Teaching Statement

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Teaching and communicating mathematics are, and will always be, important parts of my life. Seeing a student or colleague understand a new concept for the first time makes any day better. It is a great thrill to see a classroom full of students evolve from tentative and confused to confident and knowledgeable, knowing that they can tackle the challenges thrown at them.

Teaching, for me, has always been more than a one-way street. Of course, a teacher's main responsibility is imparting knowledge and skills to the students, but what's often exciting and inspiring is the flow of information in the other direction. Even with seemingly basic subjects such as calculus and linear algera, student questions have often made me think of a subject or theorem that I thought I knew inside and out in a new and interesting way.

Through graduate school and the first few years of my postdoctoral career, I've been lucky enough to have a wide variety of teaching experiences: large sections of basic calculus and linear algebra classes; advanced undergraduate courses; one-on-one mentoring with advanced students; and even graduate research seminars. These experiences have all helped in their own way to allow me to develop and refine my teaching philosophy.

So, how do I believe math should be taught? With simpler, more basic material (pre-calculus, calculus, linear algebra), a firm base of calculation and problem solving, while not sufficient, are certainly necessary for any understanding. Rigor needs to be emphasized, but it needs to be made meaningful and understandable. I try to explain $\epsilon - \delta$ proofs, for example, by saying that the input variable corresponds to raw materials, the function a factory, and the dependent variable the output. The students owns the factory, and are given an order demanding that the output satisfy some range of specifications (ϵ). Can they specify an acceptable error range for the input raw materials (δ) to guarantee that their output would satisfy their customer?

With more advanced material (say, the content of a research paper or monograph) I think that students need to develop their own understanding and intuition. I believe that one of the best ways to learn is to try and deliver a lecture on it. I've been part of many graduate student seminars where this was the approach, and they were incredibly productive, probably more than many of my graduate classes where we were, in comparison, learning more passively.

I have also realized the value of this approach while mentoring more advanced students, in particular as part of Chicago's Directed Reading Program (DRP), and while teaching Princeton's junior seminar (and subsequently supervising junior thesis projects). In the first of these experiences, when I was still a graduate student at Chicago, I started with a 'top-down' approach, giving lectures and attempting to share my intuition with my students. What I found worked better was when they would give me lectures, and attempt to develop their own intuition- this way, I could still steer them gently in productive directions, but the journey would be their own. I've maintained this approach through my mentoring/supervising roles at Princeton and Yale, and found it to be very enjoyable, both for me and the students.

In conclusion, I'm looking forward to applying these lessons and ideas in the future. In particular, I'd like to teach classes, or run seminars, for more advanced mathematics students. When I teach calculus, I'd like to be able to work with the students in relatively small groups, or at least have them work with each other in small groups. I look forward to hearing about and learning more from my peers (and my students) about teaching (and understanding) mathematics. Finally, I'd like to be able to continue going to work in the morning everyday with the possibility that I might help somebody understand something new for the very first time.

2 Teaching experiences

- Fall 2008: Instructor, Math 118a (Introduction to Functions of Several Variables), Yale University.
- Fall 2008: Instructor, Math 244a (Discrete Mathematics), Yale University.
- Spring 2008, supervisor, junior thesis (for Cameron Marantz and James Burgess), Princeton University.
- Spring 2008: Instructor, Math 202 (Introduction to Linear Algebra), Princeton University.
- Fall 2007: Instructor, Junior Seminar on Diophantine Approximation, Princeton University.
- Winter 2006: Mentor (to Kasia Wasilewska), Directed Reading Program, University of Chicago.
- Spring 2005: Mentor (to Aaron Baum), Directed Reading Program, University of Chicago
- Winter 2005: Mentor (to Adam Yavitz), Directed Reading Program, University of Chicago
- Winter-Spring 2004: Instructor, Math 131-132 (lower level Calculus sequence), University of Chicago.

- Fall 2002-Spring 2003: Instructor, Math 151-153 (Calculus sequence), University of Chicago.
- Spring 2002: College Fellow for Math 242 (Algebraic Number Theory); Nils Nygaard, instructor. University of Chicago.
- Fall 2001-Winter 2002: College Fellow for Math 203-4 (Analysis in $\mathbf{R}^n$; Leonid Ryzhik, instructor. University of Chicago.