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Teaching Statement

In short, my statement is this: to teach theoretical ideas, I believe that *we must make the ideas relevant to students* and *I know how to do this.*

I recently co-taught a workshop for undergraduate women in computer science at Carnegie Mellon University. It was an ambitious project—to guide 10 students through the research process, from formulating a problem to presenting preliminary results, in the course of three days. My co-teacher and I picked the general topic ahead of time, and we picked something that we thought would interest the students: harassment in multiplayer online video games. The students took the project and ran with it, and when we modeled the system based on Schelling's segregation model, they were the ones innovating. When they presented their research at the end of the weekend, it was clear that they owned the ideas. We succeeded in exciting them about theoretical research by applying it to a topic that has relevance to their lives.

I believe that teachers must make theoretical ideas relevant to students in order to convey them effectively, and I have been able to do so in a variety of teaching positions. Last spring I co-taught a topics class to computer science graduate students at the University of Washington. Tailoring this class to the students' interests was easy. I had a room full of sharp, young theory students who were just starting to do their own research. They wanted just what I wanted not so long ago—a coherent picture of the frontiers of research, open problems, and inspiring directions for their own work. This is what we tried to give them, by lecturing on fresh material about network economics and network algorithms from recent conference publications. As a sign of my success, two students have continued working with me to extend projects that they started in the class. One of them will use the work for a masters thesis this spring.

Making ideas relevant works in more traditional classes, too. I taught matrix algebra, which is a linear algebra class for engineers, at CMU. This class traditionally has ten row-reductions for every proof. At one point, it seemed that the textbook treatment of distances was not inspiring student interest in the ℓ_1 metric. To counter that old "when are we going to use this?" feeling, I helped the class imagine the sort of optimization problems that confront the warehouse operators working for Amazon.com, which had recently purchased a fleet of Segway scooters for use in its warehouse. This real-world application got them interested in the metric.

My big idea for keeping theoretical ideas relevant as a professor is to create a type of service learning class. This is a class I wish I had been able to take. Teams of students would work together with non-profit, volunteer, or public-sector organizations to formulate and solve the sort of operations research problems that for-profit businesses hire consultants to work on all the time. This will benefit everyone involved. Students will connect theoretical ideas

to real world applications, and build ties with organizations that need these applications. Meanwhile, organizations will receive technical assistance that they would not necessarily have been able to afford otherwise.

I have recently been working with a student group of statisticians at UW, that does this sort of pro bono statistical consulting. One project we have undertaken is helping the Washington ACLU understand the details of some statistical reports relevant to their work that were conducted by the Washington State Institute for Public Policy. But we also have projects that go beyond statistical methodology. Any situation where math is used in decision-making would be appropriate. Some examples that I have heard about recently are planning deliveries for a meals-on-wheels program in Atlanta, matching up multiple donors and patients for kidney transplants, and assigning Teach for America volunteers to teaching regions equitably.

In advising student research, the same principle of keeping ideas relevant to students applies. Students must find something to research that they find endlessly fascinating. They should lie awake at night (occasionally) because they cannot stop thinking. An adviser has an important role in making sure that students find problems that are hard enough but not too hard, and in helping them students learn how to generate high-quality research problems of their own.

Over the course of my career, I've taught gifted high school students, first- and second-year undergraduates, math majors, engineers, and graduate students (a more detailed list appears in my c.v.). My experience in every instance has been that once theoretical ideas are relevant to students they will learn, even when the material is difficult. I have been successful at finding ways to make this happen for many years as a teacher, and I am excited to apply my plan for service learning in pursuit of this goal as a professor.