Matthew D. Sinclair – Teaching Statement

Teaching Experience

I have served as a teaching assistant (TA) for the following three Computer Science (CS) and Electrical & Computer Engineering (ECE) courses: ECE 376, a course for non-ECE engineering students in which I ran four lab sections, CS 433, an upper-level undergraduate computer architecture course, and CS 598-SVA, a new graduate-level course that I helped my adviser develop which focuses on recent advances in heterogeneous computing. My work as a TA has been recognized with several awards and honors, including the CS Department’s Outstanding Teaching Assistant Award and twice being rated campus-wide as an Excellent TA by my students. I also received two Mavis Future Faculty fellowships, which provides promising faculty candidates in the College of Engineering with additional teaching and mentoring. This training enabled me to complete a Graduate Teacher Certificate from the Center for Innovation in Teaching & Learning at the University of Illinois.

Teaching Interests

My experiences as a TA have prepared me to teach a wide variety of CS and ECE courses. I am especially passionate about teaching undergraduate and graduate computer architecture and digital design courses. Since my research focuses on emerging, highly parallel architectures, I am also interested in teaching parallel programming courses (including programming parallel heterogeneous systems with languages like CUDA and OpenCL). I would also be happy to teach courses such as operating systems, introductory CS and ECE courses, or seminars similar to CS 598-SVA that cover heterogeneous systems.

My overarching goal is to get students excited about hardware design. Although undergraduate curriculum generally focuses on software development, understanding the underlying hardware is also extremely important. In my classes I will emphasize how hardware and software work together. I believe that software developers will develop better software if they understand the behavior of the hardware their program is running on and hardware designers will design better hardware if they understand the types of programs being run on it. I am also interested in updating existing curriculum to reflect the growing importance and pervasiveness of parallelism.

Teaching Philosophy

Regardless of the class, I believe that how the material is taught is of the utmost importance. My beliefs about teaching have been shaped by my experiences as a CS and ECE student. One course I took as an undergraduate student was especially influential. The instructor’s enthusiasm was infectious and helped shape the three key pillars of my teaching philosophy: engage students, develop a rapport with students, and be prepared and clear. These pillars help me effectively teach a variety of classes, many of which can be large in size due to growing student enrollment.

Properly engaging students creates intrinsically motivated students who are excited to learn about the material in a course instead of taking the course to fulfill a requirement. I will engage my students with a detailed syllabus that identifies learning goals and defines classroom expectations. When discussing course goals, I will relate them to their motivations for taking the course so that students internalize the value of the material. For example, in ECE 376 I showed my students how the course was relevant to them by explaining the relationship between ECE and their fields of study. Students responded positively to this approach. In fact, one student even remarked that he wished the instructor was as enthusiastic about digital logic as I was.

Throughout the semester I will also seek to develop a rapport and trust with the students. Developing a rapport with students is crucial because it shows students that I have a vested interest in their success. In my experience, learning the names of the students and being available outside of class has helped me to develop a personal rapport and trust with students. Rising CS and ECE enrollments, including the increasing number of online students, makes forming a personal relationship with students more difficult. To help me learn student names I plan on using pictures of all student in my class. I will also make myself available in person and electronically both during and outside of office hours. Students have told me that they appreciate this approach, especially my timely responses to their questions.

I have found that before students will trust you as an instructor, you need to demonstrate that you are prepared and have clear expectations about what they need to do to succeed. As an instructor, I will set clear expectations by providing a detailed syllabus and grading rubrics. For example, in ECE 376 I provided a rubric for each lab writeup detailing how many points each problem was worth and what was required to obtain full credit for each problem. Detailed, clear rubrics reduce confusion, especially for part-time students who may be participating remotely and balancing academics along with full-time jobs or other responsibilities.

Goals

The three pillars of my teaching philosophy provide a framework for students to succeed in my courses, while shaping my main goal as an educator: to help students become life-long learners. CS and ECE graduates are likely
to work in industry or attend graduate school. In both of these environments graduates must be able to solve difficult problems (often in a team setting) by analyzing the problem and then thinking critically about how to solve it. Furthermore, since technology is rapidly evolving, the specific techniques from my courses may not be directly relevant. Thus, I believe that my students should learn not just the specific concepts relevant to my course, but also how to apply what they have learned. To help students to become life-long learners I will emphasize problem solving (both individually and in groups), critical thinking, and effective communication in all my courses.

In my classes, I will use interactive example problems because I believe students are more likely to retain knowledge if they “learn by doing.” Actively solving these problems individually or in small groups helps students apply the facts, concepts, and theories they have learned and develop their critical thinking and communication skills. I plan on grading these classroom assessments for completion, not correctness, to create a low-stakes learning environment. I emphasized this concept in ECE 376 by starting each lab with a short 10-minute quiz which required students to apply material from lecture. When I lectured in CS 433, I had students first try to solve the problem by themselves, then together with a partner, before finally coming together as a class and discussing the solution. Solving interactive problems also works extremely well for flipped classrooms. In larger classes, I plan to use clickers and online daily quizzes to help me assess how the class is doing and adjust the content accordingly.

Working in small groups also helps students develop their communication skills and provides a low-stakes learning environment. Learning how to communicate effectively is important because CS and ECE students are likely to work on teams after graduating. In CS 598-SVA I encouraged students to be active participants during class by grading their reviews before the class session. In my feedback I praised any strong arguments the students made in their reviews and encouraged them to raise these arguments during class. Providing this positive reinforcement empowered several students to participate more consistently and confidently. Obtaining feedback before class also allowed students to quickly clear up any misconceptions and helped them learn how to self-assess their understanding and mastery of the concept or theory in order to become life-long learners. In ECE 376 students worked in groups of three and had to communicate effectively with their teammates to successfully complete the lab assignments.

Critical thinking is also highly valued in engineering graduates. In CS 598-SVA students read and submitted reviews of research papers before every class session. As part of their reviews, students were charged with critically analyzing the paper, discussing potential research directions, and identifying a topic for in-class discussion. Throughout the course, the professor and I repeatedly stressed the importance of critically analyzing research papers by explaining how vital this skill is for CS and ECE professors and researchers.

**Methods**

I will assess my students with a variety of assignments such as weekly quizzes, paper reviews, weekly lab assignments, term projects, and participation in classroom assessments. I will grade these assignments using the detailed rubrics I put forth in my syllabus. For larger classes, I plan on making quizzes and homework assignments electronic. To encourage online students to participate, I will incentivize students to participate on message boards like Piazza. These assignments will build on the key concepts discussed in class in order to help students develop their critical thinking and problem solving skills and provide them with the repetition necessary to develop mastery. For example, I designed my weekly ECE 376 quizzes to be similar to homework and exam problems to help students tie the concepts discussed in lecture and lab together. In the future, I will incorporate additional assignments, such as exams and weekly homework assignments. Having a diverse set of individual and group assignments helps students to develop their communication, problem solving, and critical thinking skills by looking at the concepts from many different perspectives. Additionally, when developing problems for these assignments, I will make the higher-stakes assessments (e.g., exams) similar to the lower-stakes assessments (e.g., classroom assessments and homeworks) to help the students learn how to self-assess their progress – an important component of becoming a life-long learner.

CS and ECE graduates often design real products after graduating. Additionally, students often learn as much or more outside the classroom as they do inside it. Thus I believe it is important to provide students with opportunities to learn outside the classroom on “real world” problems through term projects. For classes with online students I will require each group to be a combination of on-campus and online students. For example, in CS 598-SVA groups of three or four students performed original research on a topic of their choosing. That term project mirrored the kind of research those students will be expected to do both in the process of completing their advanced degrees and in industry or academia after graduation. Those students also invariably ran into challenges that required them to further develop their critical thinking, problem solving, and communication skills.

Overall, my experiences as a TA have provided me with a solid foundation. Moving forward, I am eager to apply the three pillars of my teaching philosophy to get students excited about hardware design and create life-long learners.