Teaching Statement

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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. Routing protocols make more sense when students can configure routers, induce failures on an experimental network, and watch the behavior of traffic over that network.

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. I have tried to imbue these elements into every class I have taught. 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 and VINI, 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 incorporated 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. My reasoning here is two-fold. First, I believe that the traditional classroom lecture is"going the way of the blackboard", to paraphrase a recent *New York Times* article. With so many computing and communications tools for aggregating and processing information these days, it is hard for me to see how a conventional lecture will continue to be 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. Second, given that networking is still maturing as a field, there is a tendency to focus on protocol details, which may change over time. Ten years from now, I would like someone who took my class to be able to say that the concepts they learned have remained applicable. I try to organize topics around higher-level concepts (*e.g.*, randomization, caching, tree formation, identity), so that even as protocol details continue to change, the concepts that they learn remain valuable.

I enjoy teaching students how to think. With Alex Gray, 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 (*e.g.*, Duke, Princeton) are now starting to adopt some of the material and may even start a similar course.

I also have a strong mentoring and advising record. 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. Notably, my undergraduate Megan Elmore received the Sigma Xi Undergraduate Research Award, the CoC undergraduate research award, and an NSF Graduate Fellowship, and she is now a Ph.D. student at Stanford University.