

Teaching Statement - Zvi Rosen

Teaching Experience: I served as a graduate student instructor (GSI) in Berkeley for three semesters, teaching MATH 1B (second-semester Calculus) and MATH 10B (Mathematics for the Life Sciences). My responsibilities included six weekly hours of teaching, as well as weekly office hours, exam review sessions, and grading homework, quizzes, and exams. In my postdoc at University of Pennsylvania, I served as primary instructor for MATH 320 (Computer Methods in Mathematics), focusing on root-finding, differential-equation solving, and linear algebra algorithms. I wrote the curriculum, and I wrote and graded all homework assignments, quizzes, and final research projects.

Teaching Philosophy: As an instructor, I urge my students to fiercely challenge their axioms and intuitions. Particularly in a class like calculus, students are often held back by basic misunderstandings. My goal as an instructor is to encourage my students to flesh out their ideas and truly understand what governs their thinking. Then we can strengthen the good, filter out the bad, and move forward on more solid footing.

In lectures, I work through examples that challenge students' intuitions. For example, in one calculus section, I wrote the harmonic series on the board, and surveyed the class: "Does this series converge?" One student raised his hand and said "I think it will converge, because the terms go to zero." I used that as an opportunity to identify the intuition that terms approaching zero implies series convergence, and to explain why they should reject that idea. Having students question their prior beliefs trains them to carefully examine new ideas, and teaches them that mathematical thinking involves rigorous reasoning, self-correction, and copious practice.

This principle guides all of my teaching: identify specific errors in students' faulty reasoning, then use that as an opportunity to learn and improve. This manifests itself in a number of ways:

- ❖ *Preparation:* as I prepare class notes, I think about common mistakes that students might make, and prepare examples to help expose those errors.
- ❖ *Communication:* I take many questions from students, and I learn to interpret their underlying reasoning. If I figure out what they're missing, I can vastly clarify the subject matter to them – and the rest of the class.
- ❖ *Any Communication:* When students are less forthcoming, I employ desperate measures to get them talking ("On the count of three, say what you ate for breakfast!") This makes them less self-conscious and puts them in a more positive mood to engage. Even if students aren't talking, I read their expressions to see if my explanations are resonating with them.
- ❖ *Encouraging Collaboration:* I always encourage students to work together on homework assignments, going as far as "matchmaking" when timid students can't find a group. By engaging with the material together, they complement each other's understanding, and they also learn from the mistakes of their partners.
- ❖ *Celebrating Mistakes:* When I work through material on the chalkboard, inevitably, I make mistakes or find myself in a dead-end answering a question. Rather than try to underplay this experience, I react as if I have found buried treasure. I want to encourage

my students not to be afraid of making a mistake or being stuck. Instead, I train them to seek out their mistakes and dead-ends, and relish the adventure of taming that dragon.

Curricula tend to be more fun when they encourage learning in this way. “Theorem A leads to Corollary B which might lead you to Hypothesis C, but things are more complicated!” (This model runs into some difficulty for Complex Analysis where every theorem you hope to be true actually is true, but it is still generally useful.) The more that students interpret mathematics as a dialogue with the pantheon of mathematicians that they can participate in, the more fun they will have learning, and the more learning they will do.

Though my primary goal is always to inspire in my students an appetite and passion for mathematics, I know that students have various objectives, and I do my best to help all of them achieve their goals. For instance, engineering students may be seeking training to help them confidently perform certain algorithms and computations. I give those students plenty of practice problems and I work with them in and out of class to give them that confidence. I know that I am teaching not only future mathematicians, but future professionals of all stripes, and I do my best to be a positive force in their education.

The idea of challenging and testing our intuitions is a pillar of mathematical research. In my teaching, I try to give my students a taste of how the ideas we encounter are connected to questions at the frontier of mathematics. My personal research is interdisciplinary, finding motivation in tangible fields like biology and statistics, and reaching for tools from all areas of mathematics. Thus, I am ideally positioned to recruit students for research mentoring. I can work with aspiring algebraists, statisticians, and mathematical biologists; indeed, my current research collaboration with an undergraduate interested in mathematical biology has been tremendously enriching for both of us.

Student Evaluations: My evaluations have generally been very positive and appreciative. Here are some excerpts from anonymous student evaluations:

- ❖ “Zvi is an exceptional instructor. For the beginning of the semester, I was struggling with Math 1B with another instructor and decided to switch from all the positive feedback I heard from his students. Best decision I’ve made. His teaching style is very effective, he’s patient and knowledgeable, and has a great humor and attitude.”
- ❖ “Very prepared, always organized, friendly, answers questions well. Best GSI I’ve had yet for any class. Zvi deserves [an] award.”
- ❖ “Clarity and knowledge of the material. Explains things very well. Very accessible to students. Friendly, approachable, helpful. Zvi is awesome!”