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NOTES FROM THE FIELD

What Have We Done to People in the Name of Math?

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ABSTRACT This reflective commentary examines how mathematics education shapes students' identities, anxieties, and long-term relationships with mathematics. Grounded in a personal conversation with a former student who described mathematics as useless and manipulative, the article explores how harmful mathematical experiences can lead students to see mathematics as a source of judgment rather than a tool for understanding. Drawing on scholarship about math anxiety, relational understanding, mathematics as a human and cultural practice, and mathematics for social justice, the article argues that educators must distinguish mathematics itself from the ways school mathematics has often been taught, assessed, and used to sort students. It concludes by proposing a repair-oriented approach to mathematics teaching that centers sense-making, student agency, multiple representations, and real-world investigation.

KEYWORDS *mathematics education, mathematical repair, math anxiety, relational understanding, mathematics identity, social justice*

Introduction

As a mathematics teacher, enthusiast, and self-proclaimed "math person," I can almost guarantee what people will ask when they find out what I do: "Where and when will I ever use these math concepts?"

In my calculus class, my students once asked, "Mr. K, when are we ever going to use derivatives in our lives after here?" I smiled and answered, which I will share later in this piece.

Not long ago, I got into a debate with a former student about math and its place in our lives. She argued that math is a useless subject, that it does not give meaning to anything, and that it is mostly used to dramatize or manipulate information. To be fair, she had just written a term paper and been told to "ground her position in data." That feedback set her off: Why did she have to add math before her ideas could make sense? We talked for a long time. At one point, I told her that if she left my class believing math is useless, then I had failed her as a mathematics teacher.

That conversation made old questions feel more urgent: Are we teaching math the right way? Are students leaving our classrooms with the understanding we hope they will gain? Why do so many people feel not just distant from math, but actively harmed by it?

The big question I am trying to answer is this: What have we done to people in the name of math?

In this piece, I want to push the conversation about mathematics education in a different direction. I aim to (a) name some of the harm mathematics education has caused, (b) show that mathematics is deeply woven into our lives, and (c) challenge the idea that math is only about numbers, equations, and textbook exercises.

I frame this work as a call for *mathematical repair:* the intentional effort to rebuild students' relationships with mathematics after years of fear, shame, exclusion, or procedural learning without meaning. Mathematical repair requires educators to do more than make math "relevant." It asks us to recognize the affective wounds students carry, separate mathematics from the harmful ways it has been taught or used, and create classrooms

where mathematics becomes a language for sense-making, critique, and agency.

The Wounds Math Leaves Behind

When I replay that conversation with my former student, I do not hear only an intellectual disagreement. I hear pain. I hear years of tests, grades, and teacher comments that told her, directly or indirectly, that she was "not a math person." Saying "math is useless" was not just an opinion about a school subject; it was a way of pushing back against something that had felt cold and unforgiving for most of her life. Many students do not just dislike math; they fear it.

Researchers use the term *math anxiety* to describe intense feelings of tension and worry that arise when a person faces a math problem or even thinks about math. These feelings can show up physically: through a racing heartbeat, sweaty palms, or nausea and they make it harder to think clearly in the moment (Luttenberger et al., 2018). Math anxiety does not appear out of nowhere. It often grows out of repeated experiences: timed tests, ridicule after a wrong answer, being told "this is easy" when it clearly is not, or hearing adults casually say, "I've always been bad at math." Over time, some students protect themselves by shutting down in math class or by saying "I just hate math" before math can hurt them again.

As these students become adults, their stories harden into beliefs:

- "Math is pointless."
- "Math is just used to manipulate people." Meaning people use numbers dishonestly and it makes situations feel more serious than they are.
- "Math is always wrong."

When my former student said that "math is just used to manipulate people," she was not claiming that numbers themselves are inherently false or deceptive. Rather, she was criticizing the rhetorical force that numerical language can carry in public and personal discourse. Her example of debt makes this concern especially clear. A statement such as "people are in debt" names a social and economic problem in general terms, but the addition of dollar amounts, percentages, interest rates, or national totals can make that same issue feel more overwhelming, threatening, and immediate. From her perspective, quantitative detail does not always deepen understanding; sometimes it intensifies emotion and encourages acceptance of a particular interpretation.

Her example helped me see that her frustration was not with mathematics as a descriptive tool, but with the ways numerical information can be presented to shape perception. I had suggested that quantifying an issue can make it easier to understand, but her response revealed a different concern: numbers can also be framed in ways that make people feel alarmed, judged, or powerless. This distinction matters. Mathematics can clarify complex realities by making them measurable and comparable, yet it can also be used selectively to influence emotional reactions and guide interpretation. In that sense, her comment raises an important question about whether mathematics functions only as a neutral language of description or also as a persuasive instrument in social discourse.

In this sense, such a reaction can be understood as a form of self-protection. If mathematics has become associated with embarrassment, exclusion, or failure, then rejecting it may serve as a way of reclaiming agency. The dismissal of math, therefore, is not necessarily a rejection of reasoning itself, but a response to the social meanings and emotional consequences that have become attached to it.

Viewed from this perspective, the question "What have we done to people in the name of math?" becomes even more unsettling. Mathematics is fundamentally a human practice of pattern recognition, problem solving, and meaning making; yet in educational settings it has too often been reduced to a mechanism for ranking ability and assigning worth. Rather than inviting curiosity and intellectual growth, the way it is frequently taught can produce shame, alienation, and defensiveness. If students come to see mathematics as a source of judgment rather than understanding, then their resistance is not simply academic failure, but a reflection of how mathematics has been socially and pedagogically framed.

Is Math Itself the Problem?

One mistake we often make is confusing school math with mathematics itself.

School math, as many students experience it, is a long list of rules:

- "Bring down the 2."
- "Flip the second fraction and multiply."
- "Change the sign when you move it to the other side."

Students are told to memorize, repeat, and move quickly. If they ask "why," they are often told, "You'll understand later," or "You just have to do it this way."

British educator Richard Skemp (1976) described this style of learning as *instrumental understanding*, or "rules

without reasons." His distinction matters because it helps explain why many students can complete assignments yet still leave math class feeling that mathematics makes no sense. A student may learn how to carry out a procedure without understanding the relationships that make it work. When mathematics is experienced primarily as rule-following, it is easier for students to see it as arbitrary, disconnected, or even oppressive. By contrast, *relational understanding* means knowing not only how to do something, but also why it works. It treats mathematics as a connected web of ideas that makes sense. Skemp (1976) argued that relational understanding is both more satisfying and more flexible because it enables students to adapt to new problems rather than simply repeat familiar steps.

The problem, then, is not that mathematics itself is broken. Rather, the problem is that our educational systems often stop at instrumental understanding. We emphasize rules and procedures, then judge students harshly when they cannot remember or apply them quickly. Too rarely do we give students the time and space they need to build relational understanding.

This distinction also helps clarify a larger point. Philosopher Paul Ernest (1998) argues that mathematics is not a cold, perfect object floating above humanity; it is a human creation shaped by people, culture, and history. Similarly, Alan Bishop (1988) shows that every culture develops mathematical ideas to meet its own needs, whether through counting, building, navigating, or designing patterns. If mathematics is a human activity, then the way we present it in schools is a choice. We can present it as creative, sense-making, and deeply human, or we can reduce it to a list of commands. When people say that "math is manipulative," then, it is worth asking whether mathematics itself is the problem, or whether the issue lies in how mathematics has been packaged and used.

Together, Ernest and Bishop challenge the idea that mathematics is merely a fixed body of neutral facts handed down to students. Their work helps frame mathematics as a cultural and human activity shaped by the questions people ask, the problems communities face, and the values embedded in what societies choose to measure. This matters because if mathematics is human, then mathematics teaching is also a human and ethical act.

What Mathematics Really Is

Before I return to derivatives, I want to describe what I believe mathematics really is. At its heart, mathematics is the study of patterns, relationships, and structure. It is what happens when curious people ask:

- "What happens if this pattern keeps going?"
- "Is there a more efficient way to solve this problem?"
- "Is there a fairer way to divide resources, represent people, or make decisions?"
- "How can we measure or compare these things in a meaningful way?"

Mathematician Francis Su (2020) describes mathematics as something that speaks to deep human desires: play, beauty, truth, freedom, and justice. Su's framing is useful because it moves mathematics away from the narrow question of utility alone. Mathematics matters not only because it helps people calculate, but because it can cultivate curiosity, persistence, play, beauty, and a sense of belonging. This broader view is essential for students who have only experienced mathematics as pressure, speed, and judgment. When someone solves a puzzle, notices a pattern in music or art, or figures out a clever shortcut in a game, they are using the same kinds of thinking that drive mathematics. When we reduce this rich, human activity to copying examples from a board, we shrink mathematics to its least interesting form. It becomes something done to students, not by them. No wonder people walk away thinking math is meaningless. We have hidden its meaning.

Where Math Shows Up in Real Life

Students love to ask, "When are we ever going to use this?" Let me answer that in three ways.

Everyday Decisions: Health, Money, and Risk

Consider health. When you read that a medicine reduces the chance of a certain disease "from 10% to 5%," you need to understand what that means. Are we talking about 5 fewer people out of 100? Or something else? When you see a graph of COVID-19 cases or a chart of heart rates from a smartwatch, you are reading mathematical information. Research on health numeracy shows that people who struggle to interpret numbers, percentages, and graphs often have more trouble making good medical decisions, following treatment plans, or weighing risks, such as whether to get a screening test (Reyna et al., 2009). In other words, math is literally connected to how well we can navigate life-and-death choices.

The same is true for money. Interest rates on credit cards and loans, the difference between a fixed-rate and an adjustable mortgage, and the long-term impact of saving early all involve mathematical ideas. Economists

have found that people with stronger numeracy skills make better financial decisions and are less likely to fall into certain kinds of debt traps (Lusardi, 2012). You may never solve a quadratic equation on paper while standing in a bank, but the habits of mind that come from understanding math: checking assumptions, comparing options, and thinking about long-term growth or decay, are exactly what help protect you financially.

Rates of Change: What Derivatives Really Mean

So, what did I tell my calculus students when they asked, "When are we ever going to use derivatives?" I told them: whenever you care about how fast something is changing, you are thinking about derivatives.

- A speedometer shows how quickly your position is changing.
- A heart monitor shows how your heartbeat changes over time.
- A business tracks how quickly profits are growing or shrinking.
- Climate scientists study how temperature or sea level changes over years, not just what it is today.

Most people will never be asked to take the derivative of a complicated function by hand. But understanding the idea behind derivatives: change, growth, and decay, is essential for reading graphs, interpreting trends, and making predictions. It helps people recognize when a situation is improving slowly, worsening quickly, or holding steady. Mathematics gives us language for talking about these patterns clearly rather than relying on guesswork.

Power, Media, and Justice

Math also shows up in who gets power and who does not.

Our world runs on data: algorithms influence which ads we see, which neighborhoods receive extra police patrols, which loan applications are approved, and even which students are labeled "gifted." In *Weapons of Math Destruction*, Cathy O'Neil (2016) describes how many of these mathematical models are "opaque, unregulated, and incontestable," and how they often reinforce existing inequalities. Her work is especially relevant to students who believe mathematics is manipulative because it shows that mathematical systems can, in fact, be used harmfully when they are hidden from public scrutiny. Yet her argument does not require us to reject mathematics. Instead, it suggests that mathematical literacy is necessary if people are going to recognize, question, and challenge the systems shaping their lives. If ordinary people do not understand basic math and statistics, they have little power to question these systems. They may not recognize when a graph is misleading, when a risk is exaggerated, or when an "objective score" is deeply unfair. Saying "I don't do math" in a world of data is a bit like saying "I don't read" in a world governed by written laws.

At the same time, educators like Eric Gutstein argue that mathematics can be used to challenge injustice, not just support it. In Reading and Writing the World with Mathematics, he shows how students can use math to investigate issues like housing discrimination, wage gaps, and environmental racism in their own communities (Gutstein, 2006). Gutstein's work provides an important counterpoint to the idea that mathematics only functions as a gatekeeper. If mathematics can be used to expose housing discrimination, wage gaps, environmental racism, and unequal access to resources, then mathematics can also become a tool of civic participation. In this sense, mathematics education is not only about preparing students for tests or careers; it is also about preparing them to read and act on the world around them. In that view, math is not just a school subject; it is a tool for making sense of the world and acting in it.

When Math Becomes a Weapon

If mathematics can help us make good decisions and fight injustice, why do so many people feel that math itself is harmful?

Part of the answer is how math has been used as a weapon in education.

Think about high-stakes standardized tests, early tracking, and labels like "remedial math." From a young age, students are sorted based on timed tests that mainly measure speed with procedures. These labels often follow them for years, shaping which courses they can take and which futures they can imagine.

Alan Bishop (1988) draws attention to the ways mathematics has been used as a "secret weapon" of cultural power. When one culture's style of math is treated as the only "real" mathematics, it can become a tool for judging and controlling others. From a different angle, Paul Ernest (1998) argues that when we teach math as absolute and value-free, we hide the human choices built into it: what to count, what to ignore, and whose problems are worth solving. Outside the classroom, math-based systems: credit scores, school ratings, predictive policing algorithms, and more, can function as "weapons of math destruction" when they are unregulated, biased, and shielded from public understanding (O'Neil, 2016).

So, my former student is not entirely wrong when she senses that math can be used to manipulate or harm. She is noticing a real pattern. We have indeed used math to:

- Rank and label students.
- Gatekeep college majors and careers.
- Justify unequal funding and harsh policies.
- Wrap questionable decisions in the language of "data" and "objectivity."

But the key point is this: the problem is not that mathematics itself is evil. The problem is that powerful people and institutions have chosen to use mathematical tools without care, transparency, or justice. If we respond by rejecting math altogether, we lose the very tools we need to uncover and challenge those abuses.

Rethinking How We Teach Math

If we have harmed people in the name of math, what would it look like to repair that harm?

From "Get the Answer" to "Make Sense"

First, we must move from purely instrumental teaching ("follow these steps") to relational teaching ("here is why this works"). Skemp's (1976) distinction between instrumental and relational understanding gives us language for this shift.

In a traditional classroom:

1. The teacher shows an example.
2. The teacher works through a few similar problems.
3. Students do many almost-identical problems while the teacher checks answers.

Students who already memorized the procedure look "good at math." Students who need more time or a different approach often feel lost and embarrassed. There is little room for questions like "Why does this make sense?" or "Could we solve this another way?"

In a reimagined classroom:

- Students start with a problem that is understandable but not instantly solvable.
- They explore patterns and test ideas in pairs or groups.
- The teacher asks, "What do you notice?" and "Why do you think that works?"
- Multiple solution paths are shared and compared.
- Formal methods are connected to the ideas students uncovered.

Jo Boaler (2016) describes this as developing mathematical mindsets. Her work matters here because students' beliefs about their own mathematical ability are not separate from instruction; they are shaped by classroom experiences. When students repeatedly encounter mathematics as speed, correctness, and comparison, they may come to believe that mathematical ability is fixed. A classroom that values mistakes, multiple strategies, and discussion can interrupt that belief. When students are encouraged to see mistakes as opportunities, use visual and creative strategies, and talk through their thinking, they are more likely to believe that everyone can grow in math, not just a few "naturally gifted" students.

Naming and Healing Math Anxiety

Second, we need to name math anxiety and trauma openly. If students have been carrying negative experiences for years, pretending everything is fine will not work.

Simple moves can help:

- Sharing our own moments of struggle or confusion with math.
- Giving students time to think before asking for answers.
- Allowing multiple representations (words, pictures, tables, graphs).
- Praising reasoning and persistence, not just speed or correctness.

Luttenberger et al. (2018) point out that math anxiety is shaped by family and classroom environments, not just something inside the student. That means teachers and schools have real power to either intensify or reduce that anxiety.

Math as a Tool for Seeing the World

Third, we can design tasks that connect math to students' real lives and to questions of fairness. Following Gutstein's vision of teaching math for social justice, we might ask students to:

- Analyze data on local housing prices or eviction rates.
- Compare graduation rates for different groups of students.
- Study how voting districts are drawn and how that affects representation.
- Model the spread of a rumor or a disease in a school.

These are not just "applications" added to the end of a unit. They communicate to students that their world is worth studying carefully, that their questions about fairness matter, and that math can help them investigate those questions (Gutstein, 2006). Even in calculus, we can do more than talk about abstract functions. When I answer the derivatives question now, I try to connect it to students' own experiences:

- How fast is your follower count growing?
- How quickly is your bank account balance changing after you start a job?
- How fast does your sprint speed increase when you train over a season?

We sketch graphs, talk about rates of change, and connect that to the derivative they are learning to compute. The goal is not just to prove that derivatives are "useful," but to show that the underlying idea is already living in their world.

The contribution of this reflection is not to claim that math anxiety, relational understanding, or mathematics for social justice are new ideas. Rather, it is to bring these ideas together under the language of repair. If mathematics education has contributed to fear, shame, and exclusion, then mathematics teaching must become intentionally repair-oriented. This means designing classrooms where students can rebuild trust with mathematics while also learning to use it critically in the world.

Conclusion: Repairing What We Broke

So, what have we done to people in the name of math?

We have told children, often very young, that speed with procedures equals intelligence. We have used tests and scores to track and limit their futures. We have treated one narrow style of mathematics as neutral and universal, while ignoring the ways it can support or challenge power. We have allowed harmful uses of algorithms and data to hide behind the authority of mathematics. Then, when those same children grow up and say, "Math is useless" or "Math is just manipulation," we act surprised.

I do not blame my former student for her anger. In many ways, her reaction is honest. She is refusing to worship a subject that, in her experience, has mostly brought stress and judgment. But abandoning mathematics entirely is not the answer.

Math is already woven into our lives, our health decisions, financial choices, news feeds, laws, and struggles for justice. The question is not whether we will use math, but whether we will use it blindly or wisely; whether it will serve as a tool of domination or a language for understanding and transformation.

As educators, we have a responsibility to:

- Teach math as sense-making, not just symbol-pushing.
- Create classrooms where students can question, explore, and see themselves as capable thinkers.
- Help students use mathematics to read and write about the world, not just pass a test.
- Name past harms and work intentionally to heal them.

If we can do that, then perhaps one day, when someone discovers that you are "a math person," the question will not be, "When will I ever use this?" but instead, "What has math helped you understand about life?" More importantly, our students will be able to answer that question for themselves.

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