

Teaching Statement

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1 Philosophy

In my teaching, I have found it crucial to remember that each course is meant to tell an engaging story. In *The Math Gene*, author Keith Devlin points out that mathematics has a cast of characters with complicated relationships much like any TV show or novel; however, the abstraction of mathematics often puts up a barrier that discourages many people from studying it.

For this reason, I strive for clarity in my presentation style. Where possible, I follow the introduction of a new topic with a comparison to a previous topic, or even to a non-mathematical phenomenon. When I work through an example, I not only verbally explain the reasoning behind the more complicated steps of the problem, but I also write down the key phrases off to the side in a different color. As one of my Calculus III students noted, “Incorporated into [Ryan’s] teaching are appropriate figures and asides that aided significantly in making ‘bridges’ between bits of new material.”

So often, students will write down in their notes only what is written on the board, which hampers their ability to reconstruct the meaning of that day’s mathematical lesson. Presenting my work clearly and sprinkling it with simple reminders helps to combat this problem. At the same time, it helps the students understand how to write up their own work with clarity in mind, so that they can become engaged in communicating mathematical stories.

Inside as well as outside of the classroom, I aim to be accessible to my students; according to a Calculus II student, I “never fail to answer questions and other cries for help.” I approach office hours with patience; one of my Calculus III students remarks, “Ryan worked with me during just about every office hour and never once displayed any sort of annoyance for my sometimes trivial questions.” I also run a review session in the evening a few days before an exam. In my experience, being approachable for help serves much more than addressing students’ immediate concerns; it helps them appreciate the subject to know that someone is willing to take a little extra time to talk about it. This consistently instills a more positive attitude toward mathematics in my students.

In the courses that I have taught, I have taken a short amount of time to stress the importance of logic. Most calculus students have not been exposed to proof-writing, so they sometimes have difficulty in properly using results like the integral test and the n th-term divergence test for series. That is why I developed a brief worksheet (explaining implications, contrapositives, and proof by contradiction) placing plain English examples of logical statements next to theorems from their class. For instance, proof by contradiction becomes relevant to younger students when explained in terms of Sudoku puzzles. In creating and presenting this logic worksheet, I have found that a shared enthusiasm with the students is vital for courses like abstract algebra that introduce them to proof-writing as their primary means of communicating mathematics.

2 Experience

During every semester of my tenure at Rice, I have had teaching assistant or sole instructor duties as part of my graduate fellowship and my NSF VIGRE fellowship. I taught Calculus II and Calculus III in the accelerated summer sessions of 2006 and 2007, respectively. In this format, I administered the courses on my own, which included all assigning and grading duties. I again taught Calculus II during the standard fall semester of 2007. I served as the instructor of one section while two professors ran other sections. I assigned homework specific to my own class, and hence, held my own office hours, but I worked with the other two professors to write common exams for the three sections. I successfully managed these three courses, despite their varying levels of autonomy.

As a teaching assistant, I have presided over weekly homework help sessions and have graded exams for lower-level classes such as Calculus and Ordinary Differential Equations. I have also served as the homework grader for upper-level classes such as General Topology, Harmonic Analysis, and Integration Theory.

For two years, I served as a graduate assistant in the VIGRE program, helping to oversee advanced undergraduate research seminars in such varied topics as edge length minimizing polyhedra, curve-shortening, and Michell trusses. This experience has given me encouragement to develop research projects for small groups of undergraduates. Specifically, my thesis subject (knot energy) is an analytic problem requiring some background from low-dimensional topology. There are many related topics lying between these two fields that are accessible in such an undergraduate research format.

As part of Rice's mathematics curriculum, I participated in three years of a graduate teaching seminar. In this course, graduate students would present mock lower-level talks and critique each other's performances. Thanks to this training, I had opportunities to experiment with lessons using techniques other than the standard "chalk talk," which included worksheets, visual aids, and even a Calculus-based game of Bingo. Invited faculty members gave us advice on such topics as building a syllabus, working with technology in the classroom, and preparing for the job application process. I have since been invited to this seminar to speak on the topic of running a homework help session.

I have organized weekly seminars in Functional Analysis and in Measure Theory at Rice, in addition to regularly speaking at other seminars on such subjects as Algebraic Geometry, Sub-Riemannian Geometry, Stochastic Differential Equations, Currents and Varifolds, and Differential Topology.

These endeavors have given me diversified training in effectively communicating mathematics to students of every level.