

Teaching Statement

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I have always been a fan of mathematics. Ever since I was a kid, I've wanted to figure out how everything works. As I got older, I started to realize that almost everything was connected to a mathematical concept. I decided that to really understand anything, I would have to start first by understanding math.

However, I know that many students do not share my feelings towards this subject. Usually, people shudder or wince when I tell them what I do for a living. My first goal in any instructional situation is to try to help the student overcome this fear. If a student learns to love math, the learning portion will become much easier.

Assessment.

I generally start the course with a pretest to cover ideas which the students should know in order to understand the semester's material. If students are missing some key concepts from the background courses, I try to cover this material in the first few days or so. If a particular student is having difficulty with the concepts, I offer to help him or her outside of class. I make it clear to the students that they can set up a time to meet with me if they are unavailable during my office hours.

Intuition.

I handle each explanation by evaluating intuitively from the bottom up, rather than by memorization and citation of existing formulas. I try to explain in detail the most basic foundations of each concept. When a student is presented with the explanation of a simple idea, one that he or she may have learned in elementary school, that concept is reinforced by bringing a new perspective to its solution. This helps a student to solve nonstandard problems by learning to use an intuitive approach.

For example, I never assume the students have memorized the double angle formula $\cos^2(x) = \frac{1}{2}(1 + \cos(2x))$. Instead, I spend a minute each time to derive the formula using the angle sum identities. I encourage the students to do the same, and to learn how to derive a formula as opposed to reciting it verbatim.

Preparation.

I make sure to bring a well-prepared lecture to the class, and to use plenty of visualizations. At the end of each class, I like to give the students a question that they can think about between classes. This question will serve as a segue into the next topic, and will prepare students for what will come.

As an example, in Calculus II we introduced the concept of a series. In addition to the homework, I gave them a particular series and asked them to think about it: $\sum_{n=0}^{\infty} \frac{1}{n!}$. I told them to work out the first few partial sums and to tell me if it seemed to be approaching anything in particular. The next week we covered Power Series, and for an end-of-class example I gave them the series $\sum_{n=0}^{\infty} \frac{x^n}{n!}$. I asked them to find the radius of convergence. A few days later, I asked them to find the value of the derivative of this series with respect to x . They noticed immediately that this function had the same value as its derivative, so I asked them to think about what functions are equal to their derivatives, and then to see if any of those functions also agree with this power series for

specific values of x . By the time we introduced Taylor and Maclaurin Series and found the Maclaurin series expansion of $f(x) = e^x$, the students were already familiar with the example and had a strong handhold to help them grasp the concept.

Consistency.

It is very important to be consistent when presenting the topic. While I may introduce a new idea with a small amount of “hand-waving” so that the students can grasp the big picture, I am always careful to discuss the material in a very rigorous and unambiguous manner.

For example, in Calculus I, most functions discussed have domain and range which are subsets of the set of real numbers. However, I remind the students constantly that the function could have some other type of domain and range. I cite for example a function which sorts the students, i.e., one which takes in an integer between one and the class size and outputs a specific student. I continue to remind students even in Calculus II the specific times in which we are dealing with functions whose domain and range are the reals, and as a result they are more receptive when I introduce the notion of a sequence as a function from the natural numbers to the reals. I point out that many of our Calculus ideas (limit at a point, differentiation, slope, integration) no longer hold for these types of functions, and that we must introduce a new set of actions for these functions. I then relate sequences and their corresponding series to functions on the reals and their integrals.

While it may take longer in the immediate sense to explain topics rigorously, I have found it to pay off in the long run. Eventually, the core ideas sink in and more complex concepts in the future will become second nature to the students. For math majors, higher courses such as Discrete Mathematics, Algebra, and Topology will become more clear. For non-math majors such as engineers or computer scientists, the generality of this method helps the student apply the concepts discussed to more real-world scenarios.

Application.

Most importantly, I emphasize direct and indirect application of the material. The “when am I going to use this?” angle is very important to me in helping a student see the immediate results of his or her studies. After introducing an idea, I try to show when it will be used (both directly and indirectly) in higher classes and in real life situations; not just for math itself, but engineering, computer science, and other subjects as well. To this extent, I like to begin a semester by finding out what major each student is pursuing, to tailor the examples of the class to their needs.

In a society where technology is growing so quickly, it is becoming apparent that everyone will require a higher understanding of mathematics to compete. I consider it my job as an instructor to help them not only with basic understanding, but also how to enjoy making math work for them.