Teaching Philosophy

As academics and educators, I feel one of our first duties is to act as an ambassador for our chosen field. In the classroom, what this looks like is the willingness to meet students where they are academically and socially. We have to find a way to communicate our passion for the field in a palatable way for the student. The reason for this is that at the core of passion is enthusiasm, and there are very few things as contagious as enthusiasm. If we want our students to engage with us, then we need to make them excited to engage with us. But, this alone isn't enough. We still have to assuage the discomforts and fears many may experience with the subject.

In my experience, the best way to do this is to acknowledge it within our own work. What makes math hard? Usually not the math, it's comfort with the material and the process of putting it down on paper. To tackle this, I generally lean on 3 examples.

(1) I start by demonstrating that we all have some form of a mathematical intuition. An easy way, I've found, of doing this is tossing a chalkboard eraser to a student and then writing some of the math behind projectile motion on the board.
(2) Next, I ask them to reflect on daily experiences like driving, an experience where most of us do arithmetic and algebra in our mind.
(3) Then, I show them a stack of my own homework that's been graded wrong. And, explain to them that in math, as with most things, we have to lean into the hard things to progress and move forward. That failure isn't a bad thing, unless we let it be bad by not learning from it. That there is no glass of spilled milk which can't be cleaned up, except for those which we choose to ignore and inexcusably let spoil.

At this point, you've disarmed their concerns, humanized the material and people who study it, and can move on to teaching the material with much less resistance in the mind of the student.

Insofar as learning is concern, I am of the philosophy that memorization is a poor substitute for understanding. For example, we needn't memorize the formalization of Riemann or Lebesgue integrals if we understand the theorems and concepts surrounding series, continuity, measures, etc. 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 back. It motivates students to revisit their past mistakes and to convert them into successes. In this way, not only are they learning from their mistakes, their building up a sense of confidence, and gaining a deeper understanding of the material by seeing the right and the wrong side by side.

Another way, that I keep the focus on understanding in my class is by teaching to where my students are and by pulling from their 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 sort of connection between the student's life and lecture material serves two jobs. It helps them understand the material by connecting it to a common experience. And, it also helps to dispel with the complaint that, "math isn't practical" or "isn't applicable to life." Of course, none of this is enough on their own, we need a strategy for how to implement all of this.

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 discussion on possible methods, which I would then gently guide with theory untill 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. Once, I've walked them through the motivating question, I return to the theory to write it out more formally, followed by an example, a vernacular explanation, and another example or two. Again, the focus in on understanding and not memorization.

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 try to provide my students, a comfort and understanding that allows them to imagine in the ways necessary to know mathematics.