Teaching Statement

Olatunji Ruwase (oor@cs.cmu.edu)

The primary responsibilities of the teacher towards the student are to: (i) stimulate excitement and curiosity about the subject matter, (ii) supply the necessary ingredients for grasping the basic principles, (iii) and regularly assess the acquired knowledge through appropriately challenging problems. In pursuing this idea, however, the teacher often has to confront the tricky balancing act of accommodating the diversity of interest and expertise amongst the students. At Carnegie Mellon University (CMU), I had the opportunity to serve as a Teaching Assistant for undergraduate operating systems (15410), graduate compilers (15745), and graduate computer architecture (15740). Both my research background in computer systems and my teaching experience have inspired and prepared me to teach related computer systems courses at the undergraduate and the graduate levels. In particular, I am eager to leverage the unique medium of course work to share my passion and expertise in the systems area with students.

Engage

Regardless of his/her individual reasons for taking a class (e.g., satisfying degree requirements, acquiring knowledge for future research, etc.), a student is more likely to derive the most benefit if the teacher manages to inspire considerable interest in the course materials. Consequently, a teacher should aspire to keep students highly engaged, not just during but also outside lecture and office hours. In fact, I am always delighted when students approach me with questions that go beyond the current homework assignment. Establishing this level of student engagement requires, at the minimum, that the teacher’s enthusiasm and passion for the course be palpable, if not infectious. Quite simply, students are unlikely to care for a course that the instructor, who is the expert, is seemingly not excited about. Thus, the teacher should consider lectures and office hours as prime opportunities to get students excited about the subject. Another effective method for engaging students is to connect concepts from the course to issues that are of interest to students. This will motivate students to remain interested in the obviously valuable knowledge that will be imparted during the class. Fortunately, the central role of computing systems in everyday life provides numerous examples of systems topics with real life applications that are familiar even to non majors, and could be used in introductory computer science courses: e.g., the relevance of packet switching to video streaming, low power computing to battery life of mobile devices, and distributed computing to social networking sites. Exciting real world applications of the course materials can lead students to discover new interests (e.g., potentially even a career path), and subsequently seek out advanced classes or research opportunities to further such interests.

Encourage

Over the length of a class, it is quite common for the excitement levels of students to wane as the course becomes tougher; either because the course materials are increasingly more difficult, or because students are unhappy with their performance and see no hope for improvement. Unfortunately, at this point students often switch off, resigning themselves to a poor course grade (while re-channeling their energies elsewhere), or abandoning the class entirely. I believe that teachers could do a lot to help students avoid such uncomfortable situations in the first place, and to better manage them. A common reason for students “getting lost” in a course is that they had somehow developed a faulty mental model of the basic principles. Such misconceptions are typically framed during the early days of the course, when the materials are seemingly easy to grasp. The teacher could pro-actively address this by posing examples and problems that force students to confront such misconceptions. The earlier students become aware of their misplaced notions about the course materials, the better for all concerned. Another common reason that students get lost in a course is because of their lack of some critical prerequisite knowledge. This is typically addressed by enforcing a set of prerequisites for students that are allowed to take a course. However, this could be insufficient because of the differences in undergraduate course offerings across schools, and graduate students, in particular, often stumble on this issue, resulting in poor performance. If possible, the teacher could help the student morale in such situations, by identifying the missing knowledge, and encouraging the student to take corresponding prerequisite(s), before re-taking the current course. Otherwise, the student might simply leave the class for some easier alternative without ever addressing the underlying knowledge gap, which could have a negative impact in the long term.

Evaluate

Ultimately, the main objective for making students undertake course work is to ensure that they develop a mastery of relevant knowledge, while acquiring or honing critical problem solving skills along the way. It is therefore essential to regularly evaluate how well the students are faring, to provide critical feedback to both students and teaching staff. This evaluation is often conducted through a combination of written (or oral) homework, programming projects, quizzes, exams, and open-ended research projects. I have found this aspect of teaching to be exciting and challenging in equal measures. For homework, quizzes, and exams, the teacher must pose original and interesting questions that force students to learn more or reinforce
their knowledge of the course material. Moreover, I view grading as more than an exercise in assigning points, but also a chance to get a sense of the effectiveness of my teaching. For example, I look out for evidence of systematic learning issues (e.g., many students misunderstand a fundamental concept), that could be addressed through changes in my teaching.

On the other hand, programming and research projects, which constitute the hands-on aspects of systems courses, offer a different kind of insight into how well the students can synthesize the core concepts of the course. Thus projects must be of sufficient scope and complexity to rigorously test students, but still be subject to timely completion. In my opinion, open-ended research projects should be a requirement for graduate systems courses, as they help students develop a scientific approach to problem solving. The experience can be extremely rewarding; I have seen course projects evolve into research publications, sometimes in a topic in which the students previously had no expertise. In such cases, the students are highly self-motivated and offer a fresh perspective on a research question. However, such positive results often depend on the willingness of the teacher to provide research advising support to the students, a commitment that often extends beyond the end of the course.

I hope to get opportunities to provide this kind of support to the students that I teach, as they pursue their research interests.

**Conclusion**

It is important for the teacher to view each teaching assignment as more than an opportunity to increase a student’s knowledge in a particular subject, for two reasons. First, beyond earning an excellent course grade, I believe that students should come away with newly acquired or reinforced, set of sound problem-solving principles (e.g., modularity) and skills (e.g., peer programming), that can be leveraged in the future to attack more challenging problems either in advanced courses, or outside the controlled environment of college course work (e.g., real world problems in the industry). The potential to acquire life-long skills should also be made apparent to students; this could encourage those struggling with specific course materials to seek help, rather than losing interest, or abandoning the class entirely. Second, I have observed that my teaching skills have been most improved by simply teaching the material repeatedly. Students often differ in how they think or assimilate information, and so the process of presenting the same material to a different audience (e.g., during office hours), often exposes the subtleties of the material that could hinder effective learning.

I have found that a combination of highly motivated students, and an equally supportive teaching staff often results in mutual satisfaction at the end of the course. For example, some of the most rewarding moments from my teaching experience have come from watching students progress from quick hacks to more principled problem solving, even as they come to appreciate the long term returns of the (often steep) initial investment. Consequently, I hope to further my teaching career in an environment that offers ample opportunities for turning students into top notch problem solvers.