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Teaching Statement

I believe that students learn best by doing. Hands-on experience and real-world exercises not only make classes more exciting, but they also provide memorable examples and analogies. Our ability to understand abstract concepts is more limited than our ability to process concrete examples that relate to familiar ideas. Some of my own memorable classroom experiences were lectures with concrete examples; I apply a similar approach in my courses, tying abstract concepts to relevant concrete examples and hands-on experience. For example, "route hijacking" is more concrete when students can actually see network traffic going where it isn't supposed to go.

To this end, my first goal in teaching both networking and security classes is to connect textbook material with (1) real-world examples; and (2) hands-on experience. At both the undergraduate and graduate levels, I have incorporated course material that familiarizes students with the state of the art in network design, implementation, and experimentation; for example, I have students run experiments on network testbeds like Emulab, VINI, and BISmark, with real software routers that they can configure. Where appropriate, I have also allowed students to shape the course themselves by bringing in real-world examples, from which I will design a lecture. For example, in my undergraduate networking course, I maintain a wiki where students could post relevant "current events" in networking and vote on which topics they would like to see covered. Based on that input, I incorporate new material into the syllabus— teaching not just the current event itself, but also the relevant foundational material. I also bring my own current events to lecture and relate them to the textbook being covered. This takes more effort than dusting off old notes, but it keeps students engaged and helps me stay abreast of what is happening both in industry and in research.

My second goal is to elevate course material so that students are not just learning mechanics of protocols and systems, but also gaining a deeper understanding of the *concepts* that underlie their design. With so many computing and communications tools for aggregating and processing information, conventional lectures are no longer always the most efficient way to convey textbook information. In my lectures, I try to go beyond what is taught in the textbook— rather than teaching only mechanics, I ask students about design rationales, and whether they would make the same choices today, given the changing roles of communications networks. Given that networking is still maturing as a field, there is a tendency to focus on protocol details, which may change over time.

Teaching research methods. I have designed a graduate course that focuses on teaching first-year graduate students how to do research. The course includes topics ranging from paper reading to fellowship applications to generating (and executing) research ideas. The value of the course is evident from student response: Students at various points along their Ph.D.—even more senior students—sit in on lectures. We presented a paper on the course at *SIGCSE* in 2008, and other computer science departments are adopting the material. I also have developed a blog on research methods to accompany the course (`http://greatresearch.org/`), which receives about 10,000 page views every month.

Bringing new media and technology into the classroom. I believe that traditional lectures are "going the way of the blackboard", and I have made concerted efforts to introduce new media and methods into the classroom. I have now designed two massive open online courses (MOOCs), and I am using technology such as video lectures in the classroom to create a "flipped classroom" experience. I have also begun to disseminate the results of my research and teaching efforts through online media that can reach a much greater set of people. I have developed two blogs—one about my own research and one about research methods. One of my blog entries on Internet censorship was picked up by *The Wall Street Journal*; the article won the Bronze Anvil journalism award. I have also developed the first Massive Open Online Course (MOOC) on Software Defined Networking, which had 50,000 enrolled students in the first offering, 1,000 of whom successfully completed all of the programming assignments. I used the videos from the MOOC as part of a "flipped classroom" seminar for students at Georgia Tech in Fall 2013.

Mentoring and advising. My graduate students have received best paper awards at top conferences (including *SIGCOMM*), and my undergraduate students I have advised have garnered publications in top conferences and have gone to the best computer science graduate schools in the country. One of my most rewarding advising experiences was with undergraduate student Megan Elmore. Under my advisement, she received the Sigma Xi Undergraduate Research Award, the CoC undergraduate research award, and an NSF Graduate Fellowship; she is now a Ph.D. student at Stanford University. I have received multiple "Thank a Teacher" awards at Georgia Tech for outstanding teaching performance. I also won a Hesburgh Teaching Fellow award at Georgia Tech in 2012, which is awarded to only about ten instructors across campus.