By the time they walk into my college classroom, students have already taken over a decade of math classes. They invariably have strong preconceptions about what math is, and their own aptitude for it. Many, even highly talented students, are convinced that they are “just not a math person,” a self-defeating attitude made even more pernicious by a culture that frequently conflates mathematical ability and intelligence. My first task as a teacher is to meet each student where they are, with acceptance and compassion, and to provide them with an environment where they feel comfortable and empowered to learn. With baseline trust established, I offer them my own view of what math is, emphasizing logical reasoning over memorization of facts or algorithms, and highlighting the intrinsic aesthetic value of mathematics alongside its practical uses. Admittedly, encouraging students to reorient their understanding of a subject they have studied for many years is asking quite a lot. To help communicate and demystify my perspective, I organize my teaching philosophy and learning objectives into a few categories:

**Computational proficiency**

This is typically the category that students are most comfortable with, if not always best at. Many come in believing that math is all about computation. For students with a history of feeling lost and confused in math classes, or with a sense that they don’t belong, algorithmic computation can be something of a life raft, something concrete they can know how to do. It can also serve as a capstone, demonstrating to the students that they have learned something. For example, after learning about centroids in a class on integration, I had my students compute the centroid of an odd shape printed on cardstock, then cut out the shape and balance it on the tip of a pencil. The physical demonstration of their correct computation was a moment of victory.

While computation is rarely the focal point of my classes, I like to assign small sets of relatively easy computational exercises as homework for each class period. This has the effect of building students’ confidence, and encourages them to spend at least a little time thinking about math every day.

**Conceptual understanding**

I organize all of my classes around a few key ideas to which all others relate, and I present material with explicit reference to this architecture. By using early topics to foreshadow important results later on, and tying later material back to the central concepts, I help the students construct a scaffold on which to hang their understanding, with everything in context. I encourage them to study by drawing concept maps, or otherwise visually representing the relationships between course topics.

I principally assess understanding through weekly homework assignments featuring a small number of conceptually challenging problems. To mitigate the risk of students getting stuck and demoralized, and to build community within the class, I encourage them to work together on these problems, though they must write up solutions independently to demonstrate their understanding. Shorter and easier variations on these problems may later appear on exams, keeping assessment in line with instruction.

**Mathematical literacy**

The specialized, formal language in which math is done can be a significant barrier to the uninitiated student. I consciously work to lower this barrier by assuming as little technical terminology as possible, and by establishing a classroom atmosphere where clarifying questions are encouraged. I am thrilled when a student stops me because they have forgotten the definition of some object or property, because the alternative is not that they never forget but rather that they sit in silent confusion.

In addition to technical vocabulary, mathematical proof falls into this category. Proof is a particular challenge to many students, seeming foreign and unintuitive. In classes where it is expected, I make sure to talk about proof-writing as a skill, one which takes practice, and which students are not expected to be expert in on day one. At the same time, I emphasize that a proof is just an explanation, not so unlike writing they do in any other subject, only with a particularly formal style and high standard of logical precision. I sometimes assign students to peer-edit each other’s proofs, which helps them contextualize proof as a writing skill and provides them with important, low-stakes feedback. For alignment, assessment of students’ proofs should then take into account clarity and fluency, in addition to the logic and mathematical content.
Creative exploration

In stressing the usefulness of math in the sciences, I believe teachers often disregard its creative and aesthetic aspects. Particularly in general education or distribution requirement classes, I want my students to reflect on their personal taste for mathematics, in particular to see that math is something for which one has taste! When possible, I encourage them to play around with mathematical ideas, with the only goal of finding something that interests them. Digital tools such as GeoGebra and Desmos are excellent for this purpose. For advanced students, free exploration helps develop the subtle but essential creative skills needed for mathematical discovery; for students who do not plan to continue studying quantitative disciplines, or believe their weak math abilities preclude that option, the individual and subjective nature of creative exploration makes it easily accessible. This work is assessed only for engagement, as judgement of play would defeat the purpose.

Mathematical culture

Whatever specific class I am teaching, I try to give my students a glimpse of the wider world of mathematics. For example, when teaching induction in my calculus class last year, I opted to present the inductive proof that the Euler characteristic of a planar graph is always 2 (after letting them play around with graphs and investigate for themselves). This simple and beautiful result was unknown to anyone in the class; indeed, one student expressed that they would not have recognized an idea like this as math! There are many gems like this which can be appreciated widely.

Lastly, I avoid teaching math as if the ideas were handed down to us on stone tablets. Every definition or theorem we learn was written by a human, with deliberate design for practical or aesthetic purposes. Like any subject, math benefits from being taught alongside the long and multicultural history of its intellectual development. Doing so can motivate and demystify difficult material, and allow students to see themselves possibly contributing to that long history. In this way both the students and the mathematical community grow.