Teaching Statement

During my first week as a graduate student, my officemate gave me my first bit of teaching advice, “the point of teaching is to spend as little time as possible doing it.” I have adopted this advice and it serves me well.

Of course, I took his advice, though not as he intended it. Like most teachers, I began teaching with a standard lecture format. Though the simplest to implement, the lecture format is not ideal for student learning. Indeed, as the educator Charlotte Mason said, students are in “danger of receiving much teaching with little education.” Thus, I now use different methods, which I believe help students learn more effectively while I lecture less.

1 Reading

An important mathematical skill is being able to learn mathematics from a textbook. If students know how to learn from a textbook, after college they can learn any mathematical skill they may need. However, reading mathematics is a skill that is rarely practiced before graduate school! In high school, math is usually spoon-fed to students during class; students hardly have a reason to read the book. And, if they do try, it is written in a way they are unfamiliar with. In college, where math is taught at a faster pace, students are more likely to need to refer to the textbook. Unfortunately, the book is often unhelpful for those unpracticed in reading math.

Most students try to read math textbooks like history textbooks: quickly, in order to get an overview of the subject. That simply doesn’t work for math; thinking about each paragraph’s meaning is essential! Students don’t realize they need to spend fifteen minutes or more per page to gain understanding. I explain this at the beginning of each term, and then, to help them practice this skill, I expect my students to read assigned sections from the textbook before lecture.

By having students read ahead of time, I can test their readiness and understanding before class via an online reading quiz, and thus I know how to make my lecture most helpful. Though the quizzes are not designed to test real mastery, they do ensure the students have at least a cursory understanding of the material, and so students come to class able to ask meaningful questions. During a standard lecture, despite regular requests for questions, I know some students do not understand enough to know what to ask. The reading quizzes are especially helpful for these students.

2 Interaction and Feedback

Standard lectures are, by and large, boring. Pre-class reading helps my students engage more with the material and allows me to implement active learning strategies. For instance, I spend some class time asking conceptual questions, which encourage students to think about and interpret the information, rather than simply passively receive it. This allows me to focus on the most important and difficult aspects of the material rather than spending so much time on the easy concepts. I can then use peer instruction as a tool when students answer questions incorrectly. This immediate feedback allows me to test understanding in class and correct misunderstandings immediately, rather than simply continuing with my lecture when no questions are asked. In addition, interaction draws students into the lecture, which helps them focus on the instruction.
3 Explanations

The lowest form of mathematical understanding is the ability to follow a memorized algorithm in order to solve a particular type of problem. In high schools, mathematics is often taught as a rote regurgitation of predigested problem solving skills. That is how I was taught, and though I moved past that, many students never do. They often don’t even realize that there is more to mathematics. Students in many undergraduate math courses, especially the service courses, are tested almost entirely on calculation-type questions. Certainly these questions have a place, but I also emphasize explanation questions, and, in higher division classes, proofs. I feel it is important to not just teach specific bits of knowledge, but also the thinking and understanding needed for further progression.

Explanation questions ask students to explain a concept. Though I require accuracy, I don’t require rigor, and I will often ask for examples. For instance, in a second-quarter linear algebra course, I asked, “Explain why invertibility and diagonalizability are independent properties, i.e., that neither one implies the other. Your explanation should include one matrix that is invertible, but not diagonalizable, and another matrix which is diagonalizable, but not invertible.” This question requires the student to synthesize her understanding of the quite different properties of diagonalizability and invertibility. This type of synthetic thinking also starts students on the path to proof; it forces them to consider why earlier properties imply a later result. These questions form a large part of my homework and exams.

4 Mentoring

Mentoring is a wonderful opportunity to make a difference in students’ lives. I was able to do two years of undergraduate research myself, which made a huge difference in my mathematical development and solidified my desire to go to graduate school. My advisor helped me think like a mathematician as well as write and present my ideas more clearly. Similarly, my graduate advisor helped me choose good problems, know which conferences to go to (not to mention fund me) and meet future collaborators.

Naturally, I find it rewarding to mentor students, and it is a priority for me. Shortly after starting my postdoc, I had a few students come asking for advice about graduate school and possible research projects. Fortunately, I had recently found an idea in my research appropriate for an undergraduate to work on, so I was able to take one of these students on. When this first student, Tamara, began to work with me, she was afraid I would fire her for incompetence. She hadn’t realized that the reason for undergraduate research is not so much to do research I don’t have time to do, but rather to help her progress—and she did. Tamara eventually succeeded in her research, and is now a coauthor on one of my recent papers. It has been rewarding for me to see her progress to become a more mature mathematician. As it did me, the research experience convinced her to go to graduate school. I continue to mentor students, and it is always a rewarding experience.

5 Conclusion

To conclude, here is a quote from a recent student review. Obviously it is among my most laudatory, but it also highlights many of the principles discussed above.

“I can’t say enough nice things about Dr. Dilts. He is the most incredible teacher I’ve had here, and I’ve done very well in this class even though it’s probably the hardest one I’ve ever taken. He
explains everything so clearly and asks clicker questions (which usually annoy me, but not in this class!) that are really helpful. I leave class actually understanding what I’ve just heard, as long as I do the reading and quizzes before and take notes throughout. He wants us to understand, and he teaches in a fun way that makes everything interesting and holds your attention. His assignments are long but they are necessary, and doing them well and understanding everything leads to doing well on the exam.”