Statement of Teaching Philosophy

Why I Teach. I teach because I love to do it. It is the best way I have found to make a positive difference in other people's lives. Teaching gets me out of bed in the morning and keeps me working late in ways that my research does not.

My Goal. In teaching, my goal is student education, which I consider to have three main student outcomes: practical skills, a foundational breadth of knowledge, and a confirmation of mastery.

For example, my primary goal when teaching an introductory computer science course is for students to learn how to program.

While motivated students could probably learn to program on their own, an education should also establish a solid foundation for future study beyond the course. This requires both a sufficient breadth of knowledge and an ability to think critically about the material. For example, programming students also need to be able communicate using the terms and concepts of computer science. They should be able to recognize and apply certain best practices–such as encapsulation or object-oriented programming–in real-world settings. They need to be able to reason about why one possible solution would be preferable to another given a particular context.

The third component of my teaching is student assessment. Providing adequate feedback helps students confirm what they know, what they don't know, and where they might improve. Equally important is my responsibility to certify to the broader community that the student has actually mastered the material of the course. Assessment also helps me recognize which parts of the course are particularly difficult for students. This helps me improve my own teaching focus.

In my teaching career so far, I have not found a single technique that allows me to achieve all these ends. Instead, for me, teaching is an endless stream of tweaks and improvements, searching for better approaches that reach more students. These are some of the areas I have explored so far:

Human relationships. I see teaching as forming a three-way relationship between me, the students, and the course material. I already know the material, so I must also get to to know the students. I usually teach about 60 students a semester, either split between two lab sections or combined in a single lecture section. I make a point of learning all of my students' names on the first day, and actually remembering them all by the end of the first week. My students are the reason I teach and knowing them keeps me grounded. When I answer a question by email, review an assignment, or grade an exam, I can mentally connect a face and a person with that interaction. I can thus build a sense of how each student is doing. When a student starts to have trouble–despite regularly attending class and putting in the effort–it affects me. Their struggle means I need to change something about the course structure or find an alternative way to present the material.

Content delivery. While I think practice is more important, learning needs to start with exposure to the course material. For this, I have had the most success with lectures augmented by a whiteboard. I find that lecture without slides becomes a live performance, with a certain engaging immediacy to it. I believe there is a reason that live lecture persists as the dominant form of instruction despite the advent of books, TV broadcasts, and internet video. In a lecture, I can emphasize exactly those points that I care about in a logical order. I can adapt the presentation to specific questions or just to puzzled expressions.

However, the live immediacy of lecture is also its biggest drawback. There are countless reasons why students cannot always keep up–whether because they are distracted, are not native English speakers, are poor note-takers, or even missed class entirely that day. Because I believe students

should have alternate access to the lecture content, I have started exploring other formats, especially now that I am serving as the primary instructor for the course. This semester I have tried basic slides that I can project while still augmenting with details on a blackboard. I can post the slides before the lecture so students can print them and take additional notes on them. I have also been considering short recorded online lectures or greater reliance on a better textbook, though each of these is a step further from the "liveness" I find useful about lecture.

Practice. I believe practice is where most learning happens, especially with programming. I usually break up my lectures with short pauses for students to try sketching out a solution for themselves before I present it. One of my favorite techniques is to ask for possible answers concerning what a snippet of code will do. Once students have proposed 3 to 5 answers, I ask everyone to commit to one of the answers by a raise of hands for each option. Then I trace through what the code does to reveal the correct answer.

Outside of class, I use weekly assignments for programming practice. I have designed and implemented my own online submission and automated grading system named Tamarin. This lets me give students immediate tentative feedback on their submissions. They can then resubmit at a small penalty. (The penalty is to encourage students to test their own code rather than simply relying on Tamarin to find their bugs for them.) Once the deadline has passed, I provide additional human feedback on their submissions. I also use short weekly online open-book quizzes to help students practice some of the more theoretical aspects of the course.

To practice communication and critical thinking, I have used a studio-based code-review exercise where students evaluate and critique each others' work in a structured way. I found this to be productive, and it contributed to a better sense of community in the class. However, it was quite time-consuming to organize, so I am currently considering an online asynchronous version of the exercise.

I have also tried using similar small group exercises to break up lectures, but I have had less success there. While some students found the activities engaging, about half of them would not participate but instead just wait for the final answer. I would like to revisit this approach in a different form, though.

Assessment. Since students spend most of their time working on the assignments, their performance there determines half of their course grade. I use small quizzes primarily for feedback to the students themselves and as practice for the exams. I use closed-book exams to determine whether students have actually retained what they practiced and can reproduce the effort on their own. Since the purpose of my exams is strictly assessment of what the students have already learned, I strive to have no surprises or new challenges on an exam. Instead, I use only variations of problems the students have already seen on assignments and quizzes. To soften the weight of each exam, I give four exams over the semester and then allow students to drop one of them.

Growth. The best inspiration I have found for improving my teaching is being a student myself. It is a reminder of all the distractions and difficulties students face while learning something new. I continue to augment my teaching tool-belt with techniques and styles I have picked up from other instructors. Often, these are just little things, like making sure I pause long enough after asking for questions or more clearly separating requirements from implementation suggestions when drafting assignments. I have also started reading practical teaching guides for more inspiration and ideas. I am currently looking at better ways to structure active learning opportunities, such as the in-class group exercises mentioned above. I also need to explore more efficient ways to focus my time when running a course.

In the future, I look forward to teaching in contexts other than a large introductory course. Although I would change many of the practical techniques I use if I were teaching a small upper-level course, I believe my focus on relationships and student education outcomes would remain the same.