Emma Tosch · Teaching Statement

Teaching and mentoring have a disproportionate and immediate impact on society. The nature of scientific pursuits is such that research will not always work out; conversely, the volume of interactions a professor has with students practically guarantees that they will make a contribution to some student's decision to pursue or quit computing. Whatever path that student chooses, current economic trends indicate that computational literacy will be necessary for their future economic security. The reality of this situation confers a unique responsibility on those teaching and mentoring in the field of computing.

Formal Teaching Experience. In Spring 2018, I was invited to teach our introductory course on **topics in discrete probability**, *Reasoning under Uncertainty*. The course had approximately 180 students enrolled, and is a required course for the major. Having seen some people struggle their first time teaching alone, I agreed under the condition that I have a co-teacher (Luis Pineda, now at Facebook AI Research). Luis and I had the opportunity to engage with many aspects of course management during this experience, including training and mentoring TAs and undergraduate course assistants (UCAs).

Our main approach when teaching this course was to communicate frequently about the goals of assignments (e.g., **evaluative vs. diagnostic**), the expected time to complete assignments, and to periodically solicit feedback from students about their preferences. We were open and honest about the fact that we were graduate students, and that this course was going to be an **educational experience for everyone** involved. We **explained our decisions** to students to demonstrate that our decisions were never arbitrary, nor capricious. One challenge we faced was that classes of this size and nature can easily elicit an antagonistic relationship between students and instructors; many of the choices in our communications with students were in service of dispelling this notion.

My past experience with this course led me to realize that there was quite a bit of heterogeneity in students' backgrounds, and that some students found the intensity of the undergraduate major sequence distressing. One of the major changes we made to the course from past iterations was to have a **dual-track grading rubric**. One option included only assignments and tests, putting more weight on tests. The other option included assignments, discussion sections, clicker exercises, and tri-weekly quizzes, and weighed tests less. We would take the higher of the two grades for each topical unit. Our objective here was to ensure that students who tested poorly had a chance to do well, and to ensure that students who tested well did not feel the need to make up "busy work" in order to maintain their grade.

I believe that co-teaching led to better outcomes for both the teaching staff on this course and the instructors, had either of us taught alone. Luis and I were able to offer **different communication styles** and approaches to students, while maintaining overall cohesion in our interactions with the class. We were able to accomplish this by attending each other's lectures and communicating frequently about student issues. While this **coordinated, collaborative approach** certainly required more raw hours from each of us than a more specialized approach, I believe it led to a less stressful experience than teaching alone, which in turn increased the quality of our teaching, and allowed us the **mental and emotional capacity** needed to simultaneously engage in research.

Teaching Assistantships. I have been a teaching assistant for fundamental topics in computer science throughout my graduate studies: *Data Structures*, *Theory of Computation*, *Structure and Interpretation of Computer Programs*, *Reasoning under Uncertainty*, and *Advanced Logic*. All were listed at the undergraduate level, except for *Advanced Logic*, which contained a graduate section and an undergraduate section. The three courses I TAed while at Brandeis University were in a liberal arts setting, with class sizes that ranged from 20-50. I TAed *Reasoning under Uncertainty* twice; this course had approximately 90 students the first time

I TAed it, and approximately 120 students the second time. *Advanced Logic* was comparable in size to the courses I'd TAed while at Brandeis.

My TA experience ranges across two institutions having dramatically different education models and class sizes. My duties varied by class, but each encompassed a subset of responsibilities typical for TAs (e.g., drafting assignments and solutions, holding office hours, leading discussion sections, guest lecturing when the instructor is absent, etc.).

Formal Mentoring. I have mentored two summer research students who participated in the REU program: Molly McMahon and Rosario Huamani Carpio. Both students worked with me on research related to the SurveyMan project. I also mentored a Google Summer of Code student, Prakhar Srivastav on a SurveyMan interface. I have also mentored several junior students in my current lab (Knowledge Discovery Laboratory) on research projects that are not my own, including in a non-authorship capacity.

Teaching Philosophy

The core principle of my teaching philosophy is to establish a **supportive and non-adversarial relationship** with students, with the goal of guiding them to a level of **mastery** of the material that comports with **students' individual goals and values**. The specific teaching methods I use vary on the basis of the subject matter, students' backgrounds, and class size. That said, I have observed that the values the instructor communicates are perhaps more important than any specific teaching techniques. I believe a precondition for optimal student outcomes is *compassion*, rather than *empathy*, for students and their situations. Compassion requires the instructor lessen their own importance, while empathy can run the risk of perpetuating inequality, due to a lack of shared experiences.

I try to establish an environment that promotes **psychological safety**, while also emphasize that **learning can be uncomfortable**. Since most of my teaching experience has been early in undergraduates' education, I try to make connections between computer science and language learning, or computer science and physical exercise. I encourage my students to think about computing as a language for which they need to learn vocabulary and grammar, and practice every day. I encourage them to think about learning as an exercise of the mind, and to be mindful that some amount of discomfort is a sign of growth.

Finally, I try to emphasize to students the need for **intrinsic motivation** in course work, research, and life. The **emphasis on passion in computing is exclusionary and counterproductive** for both increasing diversity, and for the pursuit of science. I have seen this emphasis on passion lead to performative behaviors from students. I also believe it increases student anxiety (e.g., via "imposter syndrome"), and as a consequence reduces learning outcomes and research output. Only individuals can decide whether their motivation is intrinsic. However, an emphasis on intrinsic motivation from instructors and mentors, who have social capital, can **legitimize the experience of students** who are pursing computing for its financial benefits (i.e., sends the message: there is no shame in wanting to support yourself in a comfortable life), for familial obligations (i.e., sends the message: a desire to please parents, is a valid cultural expectation, provided it does not do harm to the student), and other motivations students may feel pressured to hide.

Conclusion. I care deeply about inclusion in Computer Science and broadly in teaching, which motivates most elements of my teaching philosophy. I have successfully put elements of this philosophy in practice as both a TA and a co-instructor at a large research institution, and as a mentor to undergraduate and graduate student researchers.