

## TEACHING GOALS

My philosophy of teaching has evolved significantly since the first years that I taught undergraduates. Then, I felt that for each mathematical topic there was a “correct” educational approach, and this approach was universally valid for all students. The approach might be more or less successful for certain students, but this was a function entirely of the aptitude and background of the student. Belief in absolutes is reassuring, especially to a young faculty member who is, frankly, frightened to reflect on his own limitations. I have now abandoned my dogmatic views of education.

The “correct” educational approach is whatever helps the student standing in front of me. I learned this lesson through regular tutoring of Stony Brook undergraduates in the Math Learning Center. I learned this in review sessions where six, seven, eight students vie for a shot at my office chalkboard. I learned this advising undergraduates who are on the cusp of failing out of their courses. I learned this in numerous new student orientations, helping students with the fraught transition from junior college to four-year school. But I also learned this lesson in independent reading courses with exceptional undergraduates headed for graduate school at the University of Chicago and U. C. Berkeley. I learned this lesson in the 9 mini-courses I have delivered in graduate summer schools in foreign countries. Of course I learned this lesson with the 9 Ph.D. students I have advised. There is no absolute teaching philosophy: just do what helps that student to learn.

I love teaching beginning undergraduates. The best part of what I teach is not really mathematics, it is more elemental than that. Question assumptions. Try new things. Work backwards. Don’t be afraid to ask. Problem-solving is power. These are the deeper lessons that I try to relate, whether I am teaching “MAT 118. Mathematical Thinking” to undergraduates who are ending their journey in mathematics or whether I am teaching “MAT 131. Calculus I” to students who are forging through the middle of a long marathon. Formulas and theorems will fade, even for most of those pursuing careers in science and engineering. However, learning and problem-solving skills settle in the bones. This was foremost in my mind during my most recent educational initiative: in Spring 2015, at the request of the undergraduate committee of the math department, I was course coordinator for our pre-calculus course, transforming it into a competency-based course and writing new course materials.

I believe in educational technology. One early highlight for me was running an undergraduate seminar at MIT – with students delivering most of the lectures – on algebraic geometry using computers. This course was the closest thing to a lab experience that I have had since my early days as an undergraduate physics major. That experience was one of the reasons I chose to contribute courses to MIT’s OpenCourseWare project. The OpenCourseWare project aims to make high quality course materials freely available through the internet to all students, with particular focus on students in disadvantaged circumstances and developing nations. I contributed course materials for two courses, Math 18.01, Single-Variable Calculus, and Math 18.034, Honors Differential Equations. When I last checked my OCW page for 18.01, in Fall

2006, it was one of the top 15 most accessed courses with 200 user visits per day, and over 150,000 total user visits.

More recently, for several years I served as the Stony Brook math department's "resident guru" for online homework, namely the WebAssign system. I organized training sessions for new users, I did one-on-one sessions with the course coordinators for setting up their courses, and I did weekly "check-ups" to answer student and instructor questions, to make sure WebAssign was correctly populated with current student lists, and generally to make sure everything worked smoothly. Initially a skeptic about WebAssign, I saw with my own calculus students the dramatic effectiveness of immediate, in-depth feedback to individualized exercises. Now I am a believer.

Probably my most eye-opening teaching experiences have been helping current high-school math teachers with their continuing education. For about a year I served as the graduate director for a masters program in mathematics for high-school teachers. That was a roller-coaster experience, but I learned quickly about the challenges faced by high-school teachers "in the trenches". More recently, I taught one of the courses in the masters program. These teachers have a very definite viewpoint, one quite different from the usual perspective among university professors. To them mathematics is what they can use to teach their own students, and it is nothing other than that. I learned a lot from these teachers, and I developed a genuine rapport with many of them – even those who continued to challenge my pedagogical precepts to the last day of the semester. I've certainly learned to question more critically my own perspectives of our shared subject. After many years, I now believe that is a far better preparation for effective teaching than is any single dogma.