TEACHING STATEMENT

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A standard course has a syllabus that comes from a long evolution and the needs of other courses. For this reason, my first objective in teaching such a course is to effectively impart the explicitly established concepts of the course. I will share several of the tactics I commonly use to achieve this aim; a unifying theme is that they are constructed to motivate the student to actively work toward a specific goal. During office hours, my first objective is a cooperative atmosphere in which students are the ones holding the chalk, explaining what they know or believe about a problem. It is common for students to come in asking about a problem, only to work it out on the board (to their surprise) after trying it with minimal guidance at my request. Other times, a student may come in expecting a routine verification that he or she is ready for a midterm, only to be surprised by their inability to work an example problem. In other words, students tend to misjudge their own ability. Commonly, after an issue has been resolved, another student comes in with the same question. At this point, I invite one of the less confident (yet still capable) students to be a representative of the group to reiterate the resolution they just found. When this fails and it seems each student is at a loss (a less common situation than one would expect), there is a natural curiosity that results from their effort, adding instructive value to my explanation. Correctly applied, this method adds confidence and communication skills to the list of benefits of a math class.

Aside from curiosity, an appropriate amount of stress is another natural motivator. For example, during a lecture, I tend to conclude the presentation of a technique or concept by asking the students to work out a specific example for themselves. After a few minutes I work it out on the board, allowing them to compare their work with mine. This serves a number of purposes: it precludes the situation where the clarity of my presentation artificially increases students' perception of their own understanding, and it allows meaningful practice while the concept is still fresh. Also related to stress, I use my exams as much for motivation as for evaluation. Students ask how they can verify that they are ready for a test, and my advice is to choose one or two entries from a list of concepts I have furnished, then to compose and solve a problem that combines those concepts. It is surprising how many students have not considered making up their own problems, though this is a fundamental activity for anyone who wants to learn mathematics.

A secondary aim is to share my perspective that math (like virtually every other intimidating, complicated subject) can be approached through experimentation, analogy and heuristic. Though the two tactics discussed above have some utility toward this end, it can be difficult to encourage this approach when many students lack confidence and the perspective that comes from years of effort; for the beginning classes I have taught, the main method I have is exemplification: when it is possible I try to compose a lecture more as a research diary than as a freight train of facts. For example, before introducing exponential functions, it makes sense to first examine the iterated application of taking a percentage to track the value of a savings account.

I feel that the methods of learning and using mathematics are not fundamentally different from those of science and engineering in that, when one is presented with a problem without an obvious solution, usually the first step is to experiment and try to find a pattern, then use that pattern to create predictable results. I want to share this philosophy with my students by presenting new concepts as outcomes of natural questions and mathematical experiments. This is not an easy job, and I am especially open to new presentation tactics that have a chance to make arcane formulas and seemingly arbitrary techniques into natural and beautiful insights.