 5 being the best. One question in particular is: “Overall rating of the instructor.” The following is my overall average along with the associated average for the courses I taught (i.e., taking into consideration other lecturers that taught the same course), average for classes throughout the Mathematics Department, and the average for classes across the College of Liberal Arts and Sciences.

My Average	Course Average	Department Average	College Average
4.71	4.26	4.23	4.28

Additionally, students have the option to leave written feedback. The impression I leave on my students is exemplified by the following Calculus 2 review:

“Mr. Pfeffer is such a great guy, he always shows up early and ready to get to teaching. He’s super approachable and friendly, and I think it’s safe to say that everyone in his class knows that they can ask him pretty much any ”dumb” question without getting a single bit of negativity from him. I seriously cannot stress enough how awesome this guy is. Also, his lectures are very coherent and easy to understand. He welcomes feedback from the class and constantly encourages students to come to his office hours. Probably the best professor I’ve had since I started college.”

Overall, I believe a basis for my mathematics teaching philosophy is best exemplified by W. S. Anglin in *Mathematics and History*, “Mathematics is not a careful march down a well-cleared highway, but a journey into a strange wilderness, where the explorers often get lost.” It is my perpetual goal to be a guide that assists the future generations in understanding and embracing this wilderness.