

# Nicholas Camacho

## Philosophy of Teaching Mathematics

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For many students, the words “mathematics” and “impossible” are essentially synonymous. Although this negative association is not true for all students, it is the perception of many. Designed to confront this perception, my philosophy for teaching is focused on finding ways to motivate students towards a better *perspective* of mathematics, creating an *atmosphere* that builds confidence, and emphasizes the importance of individual and cooperative *practice* that promotes problem-solving skills more than problem-specific skills.

A frequently-asked-question of the math student is “when am I ever going to use this?” Outside of financial math – and maybe some statistics – students are often convinced that learning math is irrelevant to their future. I confront this thinking in my classroom by showing students that the value in learning mathematics is often not in the explicit material learned, but in the skills gained along the way. In whatever career choice a student has in mind, the importance of learning mathematics is in practicing the ability to learn a new “language,” and then solving problems with the words, rules, syntax, and grammar of the new language. I am fond of saying to students, “I know that you may never again have to ‘solve for  $x$ ,’ but in whatever career path you choose, you will need to possess the determination and problem-solving skills that ‘solving for  $x$ ’ teaches you.”

Moreover, I emphasize to students the importance of possessing a “growth mindset” instead of a “fixed mindset.” A fixed mindset is one in which the student believes their abilities are fixed, determined, unchangeable, and hence leads to avoiding challenges and giving up when a problem arises. On the other hand, a growth mindset leads students to realize that their abilities are determined by their effort and attitude, and hence leads to embracing challenges and viewing problems as an opportunity for growth.

Giving a student the right perspective is only helpful if they have the right environment to realize this new mindset. In my experience, many students come in to a math class with fear: fear of failure, fear of their peers’ perception, and fear that they are incapable. When challenged by a new concept, this fear leads to a kind of paralysis which causes them to remain static and in a state of confusion. To combat this immobility, I promote an atmosphere where students can “think out loud”, and where students are not afraid to “fail” in front of their peers. I focus on building a strong rapport with the students, making genuine efforts to make each student feel welcomed, and always make sure to myself be the most excited and enthusiastic person in the room about math. In practical terms, this means, for example, that I speak words of affirmation and encouragement during class, teach new material with a captivating excitement, show interest in the students as people, as more

than just “students,” and make students feel that my office hours are, if they desire, a safe space to talk about more than just math.

In addition, I have experience working with students from underrepresented and underprivileged groups, and hence I am aware of the diverse backgrounds, cultures, learning styles, needs, and experiences that students enter my classroom with. Therefore I recognize the importance of creating not just a space to learn mathematics, but a space to be welcomed, supported, and encouraged.

Finally, it is impossible to learn mathematics without *doing* mathematics. Mathematician James Munkres writes in his popular textbook *Topology*, “Working problems is a crucial part of learning mathematics. No one can learn [mathematics] merely by pouring over the definitions, theorems, and examples that are worked out in the text. One must work part of it out for oneself.” Given the highest perspective and the most welcoming environment, a student may still never actually *learn* mathematics without actually doing mathematics for themselves. The emphasis in my classroom is found in giving students ample opportunities to learn mathematics through working many problems for themselves. In particular, this means that there is a deemphasis on lecturing as the main way we spend time in the classroom, and instead providing students with creative and cooperative ways to learn by doing. This not only means the students will solve textbook problems, but it also means that students are given opportunities to learn through discovery. For example, I may show the class a few examples of a concept, and have them hypothesize what the general formula or principle might be. Moreover, the students are shown not simply how to manually compute an answer, but how to problem-solve for themselves.

For example, a student once asked for my assistance in solving for  $x$  in an equation of the form

$$\sqrt{3x} = x + 5.$$

Instead of simply telling them the first step to take to solve this specific problem, I first helped the student think about what other types of equations they were familiar with, i.e. equations involving linear and quadratic expressions. Then I asked about how we could rearrange and manipulate the equation at hand in order to express it in one of these familiar forms. From there the student was able to see, on their own, that we should first “remove” the square root by squaring both sides of the equation, in order to change the problem into a quadratic expression. The student learned that when we encounter an unfamiliar expression, one problem-solving method is to try and re-express the problem in familiar terms.

When a student is encouraged to have the right perspective, become a part of a welcoming classroom, and are given opportunities to learn by doing and by self-discovery, they will have success in learning mathematics and, more importantly, in becoming a confident and happy critical thinker.