

Teaching And Mentorship Statement

Alex Sanchez-Stern

My teaching and mentorship experience spans a variety of activities, both during my PhD at UCSD and in my Postdoc at UMass Amherst.

Student Mentorship During my postdoc at UMass Amherst, I've had the privilege of advising multiple PhD students on their work in foundational verification and proof synthesis. One is a first year PhD student who is getting started in the program, and learning to manage teaching duties, classes, and beginning research. The other is a fourth year PhD student well established in the program who is working on skills related to composing and practicing research talks. I've been able to work closely with both students, meeting with them regularly and providing feedback on research, talks, and understanding advanced programming language material.

Prior to my postdoc, I was able to mentor multiple students at UCSD. This included advising an REU for a student at Howard College, who was working on basic tasks in my proof-synthesis project to give them experience in Data Science. I also advised the masters thesis of a student at HSE, who was implementing alternative proof search strategies in the same project. And in my last two years working on the project, as it became my thesis work, I recruited and advised a new graduate student to work on the project. We met regularly, both with and without professors, to make progress on the project.

Teaching philosophy While I haven't been teaching during my Postdoc at UMass Amherst, and have instead been focusing on research, my teaching experience spans a variety of activities across my time at UCSD. I've been a teaching assistant for several professors at my institution, including my advisor Sorin Lerner, Ranjit Jhala and Nadia Polikarpova, on both undergraduate and graduate programming language classes. My duties included grading assignments (and maintaining auto-grading infrastructure), holding office hours, and (preparing material for and) leading discussion sections. I particularly enjoy the challenge of breaking down concepts to be understood in a wide audience, whether they're concepts in my own research, or foundational concepts of computer science.

During my time teaching, I've consistently found office hours were one of my favorite parts of the job. The opportunity to work with students one-on-one allows me to tailor my teaching approach to the students learning abilities, and the ability to explain a concept to a student in a way that got them excited about it has always been immensely satisfying. As I gathered more teaching experience, I tried to apply the effectiveness from office hours to the more challenging task of teaching many students at once with the same material. Knowing that each student would absorb the material in a different way, I've always strived to allow multiple paths through the material I'm teaching, whether that means reflecting each thing I say with an onscreen diagram, or presenting multiple metaphors for each core concept.

As someone who works in a field that deals so much with abstraction, it can be counterintuitive how important concretization is for teaching core concepts. While the power of abstractions like Monads lies in their flexibility, I think that when teaching them, that flexibility can often be a distraction. Instead, students often benefit from seeing concrete examples of how core concepts work, that they can relate to programming problems they understand. Alongside the fully abstract version of the concept, these concrete examples can go a long way to maintaining student interest and engagement in topics that help their long term growth as programmers and computer scientists.

Remote learning experience In the past year, the world of teaching has been turned entirely upside-down. Until recently, remote learning was an area of experimentation; but for several years during the pandemic, it became the sole way in which teachers can interact with their students. TA'ing during this time, I've seen firsthand the new challenges that we face as educators in engaging with students who are stuck at home in a variety of situations, instead of comfortably sitting in our classrooms. But with these new challenges come new opportunities, to use the changing medium of education to better engage a wide variety of students.

I've personally noticed several changes to my teaching style that I've had to make to adapt to the changing circumstances. First of all, as not all students are in the same time zone, it has become more important than ever to post lecture materials online. Even for students who are able to attend lecture, this allows them to follow up with the material at their own pace after class, and gives them a reference for the scope of material covered in the class. This also means making sure that all content from the lecture is expressed in these formats; where before it was possible to omit some details from the slides and cover them through speaking, now it's necessary to make sure those elements are available some other way, either by recording lectures, or ensuring that everything spoken also has a counterpart on the slide.

A second change that has become necessary is the de-emphasis of questions to the audience as part of the lecture. While before it was relatively easy to follow a section of material with a question about that material, in a Zoom environment, asking students to volunteer to solve a simple problem is fraught, and can lead to long awkward silences in the zoom session. Instead, it's now necessary to structure such participation, breaking students into breakout groups to discuss the question, using the text chat or poll features of Zoom, or asking students to answer in some "out-of-band" format, like a web form.

Finally, the biggest need in these challenging times is a renewed empathy for the variety of circumstances that students find themselves in. Students in our classrooms today can be halfway across the country, dealing with life-altering circumstances, and trying to focus in their home environments. While students of privilege have quiet spaces and support networks with which to participate in remote education, the gap between the have and have-nots has only been widened by the worldwide pandemic. It is more important than ever that we challenge ourselves to support every student, whether that means more flexible office hours, more assignment and lecture alternatives, or simply listening to students and adjusting to their needs and circumstances.

Looking forward I'm looking forward to mentoring students both in classroom and research environments as a university professor. I would like to teach classes spanning from basic introduction to computer science, to advanced Programming Languages and compilers, program synthesis, and verification. I'm also excited to explore teaching where needed in my areas of adjacent expertise, such as basic numerical analysis. I look forward to working with my colleagues to constantly explore and adapt our curriculum to an ever changing environment, and provide students with the best education possible.