Teaching Statement

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My primary goal in teaching mathematics is to encourage careful, logical, and analytic thought. Instructors should set high expectations and provide students with ample help to meet them. Our students must be challenged to achieve an understanding of the mathematical principles underlying problem solving techniques. A student equipped with this deeper level of understanding is far more likely to "own" the new concepts and apply them in novel contexts. Such high aspirations require well-designed courses and a deep respect for the efforts of students.

A well-designed course develops new knowledge incrementally, at a measured pace. In addition to the core topics, I like to allocate time for a few optional lessons throughout the semester. For classes capable of moving at a faster pace, these lessons provide a chance to discuss deeper, more challenging material. For classes more comfortable at a slower pace, the optional lessons may be replaced with activities that reinforce core concepts. Student feedback in the form of assignments, exams, office hours, and facial expressions during lecture all provide clues as to whether an optional, more advanced topic is appropriate or whether reinforcement is needed.

A course must also be well-designed at the level of individual lectures. When designing a lesson, I find it is instructive and useful to adopt the point of view of the student. Given the known material, what is the simplest way to achieve an understanding of the new material to be covered in the lesson? Perhaps other intermediate concepts should be covered first. Perhaps a carefully selected, concrete example would set the stage for a more general discussion. Adopting the point of view of the student also helps the instructor appreciate the students' efforts.

For many people, learning technical concepts is a daunting task. The classroom environment and the attitude of the instructor have a significant impact on whether the student sees this task as manageable or impossible. In the ideal environment, students feel comfortable asking questions and requesting help. Anonymous, informal feedback is a particularly useful tool to gauge general concerns about the course, and it demonstrates that I care about my students' learning experience.

When one of my students asks a question during office hours, I encourage my student to explain any work that he/she has done, until the point where my student gets stuck. While I prompt my student to fix mathematical errors as they arise, I often allow my student to pursue a line of attack which, although mathematically correct, does not seem promising. For example, in attempting to solve an integral, a student might make a substitution that does not result in a simpler integral. Allowing the student to proceed serves several valuable purposes. First, the student learns a clear distinction between mathematically correct and incorrect reasoning. Second, the student learns not to fear a little trial and error. Third, the student gains more experience about the settings in which various problem solving techniques are useful. Indeed, in all likelihood, the reason that I have classified the student's approach as unpromising is that I have tried it myself at some point, without success. Sometimes, a small tweak to the approach yields a new solution that I had not previously considered. Finally, listening to the student's approach demonstrates respect for the student's ideas.

I am prepared to teach any introductory course in mathematics and computer science, as well as advanced courses in discrete mathematics (such as graph theory, combinatorics, and the probabilistic method), algorithms, and computational complexity theory. I would also welcome the opportunity to design new combinatorics courses to enhance a department's offerings.

One of the most rewarding experiences in teaching occurs when a student engages material beyond the scope of the class. In an introductory course in the theory of computation, I had the good fortune to teach such a student. After studying nondeterministic finite automata (NFAs), I presented a diverting application where NFAs provide a solution to a party trick. My student was interested in a natural generalization of the problem and even wrote some computer code to investigate special cases. I thoroughly enjoyed discussing this problem with him, and I look forward to more such discussions with future students.