

TEACHING PHILOSOPHY

As an academic and educator, I believe one of my primary duties is to be an ambassador for mathematics. In the classroom, this means meeting students at their current academic and social levels. Communicating my passion for mathematics in an accessible manner is essential, as enthusiasm is highly contagious. To engage students, I need to make the subject exciting for them, yet I also recognize the need to alleviate any discomfort or fear associated with the subject.

In my teaching approach, I address these concerns by integrating them into my lessons. I explain that the challenge in mathematics often lies not in the concepts themselves but in gaining familiarity with them and expressing them on paper. My strategy involves three key examples:

- (1) Demonstrating innate mathematical intuition, such as by tossing a chalkboard eraser to a student and then discussing the maths behind projectile motion.
- (2) Encouraging students to recognize the maths in everyday activities, like the arithmetic and algebra involved in driving.
- (3) Sharing my own errors in homework to illustrate that embracing challenges and learning from failures is crucial in mathematics. I emphasize that setbacks are opportunities for learning, not reasons for discouragement. And end by telling them, “in my classroom, every time you spill a glass of milk its an opportunity to fill your glass with something new.”

This approach helps to disarm concerns, humanize the subject, and reduce resistance to learning new material.

Insofar as learning is concerned, I am of the philosophy that memorization is a poor substitute for understanding. For instance, if we understand the theorems and concepts surrounding series, continuity, measures, et cetera, we needn't memorize the formalization of Riemann or Lebesgue integrals. We can simply build that formalization up from first principles. With understanding comes an ability to construct and create in a way that is stifled with memorization alone. For this reason, I actively encourage my students to choose understanding over memorization. One way that I do this is by allowing test corrections for partial credit, enabling students to learn from their mistakes and build confidence.

Another method I employ is relating mathematical concepts to students' experiences. “You're a construction worker? Great, let's talk about laying concrete and bricks and optimization methods. Work in a deli? Well, the slicer works a bit like the Disk Method! You're a seamstress? Let me tell you about polynomials!” This not only aids in understanding but also counters the notion that mathematics is impractical. Of course, none of this is enough on their own. We need a strategy for how to implement all of this cohesively.

What that looks like for my classroom is that I first start with a motivating question. For example, when talking about the Heat Equation in a PDE

course, I may start with the question, “how does heat ‘flow’ in a rod?” This then opens up the class to discussions on possible methods, which I would then gently guide with theory until we eventually got to the formulation of, $u_t = k_1 \Delta u$. “So how might we solve this?” I’d ask next, pushing them to think about different methods, and eventually getting to the notion of separation of variables and eigenvalue solutions. After walking them through the motivating question, I’d return to the theory to write it out more formally. That would then be followed by an example, a vernacular explanation, and one or two additional examples. Again, with the focus on understanding and not rote memorization.

The mathematician Sofia Kovalevskaya once said, “many who have never had an opportunity of knowing any more about mathematics confound it with arithmetic, and consider it an arid science. In reality, however, it is a science which requires a great amount of imagination.” This is what I aim to foster in my students, a sense of comfort and understanding that enables them to truly comprehend and appreciate the beauty, scope, and power of mathematics.