

## Casey Douglas - Philosophy of Teaching Statement

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There are a number of ways to effectively teach mathematics, and over the past nine or so years as a student, I have benefited from many of them. My teaching experience stretches back nearly as far, when I started work as both a mathematics tutor and occasional substitute instructor at Southwestern University. My training continued upon entering graduate school, where I served as a teaching assistant for a number of courses, assisted undergraduates with research projects under the VIGRE program, and taught courses in Calculus, Differential Equations, and Linear Algebra. Though I look forward to learning even more about teaching as my career progresses, I have developed an important skill that will continue to serve me in the years to come; I have learned how to create an environment that is conducive to learning.

To be more specific, the classroom environment I seek to establish is one in which students feel comfortable asking any question they wish, where they feel entitled to getting as much out of their time with me as possible. The specifics of how this is accomplished depend in large part on the class and students being taught, but there are a few basic strategies that hold in virtually every setting. First, it is important to be responsive to the needs of the students, adjusting lecture styles if necessary, assessing both their strengths and weaknesses, and providing plenty of office hours. Second, a good instructor should promote student-teacher interaction, offering various and regular lines of communication such as e-mail or website updates, and incorporating student questions and concerns into class lectures. Last, but not least, I think successful instructors should enjoy and take pride in their work.

Entry-level classes present distinct challenges, as students from a variety of majors are often required to enroll. Some of these students already love mathematics, some of them regard it as a necessary evil, and still others view it as a form of punishment. In the Calculus class I taught, there were students with strong backgrounds, students with virtually no knowledge of mathematics to speak of, and even non-traditional students who were looking to “revamp” long neglected skills. In both my Calculus and Differential Equations classes, it was crucial to balance the course’s rigor against its accessibility, so as to serve the needs of as many students as possible. This was accomplished by coupling deep theorems and techniques with plenty of examples and pictures, explaining their veracity and utility in intuitive and easy-to-remember terms. This worked quite well, as one Calculus student noted, “He explained things very matter-of-factly and was able to ‘translate’ Math into something comprehensible. The language he used was never abstract, but down-to-earth, very easy to understand.” In fact, one student concluded, “I like math again, and am considering majoring in math again! Great class!”

Regardless of background, virtually all students benefit from a highly structured course. On the first day of every class I teach, I provide not just a detailed syllabus but also a more general road map for the course, pointing out unexpected turns, explaining how and why

the theory is useful in other disciplines, highlighting the reasons students tend to dislike or enjoy the course, and offering tips on how to do well. This was especially helpful for Differential Equations and Linear Algebra, courses that I taught over a period of three weeks, lecturing nearly three hours a day for five days a week. In Differential Equations, weekly vocabulary assignments, in addition to regular homework, helped the students stay afloat. One student commented, “The vocabulary sheets were annoying but helpful in understanding major course concepts,” while another student was simply “amazed at how well the class was organized,” without, evidently, being annoyed... or, at least, without feeling the need to comment on his/her annoyance. Because of my organization and responsiveness to student needs, I was able to maintain a steady pace without overwhelming anyone.

To foster a sense of community and encourage student interaction in my classes, I often ask for opinions on or reactions to newly presented definitions and theorems, at times encouraging students to explain why they think such facts are true, useful, or, as a few anti-math students reliably insist, “stupid and pointless.” This allows me to transition effortlessly into more detailed proofs of theorems (though, in introductory courses, I never use the word “proof,” opting instead for phrases such as “Why the Fundamental Theorem of Calculus is True,” or “Why our Existence and Uniqueness Theorem is Believable and Useful”). It also provides opportunities to motivate and demonstrate various applications of the material to other disciplines. Furthermore, encouraging such interaction affords additional opportunities for assessment. Homework and exam grades are necessary for measuring performance, but these earnest conversations often give me deeper insight into a student’s thought process and understanding. In turn, I am better able to offer help and instruction.

In order to prevent the more advanced students in an introductory class from becoming bored, I often assign “challenge problems” for additional credit or offer discussion questions, such as, “How else might one go about defining the notion of a ‘derivative?’ ” All students respond well to practice exams, review sessions, and regular e-mails. “He helps his students by coming in extra days to help us study for an exam,” wrote one Calculus student, “and also consistently sends the class e-mails to update the course website and to prepare us by telling us what we should expect in upcoming lectures.” Putting forth that extra effort helps a class overcome anxiety over grades, allowing them to focus on learning key concepts and mastering problem-solving techniques, instead of wondering whether a particular problem may or may not appear on an upcoming exam. By the end of a given course, students make much progress, with the majority feeling accomplished and stimulated. In fact, the final lecture for my Calculus course was an optional one called “What to Expect in Calculus II and Beyond,” and I am happy to report that it was given to a full audience.

When teaching higher level courses, I do not shy away from rigorous proofs and deep explanations. Students in these classes respond well to elevated expectations, especially when topics are presented with enthusiasm and interest. Moreover, students enrolled in mid- or upper-level math courses deserve and often need the opportunity to develop their critical reasoning skills and knowledge base. As in any class I teach, I treat students’ questions

and confusion with respect, re-explaining a concept from various points of view until they are satisfied. One Linear Algebra student remarked, “He did a good job explaining the theory behind the math and did not hesitate to answer anything about the lessons.” Indeed, I tend to treat questions in these classes as opportunities for deeper and more meaningful discussions, wherein I not only help students improve their understanding, but also take the time to point out where and why similar concepts and ideas might reappear. Not everyone enjoys these extra discussions, I’ll concede, but by and large they work wonders for these courses, keeping students interested in math and excited about current class work.

I have also had the pleasure of working one-on-one with small groups of gifted undergraduates, many of whom have gone on to pursue higher degrees in mathematics. From the spring of 2005 through the summer of 2006, I participated in Rice University’s VIGRE program, working alongside graduate students, post-docs, professors, and undergraduate students. This provided me the opportunity to learn more about being a mentor rather than a teacher, coaching students on presentation and teaching skills, as well as assisting in their mathematical education. The undergraduates worked together on research projects in the area of the Calculus of Variations, and I was thrilled at how much I learned as a result of my participation.

During my time with the VIGRE program, I also learned how valuable scholarship is to teaching. It is important to be able to bring new or current perspectives into the classroom, especially when working with advanced students. Helping undergraduates develop research skills requires a lot of work and one-on-one time, but this process is greatly assisted by engaging and developing my own research skills. Although my experience as a mentor is limited, I take great pride in the undergraduates’ accomplishments and look forward to having more opportunities in this area, advising students and exposing them to cutting-edge mathematics and current problems.

Be it Calculus or an advanced seminar, the relatively small class sizes found at Rice University have made it easier for me to become the kind of math teacher I think students deserve. In a different setting, some of my methods and techniques will likely need to be adjusted, but I look forward to meeting these challenges. In addition to addressing the needs of my students and facilitating an interactive classroom, I simply enjoy teaching. Whether I’m mentoring a pair of undergraduate students, leading a discussion in an advanced or specialized seminar, conducting a review session, or lecturing to a large audience, I feel privileged to teach. It is an honor and a joy to share my knowledge, opinions, and excitement with others, and it is this attitude that helps me cultivate an ideal learning environment, one in which every student has an opportunity to succeed. It’s not always easy, and it can be discouraging when a student doesn’t take advantage of such opportunities, but it is always worth pursuing. Given my experience and dedication, I am confident that even under different circumstances, with enough thought and work, similar results are always possible, and I look forward to achieving them in the future.