

Teaching Statement

Maria Belk

I have been teaching mathematics for eight years, first as a graduate student at Cornell, and more recently as a visiting assistant professor at Texas A&M. At Cornell, I served as teaching assistant for several different courses, and I taught second semester calculus for two semesters. Twice I served as the assistant to the course coordinator, which gave me some experience with the administrative aspects of running a large multi-section course. At Texas A&M, I have taught second semester calculus, linear algebra, differential equations, and graduate engineering mathematics. In addition to teaching courses, I have participated in two outreach programs for school children.

In my teaching, I try to interest the students by providing motivation and concrete examples. For example, when covering determinants in linear algebra, I showed the students a plastic model of a parallelepiped and explained how to compute the volume. I try to introduce motivations early. At the beginning of the sequences and series section of Calculus, I discuss the usefulness of polynomials, and I explain that series will allow us to write some functions as “infinite polynomials.” In linear algebra, I tell the students early on that the ideas of basis and subspace will allow us to quickly compute large powers of matrices (using eigenvalues and eigenvectors), and when I cover change of basis, I do an example of changing to the basis of eigenvectors.

I try to encourage student participation in class. When working a problem in class, I will often stop and ask the students for ideas on how to proceed. I will sometimes begin class with a “warm-up problem” — the students spend five to ten minutes working on the problem, and then we discuss the solution to the problem. This immediately engages the students, and allows them to test their understanding of the material from the previous class.

I encourage students to ask questions if they are confused. I regularly remind students of my office hours, and when there are students in my office at the end of office hours, I will usually continue answering their questions. I encourage students to send me e-mails if they have questions outside of office hours, and for large courses, I have created an online discussion board (using Google Groups) for students to post their questions; this allows all the students to benefit from the answers given to one student.

I have found computers useful in teaching mathematics. Last spring, I had the opportunity to teach a differential equations course using Matlab. The classroom was a computer lab; each student had access to a computer during class, and I allowed them to use Matlab during tests. There was also a computer at the front of the classroom which projected onto the

wall. I used this computer almost every class for a variety of reasons: plotting direction fields or phase planes, explaining Matlab commands to the students, finding the numerical solution to some problem, or simply showing the students a useful webpage. The students appreciated that Matlab made differential equations more concrete, and I look forward to using computers in future mathematics courses.

I have been involved with two outreach programs: Expanding Your Horizons and Math Explorers Club. Expanding Your Horizons is a nationwide program aimed at encouraging girls in math and science. Both Cornell and Texas A&M host annual Expanding Your Horizons conferences, in which middle school girls are invited to campus for a day to participate in multiple math and science workshops. As a graduate student at Cornell and as a postdoc at Texas A&M, I have cooperated with other postdocs and graduate students to organize and present hands-on mathematics workshops. During one workshop, we had the students play the game of Nim in pairs and attempt to develop winning strategies. In a different workshop, we showed the students some topology; for example, they wrapped a string around a doughnut, tied the string, and then ate the doughnut, leaving a torus knot. These workshops encourage interest in mathematics by showing the girls that math can be fun and that they can solve challenging problems.

Math Explorers Club is a Saturday morning program for high school students run by the Cornell Mathematics Department. Professors run 6-week mini-courses on topics such as graph theory, probability, fractals, and topology. For two years, I assisted with the modules, and I designed and led computer activities for the students. For example, during the topology module, I had the students play with the “Torus and Klein Bottle games” on Jeff Weeks’ website. Another time, I helped the students write a Maple program to draw the Sierpinski gasket using an iterative function system. These activities gave the students hands-on experience with many interesting and exciting areas of mathematics.

During my time at Cornell and Texas A&M, I have thoroughly enjoyed my experiences with helping students learn mathematics. In each situation, I have tried to make the material interesting and understandable to the students, to help the students have confidence in their mathematical abilities, and to show the students that mathematics can be fun. I hope to continue to discuss interesting mathematics with students throughout my career.