During the course of my undergraduate and graduate studies, I worked as a teaching assistant for three classes: a freshman programming class, a senior-level networking class and a graduate networking class. My responsibilities for these classes ranged from helping with grading and office hours, to sharing a significant portion of the teaching and organizational load. In addition to this direct involvement in teaching, I gave guest lectures on several occasions in undergraduate and graduate networking classes at CMU. I was also regularly involved in designing and overseeing course projects for these classes.

In the future, I want to teach core courses at undergraduate and graduate levels on topics such as programming, networking, and operating systems. I am especially interested in teaching advanced classes on wireless networks, telecommunications, sensor networks, and performance analysis of systems. From my interaction with students during my lectures, I identified a few key principles for teaching systems topics in an effective manner that I plan to incorporate when teaching in the future:

**Start lectures with real-world examples and analogies:** Most students taking graduate or undergraduate-level core classes are more familiar with higher-level applications and concepts (such as “ftp” or “creating a directory”) than the lower-level details (such as reliable transport and the functioning of a file system). I found it best to explain such low-level concepts by identifying real-world problems which require similar approaches and drawing simple analogies, e.g., using the notion of “delivery confirmation” in the postal system to discuss approaches for reliable data transfer and loss recovery. Such a top-down discussion helped make the class much more interactive and enjoyable, and made sure that all students were constantly thinking about the topic on hand.

I also realized that another effective method to improve the students’ perception of a topic, specifically of recent results, was to design simulation or measurement-based homeworks that “instantiate” key research ideas and results. Such homeworks should start with very simple examples of the concepts (such as simulations over a single-bottleneck “dumb-bell” topology or measurements over the local area), and gradually delve into more open-ended issues. I believe that this strategy also helps students understand how to systematically approach fundamental research problems in systems and networking. In the past, I successfully employed this approach to familiarize students with important topics that were not directly covered in the class, such as wide-area bottleneck properties.

**Encourage modeling and back-of-the-envelop calculations as a means of evaluating system designs:** Since a majority of students obviously lack experience in designing and building systems, and have little knowledge of real-world operational problems with many systems, they are unable to appreciate the trade-offs and complexities in most system designs. I felt that a good way to initiate students to the evaluation of system designs is to interactively develop approximate models for such systems in class, encourage them to come up with suitable performance metrics to evaluate such systems, and perform back-of-the-envelop calculations of their expected performance. I applied this approach to explain the design of peer-to-peer systems such as Napster and Gnutella, as well as to compute the routing and forwarding load on core routers and the potential impact of router misconfigurations on the load.

**Structure courses so as to appeal to a wide audience:** Students taking a class as a means to fulfill a requirement outnumber those with a genuine long-term interest in the subject. This is especially true for core classes. Moreover, many courses have a diverse mix of students from different programs (such as Masters students, PhD students and ambitious undergraduates) and with different career goals. It is therefore crucial to design a course with the twin goals of (1) catering to the different expectations of the students and (2) ensuring that students with limited interest in the subject (who usually form a majority) remain keen and appreciative of the field. I believe it is easy to achieve these two goals in practice. For example, one way of realizing the latter goal is to have a liberal dosage of “light” readings and discussion sessions on historical
surveys of specific topics, perhaps led by invited guest speakers who are experts in the topic. To achieve the first goal, I plan to design special term-projects for different groups of students, e.g., projects with significant development work for Masters students looking to find jobs in the topic area, and open-ended projects for networking graduate students. Furthermore, I plan to offer optional extra lectures on advanced topics for interested students.

As a graduate student, I immensely enjoyed collaborating with and mentoring undergraduate and junior graduate students, and discussing my research with them. I mentored a junior graduate student, Jeffrey Pang, during the first year of his graduate studies. Our collaboration resulted in several publications and has helped Jeff become a strong and successful researcher in a very short time. I am also a firm believer in undergraduate research, and hope to recruit interested undergraduates to work on research problems alongside other graduate students. As an example, my advice and guidance particularly helped a senior undergraduate student, Arvind Kannan, whose work with me lead to a publication at PODC and a very strong senior thesis. I hope to continue having such fun collaborations with my graduate and undergraduate students, as I build my own research group.