

Teaching Statement

Chad Giusti

My personal understanding of mathematics is as a narrative of an evolution of ideas. As a teacher, my desire is to impart this vision of mathematics to my students in order that they may view the subject as more than a set of exercises and mechanical procedures. While my time at the University of Oregon has taught me that not every student appreciates this deeper conceptual approach, giving them the opportunity to do so remains my goal.

Experience

I have extensive teaching experience as a result of my employment as a Graduate Teaching Fellow at the University of Oregon since fall of 2003. During the course of the past six years, I have been the sole instructor for twenty-four separate courses. Due to my positive teaching evaluations, I have been given several advanced classes to teach. A complete account of my academic employment is detailed on my CV.

During the summer of 2007, I was chosen to teach a two-week course for incoming graduate students at the University of Oregon, an honor given to one graduate student each year. The course provides a review of the fundamentals necessary for beginning graduate coursework. I chose to emphasize producing explicit constructions of examples and counterexamples, as I have noticed that these vital skills are often underdeveloped in beginning graduate students.

Course design

When planning a course, in keeping of my conception of mathematics as a narrative, I begin by outlining a “story” that takes the student from the beginning of the course to the end. Then, I assemble ideas from within the narrative with which the students should already be comfortable. It then remains to coax students onto the path of allowing one idea to lead to the next until they arrive at the intended destination. As with all high-minded approaches, doing this successfully requires more effort than one might like.

To this end, I try to borrow literary devices for use in the lecture writing process. This engages the students’ attention and helps them understand the flow of ideas in a format with which they are familiar. I employ foreshadowing by choosing examples which are to be special cases of later, deeper ideas. As frequently as possible, I recall earlier themes that are again at work and describe what influence these themes have on current developments. When anticipating a longer break between lectures, I ensure that I resolve the storylines of any subplots. When class later resumes, I summarize what we have already seen of the story in relation to the central ideas and assign my students exercises that will require them to both reconsider what has recently happened and to progress toward what will come next. And, of course, I ensure that the experience ends in a climax worthy of the students’ efforts, while leaving open the possibility of a sequel.

For example, for an introductory course on ODEs, I determined that the primary thrust would be to derive the power series method of solution for linear ODEs. I opened the course with

the equation $y'(t) = f(t)$, tying the course back to the students' recent experience with integral calculus. Then, I moved on to using the fundamental theorem of calculus and basic differentiation rules to solve a variety of different first order ODEs. At this stage, I introduced use of power series expansions as another technique for solving these simple equations. Once the students had become used to the complexity of the computations, I showed them several simple cases in which higher order ODEs are solvable, to highlight how difficult this is in general. Finally, I directed our discussion to power series solutions for higher order linear ODEs. I left the students with questions that could be solved with their new skills: development of spherical harmonics and a pointer to *Music: A Mathematical Offering*, a free textbook which applies many of the ideas we had seen.

Student interaction

I am as direct and engaging as possible in involving students in the development of ideas. I truly enjoy working closely with students and helping them realize their potential. Early in the term, I make a statement that is a step beyond the average student's level of comprehension and then ask for questions. If this fails to elicit a response, I do something out of context, like lying on the floor until someone asks a question. This makes them laugh and breaks the ice, and afterwards in-class interaction becomes easier for most students. For the remainder of the course I prompt student answers or questions several times a lecture, making a point of learning and using their names. At the end of each class I encourage students to continue the discussion during office hours. I further facilitate student interaction by scheduling my office hours per student preferences and by inviting them to make appointments outside regular hours.

It is also essential that the students continue to deepen their understanding on their own. To this end, I encourage students to work together outside of class. In addition to the usual computations, I assign exercises that they are not necessarily expected to solve but which prepare them for upcoming ideas. In the above-mentioned differential equations course, for example, over the span of the term I assigned minor computations and simple proofs of lemmas that we would later use when discussing Fourier series.

Technology

The intelligent application of technology can greatly enhance a student's learning environment, in and outside of the classroom. My computer science background and extensive programming experience, both in industry as well as academic research, give me a broad range of tools to use when implementing technology in my classes. In teaching, I have used software like Sage and Mathematica for instruction and have used WebWorK for coursework evaluation since its initial trials here in 2008. It is my intention to be part of the community effort to improve open-source educational software and to help guide its evolution into a better tool for teaching mathematics.

Ideal Teaching Environment

I have taught a wide range of mathematics classes, from intermediate algebra to multi-variable calculus. In doing so, I have been the most successful, and derived the most pleasure, when teaching students who are seriously engaged in their education. I work best with students who enjoy, as I do, pushing themselves to ever-higher levels of understanding and broadening their intellectual horizons without prejudice. I look forward to having many more opportunities to work with such students, for whom I can create courses and direct research on topics that we mutually find engaging and intellectually stimulating. As such, I believe I am ideally suited to an environment where I can facilitate the education of a small number of high-level students.