Teaching Statement

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I believe that mathematical patterns of thought benefit all students, even those who do not go on to a technical job. My primary goals as an instructor are to teach students how to translate a problem into mathematical language, and to teach them how to focus on understanding why something is the way it is, and to use computation as a tool in doing so. I want my students to learn how to make precise mathematical statements, and how to ask precise questions about the math that we do in class and that they encounter in the world.

I belove that equity is a key part of teaching and that it needs to be explicitly and constantly addressed while teaching. In my classes I aim to address the historical lack of equity in mathematics and the contributions of underrepresented groups, also on an individual level I am aware of the radically different circumstances some of my students face, and I try to accommodate my students however I can with empathy and an open mind.

I am a proponent of active learning. I like to give low states assessments like reading quizzes to my students, both so I can assess what they are learning and so that they can be exposed to the more routine material before we see it in the classroom. When I am lecturing I have a conversation with the students, and I like to ask a lot of didactic questions and get input from the students whenever possible. I am currently teaching a flipped class, and I am finding that it is successful to have the students learn some of the material such as definitions on their own so that class time is spent doing interesting problems and addressing questions, rather than a one sided output of information.

I am constantly tweaking my teaching style and seeking out new ways to address the different learning styles of my students. I attended a week long program on scientific teaching at UCLA, put on by the National Institute for Scientific Teaching, and this inspired me to spend a portion of all of my classes with the students working on problems in groups and to send out regular surveys to my classes; I use these surveys to keep in touch with my students and to help me know what topics I need to spend more time on.

To promote group work among my students, when possible my TAs and I will create worksheets for the students to do in groups during their time with the TAs, and I have had the opportunity to work with undergraduate TAs in order to have the students work in small groups with the help of a more experienced students.

I have taught a wide variety of classes at the University of California Los Angeles and the University of Washington, ranging from graduate level commutative algebra, to "introduction to proofs" classes, to calculus. I have also been involved in training teaching assistants, and this quarter I am the course coordinator for the different sections of introduction to real analysis at UCLA.

I will now discuss a few types of courses that I have taught.

1. Service Courses for non math majors

I have taught many classes geared towards upper division nonmath majors, the one that I have taught the most often both at UCLA and at the University of Washington is liner algebra. I few teaching linear algebra to nonmath majors as a fantastic opportunity to teach the advantages of mathematical thought to engineering or computer science students. I emphasize both how salubrious it is to be able to trace all our arguments back to first principles, and also how abstraction can let us study very different seeming structures at the same time. However, because linear algebra can seem foreign to some students, I look for every opportunity to give concrete examples: for example when teaching about the span of a set of vectors I use props to demonstrate the span of two vectors in $\mathbb{R}^3$. Even in a class that is mostly focused on matrix algebra I still ask the students to prove things (even if I don't phrase it that way) because to me understanding the logic around the math that they are doing and why the algorithms they are learning work is much more important than the actual act of computing something.

2. Calculus

Both at UCLA and the University of Washington I have taught the introductory calculus sequences. This is a fun class to teach because there are so many beautiful parts to calculus, but often students have trouble adjusting to a class that isn't all about computing things. I like to focus on the geometry of what they are doing, and how rather than memorizing many formulas we can understand a few key ideas (e.g. linear approximation) to solve many different kinds of problems.

3. Introduction to Proofs

At UCLA, I have taught the discrete math class several times. This serves as an introduction to proofs class for many math and computer science majors. I developed lectures and some of my own problems. My main goal was to teach the students how to use math precisely, and I had great success in getting the students to come up with definitions, theorems, and proofs for "concrete" part of mathematics, such as graph theory. I worked with my TAs to write worksheets that they students would do in groups in discussion sections, and I found that this was very successful in cultivating their problem solving skills.

At the University of Washington I had the privilege to teach the introduction to proofs class one summer. In teaching the introduction to proofs class, in addition to developing lectures I wrote many of my own homework problems and some supplementary materials on an axiomatic approach to real numbers. In teaching this class, I was challenged to help the students

learn that struggling to come up with a proof is to be expected, and is part of the learning process.

4. Upper level courses for math majors

I have taught classes such as introduction to real analysis that are mostly for math majors who have seen proofs before, and I enjoy working with honing students' proof writing skills and teaching them how to solve problems that aren't just a straightforward manipulation of definitions. It is always sometimes challenging to get students to accept the feeling of being stuck on a problem without giving up, but I teach them that being stuck is a learning opportunity, and how they can go back to the definitions or draw a picture or draw on their intuition to proceed forwards. For these more advanced classes my goals are for the students to become comfortable with manipulating different definitions and using mathematical language precisely, as well as for them to develop confidence in their problem solving skills and have them realize that mathematics is an ongoing body of work to which they can make a contribution.

5. Graduate level courses

At UCLA I had the privilege of teaching a graduate level commutative algebra class, which is a precursor to the graduate level algebraic geometry sequence. The students were either first or second year graduate students or senior undergraduate students. I was able to work with bright students on organizing and clarifying their ideas, and was happy to notice that their proofs were markedly better by the end of the course.

I graded and held office hours for the University of Washington's graduate level "Introduction to the Topology and Geometry of Manifolds" class, where I had the opportunity to help teach young mathematicians how to convey their ideas into concise and precise proofs.

6. Honors Projects

At the University of California I've had the privilege of being involved in honors contracts, which is an opportunity for motivated students to do more advanced work in a class while meeting regularly with the professor one one one. I have done this in discrete math and in calculus classes. It is a joy to work with motivated students on learning some more exciting material, and to also give them a taste for what math is like outside of the classroom setting.

7. Math Circles

For three years of graduate school I was one of the instructors for the University of Washington Math Circle, and I was a judge at the end of the year math olympiad several times. The math circle is an opportunity for bright middle schoolers to come together and explore topics that aren't

a part of traditional school curriculums. It is designed to show students that mathematics is alive and fun, and also to teach them how to explore a problem, and then explain why whatever they are trying to prove is so. It is a lot of fun to listen to the kids try to, for example, argue why an Eulerian path of the bridges of Könisburg is impossible by going through a laborious case by case analysis, and then to guide them to thinking about graphs and the degree of a vertex.

I continued this at UCLA by giving a series of guest lectures on group theory to the high school math circle, and I hope to keep up my involvement with math circles.