THE LOST ART

TO ALL THE PEOPLE WHO "HATE MATH"—I DO TOO. OR AT LEAST THE "MATH" WE TEACH IN OUR SCHOOLS.

BY JUNHEE LEE

"What is the next natural question to ask ourselves?"

The first time I experienced this philosophy was in a graduate-level Analysis course. My professor introduced a topic and we asked ourselves the next natural question, leading the lecture in whatever direction we were curious about. It was the first classroom experience where I was encouraged to be an innovator; I was asking questions and solving them for myself instead of absorbing what others said or reactively solving exercises. So when I walked out of the program, I asked myself the next natural question: Why is it that I had not experienced this creativity earlier on in my math education?

The picture of American high school mathematics became extremely frustrating after that experience. It was horrifying to me that students in Geometry would learn flowchart proofs instead of learning basic mathematical reasoning skills and lose the ability to articulate mathematical ideas. People in Pre-Calculus or Calculus on super-accelerated tracks came up to me in the middle of the year with questions that demonstrated that they had zero fundamental understanding of what they were learning.

These problems all stem from a flaw in the American math education system: the idea of mass-producing human calculators. In the interest of creating a society where everyone "understands the language of math," we indoctrinate our elementary school students with the incredibly boring notion that math is just monkey work, manipulating numbers and symbols with a strict set of arbitrary rules and formulas. And once everyone is able to do basic arithmetic and algebra, they're finally ready for interesting mathematical concepts and productive mathematical application, right?

In reality, once most students graduate from high school, they're stuck with the thought of, "I hated math in high school, so I don't want to do it anymore." And for good reason; if all the math I'd ever known was computing x for the millionth time, I'd also be that kid in the back of math class, working only to get the necessary grades and to fill my three years of math credits (God, what a chore!). On the other end of the spectrum, students who are told that they have mathematical talent due to their innate ability to bash out calculations and formulas faster than others find themselves in over their heads in college because they actually have to be able to think. The horror! Frustrated and now learning that their high school math education has failed them, these "talented students" find themselves discouraged and switch to a different major.

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After all of that, the government wonders why there's a lack of mathematical proficiency in the United States and then "reworks" the math education system so that kids will understand arithmetic and basic algebra better, adding in useless stuff like lattice multiplication and hang seven division to allow students to be "creative" in their arithmetic. And with virtually zero change to the system, the cycle starts all over again.

So, the only people who end up being successful are those who realize their curiosity about math at a young age and seek out resources to fill that curiosity. However, opportunities to do so are limited. Camps like the Ross Math Program are expensive and remote, and classes at West like Art of Math Problem Solving, which offers students the option to ask questions and explore math, are only offered as independent study courses and have extremely low enrollment. Should it really be so difficult to understand the art and beauty of math, instead of settling for the hollow shell it is now?

We need to start at the ground level and teach children to ask mathematical questions. Why is it that we don't have an integral solution to $2x = 1$, but a solution exists in the rational numbers? What properties are unique to the integers or the rational numbers, and what do they have in common? Students: when you're in math class and learning a formula or a theorem without any context or explanation, ask yourself, "Why?" And once you know why, ask yourself, "What's the next natural question?" Teachers: when you're giving a lecture, don't just move ahead to the next item on the agenda; instead have your students ask the next question and lead themselves further into the curriculum.

Because what I don't understand is, if we've established that there is a problem, isn't the next natural question, "What can we do to fix it?"

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