Much like doing research in mathematics, teaching is a difficult but rewarding process. Being a great teacher requires time, preparation, energy, and a willingness to try a different tactic when the usual approaches aren’t working – much like the development of a rough idea into a published paper. We are always willing to spend time learning and trying new things to forward our research, and we must make the same effort to push ourselves in teaching.

It’s important to also ask how we evaluate ourselves as teachers. Of course, the usual metrics of test scores, student evaluations, and success in later courses are important. However, we should also ask how much the students really understand about the material we’ve covered in a course, even if this is harder to measure. Too many students come out of calculus courses able to perform complicated substitution techniques, but without understanding how an integral relates to finding area or volume. I know as well as anyone that you can’t force a student to understand material, no matter how well you present it, but it’s also unfair to expect our students to bridge the gap between theory and applications completely on their own.

One of the most important lessons I’ve learned while teaching in graduate school is the value of student involvement. While I don’t think that getting the students involved is the only key to success as a teacher, I find that it is an important and often overlooked aspect of teaching, especially in mathematics. It is far too easy for students to watch us at the board, and simply become spectators in their math classes. This is well-summarized by a famous quote by Paul Halmos: “I hear, I believe; I see, I know; I do, I understand.” It is too easy to be content with simply showing our students how we do mathematics at the board. Our job is not simply to do mathematics with an audience, but to teach them how to do mathematics themselves. While students need to work out examples on their own, asking them to do an endless number of homework exercises is not the only way to involve them in the material.

I have found that most students entering college see little connection between the notions they study in math and the real world. For them, math is simply a game of “symbol pushing” with completely arbitrary rules made up by their math teachers. I think that this is one of the places where a more interactive approach to teaching is particularly effective. By discussing the how the ideas we are talking about in class connect to one another, and letting the students ask plenty of questions, they begin to reconnect math with the other things they study. This approach is more easily adapted to a class of 25 than to a calculus lecture with 150 students, but that doesn’t mean that it’s impossible to keep some discussion going in a larger class. I believe that in a lecture of any size, be it 2 or 200 people, the speaker should be talking with the audience, not at the audience.

I have been applying these ideas in my teaching since I first TA’ed for Computer Science classes as an undergraduate. I’ve received several honors and awards for my teaching, and my ability to get the students interested and involved in class is always mentioned as one of the key skills that distinguishes me as a teacher.

One of the most interesting tests I have had so far was the chance to design and teach my own course as part of the UCLA Collegium of University Teaching Fellows program. Each year, they select ten to fifteen graduate student applicants throughout UCLA based on your proposed course design and a departmental evaluation of your teaching performance. I offered a course called “Elliptic Curves in Pure Mathematics and the Real World,” and had students with majors ranging from French to Political Science. In addition to the material we covered in the course, each student prepared a 20 minute talk on a topic related to elliptic curves that they found interesting. While I don’t know that any of my students is going to go on to prove the Birch and Swinnerton-Dyer conjecture, I think that every student in the course could tell you at least one interesting
or nontrivial thing about the theory of elliptic curves. I think they also got the impression that math is not a dead subject, an impression that too many students get from their introductory math courses. Based on student evaluations and feedback, I think the course was a success – and each quarter since, I’ve gotten several emails from my students asking if I’m going to be teaching anything else soon.

Another important lesson I’ve learned is that no course plan or lecture is ever perfect. After teaching a course, or even a single class, I always find things that I can improve on, better ways to present the material, or think up clearer ways to explain points that students find confusing. I think that the process of revising and reflection is an important part of being a teacher. I think that there is much to be gained from regularly dissecting and analyzing material I’m already comfortable with. I have learned much by doing this in the past, and I look forward to continuing to grow in this way during my time as a postdoc.