

Teaching mathematics is a consistent source of satisfaction in my academic life. I enjoy preparing lectures and I enjoy delivering them; it deeply pleases me to see students pick up and apply the lesson in exercises, and I relish the opportunity in office hours to encourage the ones who do not. In every lesson I keep in mind the problem described by William Thurston in “[On proof and progress in mathematics](#)”: “we go through the motions of saying for the record what we think the students ‘ought’ to learn, while the students are trying to grapple with the more fundamental issues of learning our language and guessing at our mental models”. I have taught at several levels to large and small groups and with varying levels of responsibility over the curriculum, each time applying the same principle. Math can always be explained clearly, its terms can be made as familiar as natural language, and anyone can find its concepts intuitive if only their barriers can be understood and carefully dismantled.

I have done three kinds of teaching: the usual undergraduate calculus and linear algebra courses; specialized “tutorials” for math majors on topics of my choosing; and individual mentoring for exceptional high school students writing research projects (the Research Science Initiative, or RSI program at MIT).

In my calculus and linear algebra courses, I followed a fixed daily schedule but was free to write my own lectures and lead the class. While teaching, I found students’ participation essential: I encouraged them to recall concepts from before and to supply basic examples, and I prepared ten-minute exercises (up to three per hour) during which I and my assistants provided individual guidance. As the content of these courses was basic I could specifically address the principles behind it: for example, when I introduced the derivative in a calculus class, I led a Socratic dialogue by way of explaining how it leads to continuity at a point. Finally, I produced typed notes for each lecture and provided them on my website, so that the informal message (which students may not know how to write in their own notes) could be referenced.

Office hours are my strength and greatest pleasure. In the ordinary courses, I led conversations in groups as large as six during office hours: the students could teach each other by word and, in case of specific problems, by deed. This was also an opportunity for me to focus on individuals’ mental blocks as I could not during lecture. A student running a C once came to me for help and, for the last month, we worked through all the old and new material. He ended up with a B+.

In the tutorial courses, where the students were expected to produce a final research paper, we had individual hour-long meetings each week going deep into their topics. In both tutorials, the most successful students were the ones whose backgrounds were poorest. I devoted particular attention to them; their projects were the most creative and reflected the best understanding. In my mentoring at RSI, I met with my students (two per summer for a six-week program) individually for an hour *daily*; I also assigned them overnight problems which would form the basis for the subsequent discussions. My fondest memory of those exchanges concerns one student who analyzed her theories with computer simulations; each day she came with new results and debated the meaning for an hour, eventually refining her model and returning to test it anew. It is in the hopes of uncovering this form of dedication that I try to provide an inviting forum for discussion.

Students learn math not by being told what it is but by training themselves in what it does. Copious problem-solving and repeated partial progress are the best ways forward; I try to give them the means to learn this way. The most important part of that is interaction, sometimes with me but more with each other, so that the students’ individually incomplete understandings can complement each other. The joy in teaching is the student’s excitement upon grasping the full truth, and I’ll take that whether it comes from their reteaching each other or my reciting to them.