Dustin Richmond - Teaching Statement

My teaching practices focus on creating inclusive classroom environments for *active (participatory) learning*. These methods have been shown to improve knowledge retention and increase conceptual understanding. In my teaching, I have developed multi-modal learning materials that can be used inside and outside of the classroom. Inside the classroom, I use small learning-groups that incorporate think-pair-share activities. In my experience, these methods engage students and make learning more fun and effective.

My teaching philosophy is also reflected in my approach to mentorship. My mentorship promotes a sense of shared ownership and involves students in decision making. It is critical for mentees to understand the project scope, motivation, and goals to feel personal responsibility for the outcomes. Especially for undergraduates, providing impactful projects with measurable results motivates students and can become formative experiences in their careers. With this philosophy my mentorship work has produced numerous peer-reviewed research papers with undergraduates as authors.

Above all, it is critical to adapt teaching styles by continuously gathering feedback from students and mentees. Many institutions have centers for teaching and learning that are designed to help faculty reach their teaching and mentorship goals. I have experienced the positive role these groups play in courses I have taken. Being receptive to feedback also improves students' investment in the material and contributes to positive learning results.

Teaching Experiences

WES 269/207: Hardware for Embedded Systems (UC San Diego) As a Teaching Assistant for the Wireless Embedded Systems (WES) program, I was responsible for creating course content, teaching lab sections, leading discussions, and creating homework assignments for a class of approximately 30 students. I developed new interactive course materials and lab projects using interactive Python-based Jupyter Notebooks to teach students embedded hardware concepts. These projects put students in groups of two to three to learn new concepts through collaboration and discussion. Over the quarter, students learned how to use Python to interact with pre-existing hardware-accelerators, develop their own hardware accelerators, and then deploy them in Python. I received a score of 4.3 out of 5 on the final evaluation in WES 269/207, and the curriculum was used as the basis for the Computer Science and Engineering 237C graduate-level course at UC San Diego [1].

Workshops on Graduate Fellowships and Implicit Bias (UW and UC San Diego) I have organized and taught several workshops where I applied active learning techniques. For the past two years I taught the Implicit Bias session to students during UW ECE master's admissions training. At UC San Diego I organized and taught several NSF Graduate Research Fellowship Workshops. In both venues, I used breakout groups and exercises to teach graduate and undergraduate students workshop concepts. In Implicit Bias Training I gave students example applications to evaluate and discuss with and without rubrics. In the NSF fellowship workshops I had students work in pairs to develop short Broader Impact and Intellectual Merit statements for their own research. After the breakouts, students presented their work to the larger workshop group for discussion. I have found these techniques to be an effective way to help students learn by teaching each other and to turn workshops into active and focused discussions.

Undergraduate Research Mentorship

In addition to my teaching experiences, I have mentored numerous undergraduate researchers through UC San Diego's Early Research Scholars Program (ERSP), NSF's Research Experience for Undergraduates (REU) Program, and the joint Howard University/UC San Diego STARS program. All three programs focus on giving a diverse set of students research experience early in their undergraduate careers to improve representation in academic research. I look forward to using these experiences to help build an undergraduate research and education program at my destination institution. The following are a few of the projects that were published with undergraduates in these programs:

- In [2], two ERSP students made a major discovery about the depth of neural networks that is necessary to differentiate between applications in a power side channel attack. Their work shaped our subsequent paper submission, which is currently under review.
- In [3], three NSF REU students designed and built a remote-control quad-copter using novel hardware design techniques. Traditional techniques are limited to experts and the undergraduates developed a new method that is more accessible.
- In [4], NSF REU students built tools for documenting culturally-significant archaeological sites in Guatemala over multiple years. These sites are endangered by looting and deforestation and the students developed tools for recording three-dimensional digital models that are used in outreach and conservation.
- In [5], a STARS student and I built a tool that empowered software developers to optimize the underlying hardware of their system from Python.

Teaching Interests

My teaching and research experience is in reconfigurable computing, computer architecture, and hardware design. Courses I teach would benefit from my unique experience creating usable abstractions. I look forward to developing active learning curricula to teach classes in the following areas:

Digital Design I am interested in teaching students about all levels of digital logic. This includes the fundamentals of digital logic (combinational, sequential logic, and state machines), languages for describing digital logic (hardware description languages, high-level synthesis tools, hardware design abstractions), and simulation-based verification techniques. In upper-division classes I would enjoy teaching students about implementation using FPGA and ASIC flows, off-chip digital communication methods, and advanced logic implementation techniques.

Computer Organization and Design I would enjoy teaching students about the design and organization of computer systems, including the use of custom hardware accelerators that are becoming more common in systems. This includes abstractions in modern systems, from high-level languages to assembly and into hardware. This stack-spanning class would introduce students to abstractions at a number of layers: high-level languages, operating systems permissions, communication interfaces, and hardware accelerators.

References

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