Statement of Personal Teaching Philosophy

Michael E. Picollelli

My approach to teaching is highly fluid: it changes every semester, with every course and every lecture. What remains constant each time, though, are my three primary points of focus when I teach: the audience, the presentation, and the material itself.

The audience is the most important factor in deciding how I teach. Students' majors, mathematical backgrounds and course expectations often vary dramatically, and I attempt to incorporate whatever information I have about them into the planning and execution of my courses. When I taught Pre-Calculus for the Carnegie Mellon Advising Resource Center's Summer Academy for Math and Science, my audience consisted of high school students whom I presumed (and rightfully so) had little exposure to the pace of college math courses. I felt that, with less than two weeks between the first lecture and the first exam, it was unreasonable to expect students to become acclimated to the rate of note-taking necessary. To ease this transition, I chose to provide students with typed notes of exactly what I had covered at the end of each week, in many cases a word-for-word restatement of the lectures. This ensured that they had sufficient notes to study from for each exam, but that they would also need to rely on their own notes and the text for the assigned homework.

The audience, though, is typically beyond the control of the instructor, and much of the material often is as well. What is within the control of the instructor, then, is the interaction with the students, and the importance of this cannot be overstated. While still maintaining the decorum of a university course, I try to present myself in some of the ways I would use to describe a television game show host: energetic, enthusiastic, engaging, and, ever so slightly, entertaining (and with an appropriately affable attitude toward alliteration). I approach each lecture with as much energy as I can muster, hands waving (but little hand-waving), eyes wide open, sometimes shouting when the situation calls for it. Humor plays an important role in this; aside from lightening the mood, it lets me gauge student interest in the current topic, and is often an effective indicator of whether I'm moving too quickly or too slowly. Since I firmly believe that one of the greatest hindrances to learning math is anxiety, incorporating these techniques also helps the students to relax.

And since my teaching is done before a live audience, audience participation is a must. I frequently prompt the students to ask questions and answer them as well. Rather than having a single student provide the entire solution to a given problem, I build up solutions step-by-step based on suggestions from the class as a whole. This has the benefit of encouraging more questions about the solution method, since the students can think about each step instead of attempting to digest a complete answer, handcrafted ahead of time.

The final major aspect is the material itself: as with teaching, my approach to the material, what ideas should be emphasized or examples should be focused on, changes frequently, but there are two guiding principles to my lectures and recitations: simplicity and consistency.

I try to present results in the simplest terms that I am able to, with a concentration on the underlying idea. Proofs, for example, usually consist of two conceptual parts: the underlying idea for why the argument is a proof and the justifying details. As a student, I found that textbooks would often emphasize one over the other: the concept was clear but the details were not, or the details were provided but the concept was lost, leaving me unable to see the forest for the trees. To avoid this, I write out every proof I provide in a course, and attempt to fill in all of the details that I feel are necessary. I ask for student feedback as to whether what I've provided was sufficient (or excessive).

I also frequently produce and emphasize analogies for the underlying ideas, a teaching tool I prefer over real-world examples that emphasize practical applications. When I cover mathematical induction in a course, I ask my students to visualize a row of standing dominoes, arranged in such a way that when the first domino is knocked over, it sets off a chain reaction, each domino falling into the next and causing it to fall, ad infinitum. The analogy to induction presents itself almost immediately: the proposition's truth is equivalent to all dominoes falling, showing the initial case's truth is showing that the first domino falls, and proving the inductive step corresponds to showing that each domino hits the next.

Simplicity alone, though, isn't enough, as even the most detailed lecture can fail to convey the point if notation or definitions change unexpectedly. (Let n be irrational...) To this end, I try to ensure that the notes I provide and material I present are consistent with a fixed source the students have readily available, most often my earlier notes or the course text. After all, there are plenty of mathematical ideas that are complicated all on their own, and they don't need *my* help to frustrate people.

Ultimately, I'd like to claim that my goal is to educate and enlighten students, but it's not. It *can't* be; the real burden of education lies not with the teacher but with the students. My job and goal, as an instructor and a mathematician, is to lessen that burden as much as possible: to present the material in the clearest way I can, adapting my approach to the needs and capabilities of my students. Students who are willing to take on this challenge and put real effort into learning mathematics deserve nothing less of me, but I, in turn, have equally high expectations of them, and I believe that only when these standards are met by both of us can any real progress take place. At the same time, I hope I can also express to my students why I study math, and why I enjoy it as much as I do. After all, I tell them, I really wouldn't do it if it weren't fun.