

Teaching Statement

Jesse Ratzkin

People learn best by doing, rather than passively listening or watching. It's easier to learn one thing than it is to learn many things. These two deceptively simple statements form the basis of my teaching philosophy.

I have taught a wide range of classes, from remedial algebra and trigonometry to graduate-level topics courses. In all my classes, I have found that the successful students are the active ones, who participate in classroom discussions and do most of the assignments. Indeed, the most important part of any syllabus of mine is the paragraph which explains that "mathematics is not a spectator sport."

To this end, I encourage classroom participation and do my best to have make the student do as many math problems as possible. In addition, I have used technology as a tool in the classroom. Two of the classes I have taught had a computer lab portion, for which I wrote supporting code in MAPLE. The students had the option of using whichever coding language they pleased. Each of these computer assignments demonstrates an important point in the material and familiarizes the students with how some of the mathematical constructs work. In this context, computer labs play a valuable and important role in furthering the students' understanding of the subject. I have also taught a course where the students submit homework assignments using an online, web-based program called WebWork. This program immediately tells the students whether the answers they submit are correct and allows the students to resubmit answers indefinitely. The fact that students can resubmit answers encourages them to keep attempting the problems until they get the right answer.

The principle of active learning extends to situations which do not fit into the standard classroom model. I have participated in the Math Circle program at the University of Utah, where motivated high school students come to the mathematics department once a week and learn interesting mathematical tidbits. In these sessions, the students learn more (and have more fun) when they are actively trying to solve a problem, rather than listening to someone explain a mathematical principle. For this reason, we limit the amount of time someone is lecturing to the students to 20 consecutive minutes or less.

I have also volunteered in teaching youth bicycle repair classes. In these classes, each child (age 8–15) takes apart a bicycle and rebuilds it. I always try to get the children to do as much of the physical work themselves as possible. For instance, when I teach them how to rebuild hubs I might repack one of the hubs, but I get the child to repack the other hub. In this class, the children learn more, and have more fun, if they spend more time turning wrenches.

The fact that it's easier to learn one thing rather than many suggests that each course should have a unifying theme. This theme should be short (one or two sentences) and all of the material in the course should relate to it. The reason for providing such a theme for a course is that it gives the student a convenient framework on which to hang all of the course material.

This main theme depends on the course and can be quite simple. For instance, when I taught trigonometry the theme was "know your unit circle!" I referred to this theme as often as possible and related everything in the course to the geometry of the unit circle. As another example, the theme for the multivariable calculus class I am currently teaching is "what should the fundamental theorem of calculus mean for functions of several variables?" Thus, I have related everything in

the course to familiar concepts in single-variable calculus.

A main theme for a course benefits both the student and the instructor. For the student, it provides a framework on which to hang the course material. It is much easier for the student to learn new material when it all related to one centralized theme. A main theme also provides the instructor with a way to organize his or her thoughts in preparing the lectures. I find that my lectures are much more organized and easy to follow if I follow the central theme of the material.

In summary, my main goals in teaching are to first get students to learn by doing, rather than just listening and watching, and to teach one unifying theme in a course, rather than many disparate facts.