TEACHING STATEMENT

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From both my experiences as a student and as an instructor, I have learned that the single most important factor in learning and teaching mathematics is that the student should be actively engaged in thinking mathematically. Whereas in other disciplines memorization can go far in learning and understanding, memorization in mathematics yields only brief comprehension, and in many cases is actively detrimental to conceptual learning. While learning a sequence of historical events is what commonly constitutes "knowing" history, and memorizing a few landmark cases and judicial concepts comprises a majority of a standard education in law, learning mathematics requires that students be able to actually apply mathematical ideas. To do this, each student must be involved in "doing" math.

It is this concept that has guided my activities as a teacher. While the classroom lecture is valuable for framing mathematical concepts and clearing up misunderstandings, the lecture serves simply as a framework for learning the material. Beyond a presentation of the definitions and techniques, a class only teaches mathematical concepts as well as it can engage each student to fully contemplate them. For this reason, the lecture portion of each of my classes consisted of as little direct lecturing as possible, with most of the time taken up by demonstrating specific examples and by conducting a two-way discussion with students on how to solve explicit problems. Even the portions of class devoted to lecture were broken up by questions for the students, as well as from the students. In my experience, if the students in a class are not asking questions, it usually does not signify that they comprehend all concepts perfectly, but rather that they are not engaged. If they are merely taking notes, students have no way of knowing whether they understand the concepts being discussed. They may not ask questions either because they feel they are already completely comfortable with the material, because they are not interested, or because they are embarrassed at their mathematical level. The way to involve students is to pose questions directly to them and to be friendly and receptive to their responses and questions. This opens up the class to dialogue, and each pupil is more directly involved in the material and is actively thinking.

This focus on thinking and active application of concepts also means that students will learn chiefly from their own independent work. In particular, solving homework and individual problems is often when a majority of the learning occurs and is arguably the most important part of math education. Here, my role is to act as a facilitator: to give them problems that reflect what they need to learn, to help them when they are stuck, and to aid them in making mental connections. Most of my effort in these situations occurs in answering students' questions about homework. This is a valuable position because it allows me to engage each student in a problem they have already thought through. Since they have

invested time into thinking about this problem, they will already be more involved. Also, I can use this quandary to see where their misconceptions lay or help them make connections to material that they already know. The manner in which I help with questions is also critically important. Most students' questions can be answered quite quickly by simply telling them the correct method and letting them know when they have the correct answer. But it is vastly more helpful to students if I work through the problem with them with minimal input, to see what issues they have already thought of and to help them reach the right answer through their own work.

In my time at Rice University, I have been given many opportunities to see what works and what doesn't when teaching mathematics and to put my ideas into practice. I have served as a teaching assistant for ten semesters in a variety of courses, from Calculus I to Commutative Algebra. My duties included running weekly homework help sessions and grading homework and exams. I have also acted as the instructor for one semester of Calculus I and two semesters of Calculus II. As the instructor, I was given sole discretion over the class schedule, curriculum, homework, and exam questions. Additionally, I prepared all course lectures and grades.

As part of the Rice graduate program in mathematics, I also participated in six semesters of a graduate seminar in teaching. During this seminar, I worked on basic teaching practicum and pedagogy, as well as specific discussions on how to construct a syllabus and a course schedule and the proper amount of work and difficulty for daily homework and exams. We gave practice talks and lectures, and received criticism from other graduates students. I also had the opportunity to give non-standard class lectures, including talks involving physical demonstrations of mathematical concepts and math-related games and activities.

I have also worked with several teaching programs while at Rice. I participated in the Rice University School Mathematics Program as an instructor and program coordinator. This was a year-long project aimed at improving the quality of mathematics education in Houston-area K–12 schools by helping teachers develop knowledge in mathematics and improve their pedagogical skills. In this program, I worked with teachers on ways to improve their own curriculum and gave lectures in combinatorics and on my own areas of research. During the 2010 Summer Session, I took part in the Vertical Integration of Research and Education in the Mathematical Sciences (VIGRE) Program in Computational Algebraic Geometry. Through this program, I worked with undergraduate students on a directed research program investigating singularities of plane curves. This was particularly rewarding for me, because it gave me a chance to apply my own areas of research pedagogically and to help a group of undergraduates learn about research mathematics.