TEACHING STATEMENT

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During the past fifteen years, my teaching philosophy has evolved to emphasize four goals:

(1) Quickly identify and help those students who are in danger of failing a course.
(2) Encourage students, especially from underrepresented groups, to participate in class.
(3) Encourage students to learn material as it is presented rather than to wait until one week before an exam.
(4) Train students to write effectively, in particular to write valid assertions and to correctly justify them.

To help students avoid failing a course, I give a *prerequisite quiz* during the first week. This helps to identify students who are underprepared for the course. Students have three attempts to pass the prerequisite quiz, and must meet privately with me if the third attempt is unsuccessful. I then help these students to obtain appropriate tutoring. Also during the first week, I photograph students and memorize their names. This facilitates interaction later in the semester, including personal invitations to attend office hours, and email messages such as "I am concerned that I haven't seen you in class lately. Is everything OK?"

I have many tricks to encourage participation. One is to treat their mathematical doubts with dignity, never letting these look like a failure on their part. In particular, I often respond to their questions with more questions of the form, "Do you agree...?" In a linear algebra class these might be, "Do you agree that x is an eigenvector of A with eigenvalue 1?", "Do you agree then that $Ax = x$?", etc. When a student stops answering "Yes," a precise misunderstanding often becomes clear. Furthermore, the sequence of questions helps the student to see that the task of learning is not entirely theirs; it is also *mine*.

Another trick is to recommend a list of questions to the students. My list includes "I'm not sure I'm convinced," and "Could you remind me...?" as sophisticated alternatives to "I'm lost." It also includes questions of the form "What is the significance of...?" for more specific doubts. In addition to increasing communication, these overly formal questions often add some humor to the class period.

Unfortunately, no matter how effectively a strategy encourages participation, it is often the ethnic/gender majority of the class does all of the participating. Thus the name memorization mentioned above has a second advantage: it allows me to choose who participates. I can incorporate students into class discussion by asking, "Michael, I need a number to make an example. Can you pick an integer between -9 and 9?" I can also ask, "Julie, you look like you don't believe me. Should I explain that again?" These nonthreatening examples

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of cold-calling show students that I remember them, and hopefully reduce feelings of being marginalized.

In addition to encouraging participation, I encourage students to learn material as it is presented. For Lehigh's Math 22 (Calculus II), I have written twenty-eight nontraditional practice exams, each covering only one topic from the course. Each is typeset as if it were a real exam, with several multiple-choice questions and several long-answer questions. I provide these in lieu of a multi-topic practice exam before a real exam, which might encourage students to procrastinate. When students know that they will not be given a copy of the real exam ahead of time, they take the individual course topics more seriously.

Finally, I promote effective writing by requiring that submitted homework consist entirely of full sentences. Specifically, each solution must begin with a grammatically correct assertion called a *claim*, which is then justified by a valid mathematical proof. This style is essential for the study of advanced mathematics, science and engineering. It obliges students to understand their own work, to practice the justification of a scientific assertion, and to prepare for future technical communication in their chosen fields. Student Sean White, who had taken Math 261 (Discrete Structures) with me, told me, "I'm glad you taught me how to write proofs. It makes all the difference in Math 301 (Principles of Analysis)."

When students write carefully, study all topics with determination, and participate in class, they certainly learn more effectively than they would otherwise. This makes teaching easier and more enjoyable for the instructor. I strongly favor employing the strategies above.