Ethan Cecchetti – Teaching Statement

The core responsibility of an instructor is to facilitate learning. While doing so requires a firm grasp of the topics, well-constructed materials, and techniques like active learning and real-world motivations, personal experiences have shown me that a focus on the learners is also paramount. My philosophy is to understand *student backgrounds* and *adapt materials* over time. This approach allows me to maintain a critical balance: keeping material both understandable and novel.

I have seen both the powerful effects of success and the discouraging results of failure when instructors do not understand student backgrounds and fail to adapt. In one course I took as an undergraduate, the instructor assumed more knowledge than most of the students—including myself—possessed. He frequently glossed over concepts that were new to us, providing little explanation. Despite the confused and disengaged faces around the room, the instructor did not adjust; he plowed ahead with his existing lesson plans. While I tried to understand as much as I could, I realized the following term that many of us had received good grades, but learned very little.

Based in part on this experience, I have made a concerted effort to understand students needs and adapt. Throughout both undergrad and grad school, I was a teaching assistant for a variety of courses. Some students who came to my office hours were struggling to understand the core concepts of the course, while others were simply stuck on a minor detail. I quickly learned that, regardless of the assignment, effectively facilitating learning required me to first understand their existing knowledge and begin there.

In 2013, while working as a software engineer, I volunteered to teach math and computer science at Orchard Gardens Middle School in Roxbury, Massachusetts. Three colleagues and I used the well-developed Bootstrap Algebra curriculum.[1] The materials were aimed at 7th and 8th graders, but our students were in the 6th grade and took considerably longer to grasp the concepts. We did not already know the students' backgrounds, so each class, we checked in with students individually both to help them learn and to help us understand what they found challenging. Between each class, we adapted. We used the new information to modify the next class's materials and ensure that we did not leave any students behind. Multiple students started the program with confused and disheartened looks, saying they could not do math. Yet by the end, those same students were excitedly showing everyone their working programs. We did not cover every detail of the Bootstrap curriculum, but we successfully adapted the curriculum to keep students engaged and learning; the material remained both novel and understandable at the reduced speed.

The following term, I taught the same material to a second class through Newton Community Education. While students in both classes were similar in age, those in Newton generally had better schooling, more stable family situations, and wealthier and more educated parents. The difference was stark. We took the same approach as before—checking in with individual students regularly—but we immediately found the students in Newton had much more existing understanding and required less attention to stay engaged. This difference in backgrounds led us to speed up the course instead of slowing it down.

I took from these experiences that a single course plan will never perfectly fit a group of students; adjustments during the term are always necessary. Moreover, continuous interaction with students and careful consideration are important for properly making those changes. The same principles apply at both the undergraduate and graduate levels. What students bring to class will vary significantly based on other courses they have taken and their personal backgrounds—someone with wealthy parents in STEM fields will likely have very different knowledge and expectations than a first generation student from a low income family. Effective instruction requires understanding these differences and adapting material not to leave students behind.

The necessary changes will also differ from year to year. Each student body is different, and the context in which they learn changes over time. The COVID-19 pandemic has made this contextual concern all too

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[1] https://www.bootstrapworld.org/materials/algebra/

clear in the last two years. Using appropriate techniques to understand the conditions is important. In small course settings, this can be as simple as asking questions in class and paying attention to discussions. Larger courses call for more scalable and measurable accounting. For example, formative assessments throughout the term provide invaluable guidance for how to adapt material to the changing needs of students.

I will apply these ideas to each course I teach while bringing in my own background. My experiences as a software engineer and a security researcher using both applied cryptographic and programming languages techniques prepare me to teach a variety of courses. I am excited to teach courses on introductory programming, practical security, blockchains, cryptography, programming languages, and specialized courses related to my research areas.

Mentorship

Teaching does not stop at the classroom doors. Individual mentorship and advising are important parts of a professor's job. Once again, adapting based on a mentee's knowledge and background is critical. But with mentoring, an individualized approach is even more important. A successful advising relationship is one that helps the student achieve their goals and grow along the way, adapting with them as their knowledge and goals change. A good advisor should listen, understand, and provide useful feedback and direction.

For the past three years, I have had the opportunity to mentor multiple junior graduate students. At Cornell, I helped one student as he located a research direction. Much to my excitement, we ended up coauthoring a paper and he is now leading a project to extend that work. Since starting my post-doc, I have collaborated with a junior student at the University of Pennsylvania and am currently working with a first-year PhD student at UMD. In each instance, I try to sit down with the student to understand their goals and needs. The scope may be narrow—project goals or background material to read—or broad—career goals or skills they wish to develop—but either way, this understanding helps me work with the student to develop a plan tailored to them.

I also, critically, aim to provide feedback along the way. Research is notorious for delayed and lackluster external feedback. Even fantastically successful research projects take a long time to complete, write-up, and publish. To make matters worse, it is common for excellent research to be rejected on the first publication attempt. This lack of outside feedback can make students anxious about the value of their research and progress toward their goals, damaging their mental health, and reducing the quality of their work and life. As an advisor and mentor, it is my job to provide both constructive negative feedback and affirming positive feedback. This feedback both facilitates adjusting goals and expectations and makes the student are more certain of their successes and better able to address their failures.