Paul Pearce — Teaching Statement

The opportunity to teach, mentor, and interact with students is amongst the most rewarding aspects of academia. Guiding a student's progression through class material and research while observing their gaining competency and ultimately mastery, is both fulfilling and gratifying. My experience in teaching, education, and mentoring spans more than a decade. This work has prepared me for creating undergraduate and graduate courses, teaching, and advising students. I am excited to engage with all students and provide them with an avenue to bridge their understanding between the classroom and the real-world.

Teaching Experience

Course Instructor. I was the instructor of record for Machine Structures (CS61C), a 100-student sophomore level computer science course at the University of California, Berkeley [1]. I was responsible for all aspects of the course ranging from course content to exams to assigning grades. I lectured four days a week and managed a course staff of eight graduate and undergraduate TAs and Readers. My overall teaching effectiveness was rated 6.3/7.0 by my students [2]. This score is the highest for CS61C over the last 15 years, outside of single senior Lecturer, and higher than numerous experienced professors.

Education Minor. As part of my PhD work I completed an outside minor in teaching. The minor consisted of graduate courses in CS and STEM pedagogy and course design, as well as enhanced teaching requirements. These classes centered around cap-stone course and assignment design projects, for which I generated computer security content.

Graduate Student Instructor. I have been a Graduate Student Instructor (i.e., teaching assistant) for several courses at UC Berkeley. As a GSI for Computer Security (CS161) [3], I created content (homeworks, projects, exam questions, discussion material) for the upper division course, and led two 35 person discussion sections per week. I also guest lectured on content I created for the 300-student class. My teaching effectiveness rating from student reviews was 4.9/5.0 [4]. I also served as GSI for CS61C with similar responsibilities, earning an overall teaching effectiveness of 4.8/5.0 [5].

EECS Distinguished Graduate Student Instructor. For my work as GSI for Computer Security, I received the EECS Distinguished Graduate Student Instructor Award for Computer Science [6]. This award is given to the top CS GSI each year and is the most selective award a GSI in computer science can achieve at UC Berkeley.

Course Content Creation. While GSI for Computer Security, I conceived, designed, and implemented a new network-security focused course project [7]. For this project students are given a in-depth story line and a series of tasks revolving around infiltrating and attacking various types of network communication. Within a virtual environment customized for each team, students discover weak cryptographic keys, certificate parsing vulnerabilities, and use leaked certificate authority credentials and DNS injection to attack a modern fully-patched web browser (Google Chrome). The popularity of the project has seen its reuse multiple times in subsequent semesters.

Training Graduate Student Instructors. Based on my teaching experience I was selected as a workshop leader for the campus-wide UC Berkeley GSI Training Conference. During the day-long event I instructed future GSIs on the process of teaching at UC Berkeley, focused on pedagogy and strategies for success. I have also guest lectured our departments Teaching Pedagogy course on how to be an effective CS GSI.

Mentoring. Throughout my time at UC Berkeley I have mentored graduate students and undergraduates in a variety of contexts. Within research, I have actively worked with and mentored younger students and peers on numerous research projects at UC Berkeley, UC San Diego, and Princeton University. I also served as part of the student government as both a graduate and undergraduate student, including as President of the Computer Science Graduate Student Association. This role involved student advocacy and in-depth interactions with our department's faculty on issues ranging from diversity to funding to degree requirements, as well as extensive mentoring of new officers and future generations of graduate students.

Community College Instructor. Prior to attending UC Berkeley, I was a Supplemental Instruction Leader at Chaffey Community College. As part of this pilot program, I independently designed and conducted discussion sections for

math and physics courses. I also served as an instruction assistant at the college's Math Success Center, providing students with assistance across the entire math curriculum of the college.

Teaching Philosophy

Throughout my time as an educator, I have developed a number of strategies for effectively engaging with students as a lecturer and to produce course content that increases understanding. These strategies are based both on my own experiences, as well as current research on effective STEM education techniques.

Student Engagement and Active Learning. Perhaps the most trying experience for any student is sitting through a non-stop hour-and-a-half lecture with no interactivity. In such environments students can struggle to learn the material effectively, even if they have managed to stay awake. Providing structure and aids that allow students to actively engage with and interact with the material is crucial for broad understanding and mastery. My high-level goal in teaching is to instill a sense of joy and energy in the room which then helps fuel student interaction with the material. Throughout my lectures I facilitate active learning by encouraging questions, creating demos (for both myself and for students to run on their own), having students engage with those around them in turn-to-your-neighbor style interactions, and finding ways to introduce humor. For introductory courses, using real-time evaluation and feedback technologies can also be invaluable for assessing student understanding and adjusting lessons accordingly.

Real-world Grounding. The prevalence of computer science in modern society affords us opportunities to connect much of our curriculum directly to real-world examples familiar to students. Within computer security, this frequently takes the form of news articles, exploits, and vulnerabilities in software students have used. As part of all my lectures I integrate real-world news items or examples directly applicable to the current material. By actively linking ongoing topics with everyday examples, students can better relate to the material and understand its relevance and importance to their broader education.

Scaffolding. For student assignment and project design, I draw heavily on notion of *scaffolding*: projects and assignments begin with a framework that allows students to interact with the work in simplified pieces. The scaffold limits complexity and cognitive overhead, allowing the students to focus on course concepts and immediately engage with and immerse themselves in the material. This approach also affords the possibility of real-time guidance and embedded assessment, depending on the context. All of these ideas were central to the network security project I designed for CS161, Computer Security.

Teaching Interests

I am excited for the opportunity to teach both undergraduate and graduate courses in computer security. I would also like to develop and teach advanced special topics courses in network/empirical measurement, network/Internet security, censorship, and malware. Beyond areas closely tied to my research, I am qualified to teach networking, operating systems, machine structures (system/CPU design), and teaching pedagogy courses.

References

[1] Course Website, Machine Structures, CS61C, Summer 2010. http://inst.eecs.berkeley.edu/~cs61c/su10/.

[2] Student Reviews, Instructor, Paul Pearce, CS61C Summer 2010. https://hkn.eecs.berkeley.edu/coursesurveys/course/CS/61C/2010_Summer?instructor=Pearce%2CPaul.

[3] Course Website, Computer Security, CS161, Spring 2013. http://www.icir.org/vern/cs161-sp13/.

[4] Student Reviews, GSI, Paul Pearce, CS161 Spring 2013. https://hkn.eecs.berkeley.edu/coursesurveys/course/CS/161/2013_Spring?instructor=Pearce%2CPaul.

[5] Student Reviews, GSI, Paul Pearce, CS61C Summer 2009. https://hkn.eecs.berkeley.edu/coursesurveys/course/CS/61C/2009_Summer?instructor=Pearce%2CPaul.

[6] EECS Distinguished GSI Award. https://www2.eecs.berkeley.edu/Students/Awards/13/.

[7] Computer Security Networking Project, CS161, Spring 2013. http://www.icir.org/vern/cs161-sp13/projects/proj2.pdf.