Teaching Statement

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I often tell my students that my job as a teacher is to make myself redundant. After all, I won't be standing beside them while they take an exam or when they design a new parking structure or bridge. Thus, promoting self-reliance and developing general problem-solving skills are two of my primary teaching goals. Students need to work through the material themselves so that they are confident in their understanding and can explain their answers. They also must be comfortable applying the math they have learned to new situations. Active practice is essential at any level of mathematics, because we learn by doing math, not just seeing it done.

My belief in the active practice of mathematics has led me to teach many classes where students work in small groups. In these classes, my main challenge is how best to facilitate the students' work. My natural reaction to a question is merely to give the answer immediately. I fight daily to overcome this impulse. Instead, I look for different strategies to help students find the answer themselves. I will answer their question with a question of my own, encourage them to discuss the matter more with their group, or refer to the book. Or, I will have them start with a simpler problem covering the same concept. When students complete a problem, I challenge their answers whether they are right or wrong, so they can practice explaining their work. Additionally, I often need to motivate the students to work in class because, after all, it is much easier to take notes passively. I have found that one helpful tactic is turning problems into a game. Playing a game can turn a group of taciturn students into a cohesive team, checking answers and discussing solutions. I have used various games successfully, including math jeopardy, relays, and races, not only in group work courses but in standard discussions as well.

To promote problem-solving skills, I try to present mathematics as a collection of tools which can be combined in many ways. I've had students who took calculus in high school and do some problems using "voodoo" they memorized but cannot explain or generalize. I am determined to avoid this. One strategy I learned at a teaching workshop is to have the students keep a list of the main definitions, theorems and concepts along with examples of how they are used and connections between them. This helps them organize and digest the material.

Another advantage of a group-work setting is the immediate feedback I receive. Having students present their work formally and hearing how they talk to one another about it informally gives me insight into their understanding, or lack thereof. It is always gratifying to witness a student asking a great question, correcting another's mistake, or giving a clear explanation of a concept, and this is one way I judge whether or not I am being effective. Another way is to assign questions which approach the concepts I want to test in a novel way.

When I teach in a more traditional format, I try to incorporate many of these same strategies. I ask the class lots of questions as I lecture, and encourage them to guess the

next step. I take care to point out the hypotheses of theorems and give examples both of when they may be used and when they may not. I also ask students to work on problems and present their answers.

This statement is based mainly on my experience teaching Calculus I or II in various formats, and teaching "A Mathematical World," a class intended primarily for non-math majors. Many of the principles, however, should apply nicely to other courses. Because I do not have experience teaching courses beyond calculus, I must rely on my experiences as a student and assimilate the best teaching techniques I witnessed. For example, hearing about the history and applications of the concepts being presented always stirred my interest. That is a strategy I try to use. In my graduate and undergraduate work I studied a wide array of subjects. This experience adds to my flexibility as a teacher. In addition to teaching courses in logic and model theory, which is my current research interest, and teaching the standard introductory math courses, I would feel confident teaching a wide variety of "upper-level" subjects. These include set theory, abstract algebra, real and complex analysis, geometry, topology, probability, and statistics. Teaching outside of my immediate area of expertise will take extra preparation, but I am determined to become an engaging teacher in diverse range of subject areas.

For an undergraduate mathematics major, doing research is perhaps the ultimate form of active practice with mathematics. I participated in an REU at Mt. Holyoke in 2001 studying Ramanujan graphs. It was a step away from being just a student, and towards being a mathematician. It was a valuable experience, and it helped me make my decision to do graduate work. Because undergraduate research was so useful to me, I am especially interested in working with students on research projects. I realize that mathematical logic is not the most common topic for undergraduate research, but there are aspects of it which are certainly accessible. Moreover, my broad background will help me participate in projects with students in a variety of subjects.

It is a rare student, at any level, who understands everything just from watching a lecture. I am always looking for new ways to explain concepts, to motivate students to work through the material themselves, and to capture and foster their interest. Ideally, they come away with both the skills and the confidence in their own reasoning to be independent problem-solvers, in the end making me redundant.