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2026

Creating a Positive Math Culture

Egle Plytnikaite for Education Week

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EDITOR'S NOTE

Math is a challenging subject for both students and teachers. Because concepts build on one another, small gaps in understanding can quickly grow into major obstacles. Many students also **struggle to see how math connects to the real world**, and negative experiences can lead them to believe they are simply "not math people." Together, these **academic and emotional barriers** help explain why achievement remains low. This Spotlight explores **effective, classroom-tested practices** that help teachers **strengthen instruction** while **building students' math skills, confidence**, and willingness to tackle challenging problems at all grade levels.

Vanessa Solis/Education Week + Getty

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The Best Ways to Teach Word Problems So All Students Understand

By Olina Banerji

Word problems try and tell students a story about the math problem in front of them. They are a useful way to connect abstract numbers to concrete situations, so students can learn early on to apply math to solve real-world problems.

The challenge is that the combination of words and numbers can turn into cognitive puzzles, and students need to work multiple levers of their brains to unpack them. These problems can especially be a challenge for English learners or students who struggle to read or have a learning disability. In a nationally representative EdWeek Research Center poll, 29 percent of math teachers said less than a quarter of their English learners can solve word problems on their own.

If students spend all their time trying to understand the words or the context of a problem, they'll struggle to understand which mathematical function to pick. But making word problems too basic or easy, or teaching students specific "hacks" to solve a word problem, doesn't work, either, experts say.

In every word problem, there are three things that students need to do: read and understand the problem's narrative, determine what the problem is asking them to find, and identify one or more math operations to solve it.

Students who are successful problem-solvers think about what they're doing to solve the problem, and how they are doing it. When students are coached to reason through and solve the problem, it helps build their confidence.

Yet in the EdWeek Research Center survey, conducted this spring, about a third of math teachers said it's "very challenging" for them to teach multi-step word problems, and a quarter said it was "somewhat challenging." Fourteen percent said they don't teach this type of word problem.

Here's what the research says about the best ways to teach word problems.

Solving word problems isn't a solo process—teachers should join in

Students shouldn't encounter word problems for the first time in an assessment. Teachers need to bring the right word problems into rotation during lessons and expose students to mathematical language early. It's important for math teachers to have a deep understanding of their students' reading levels, prior knowledge, and cultural background.

Kevin Dykema, a math instructional coach in Mattawan, Mich., said he likes to present a word problem that uses a softball or baseball diamond to teach the Pythagorean theorem. But not all his students know what a softball or baseball diamond looks like, so he draws them a picture.

"You have to help fill in some of those missing pieces so that students can start solving that problem [and] aren't spending all their time decoding the words," he said.

Students need to understand the context and "type" of each word problem. Researchers suggest that teachers should play around with the information provided in the question to get students thinking conceptually about problems.

Numberless word problems can be used to do this—a teacher can introduce a problem without any quantities, which compels students to first think about the relationship between the entities in the problem and then the mathematical function they'd choose to solve the question.

A teacher may say, for instance, "Leo has some toy cars. Eric has a few more than Leo. How many cars do they have altogether?" The teacher can then gradually introduce the quantity of cars.

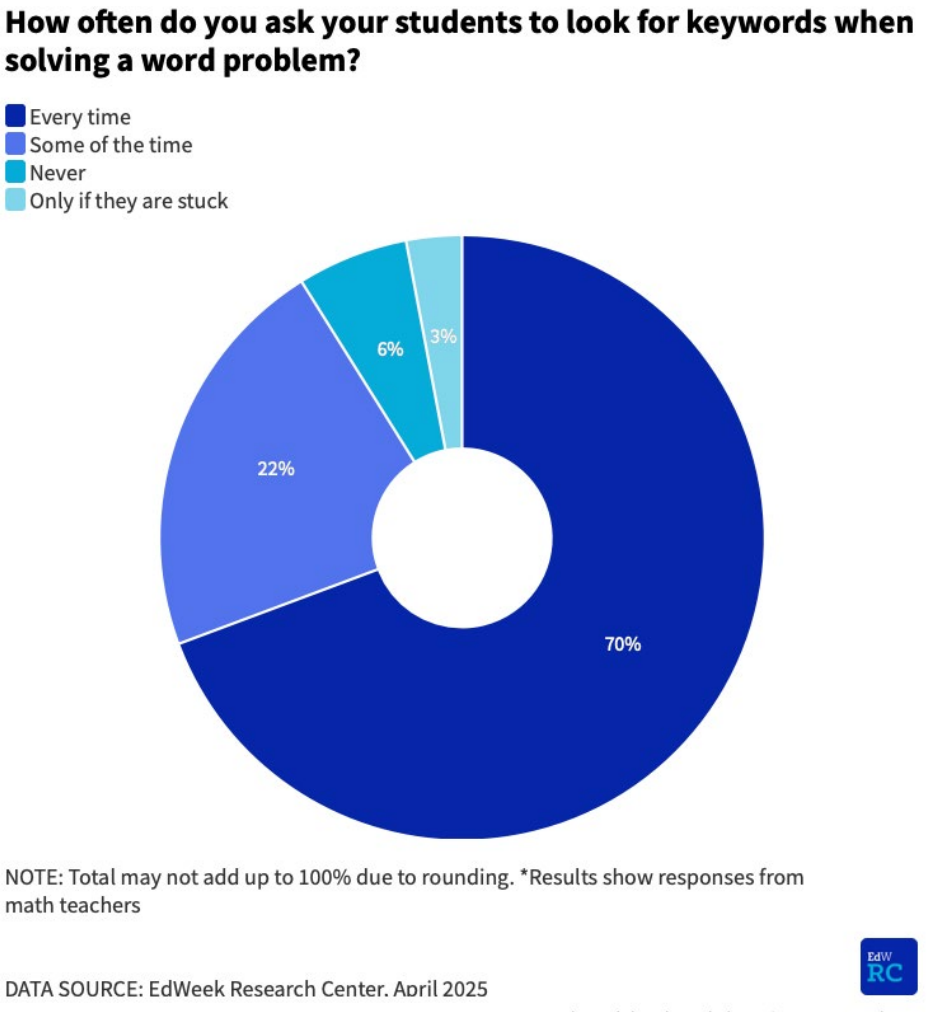
Or teachers can switch between missing quantities in the problem. For instance, students could be asked to solve for c in a+b=c. Then, they could be asked to solve for a or b to test how well they understand the relationship between the different values.

When teachers use "think-aloud" strategies—discussing steps with students as they solve a problem or visualize it—they should talk about why they chose a particular strategy. Research indicates that it's just as important for students to explain their rationale for solving or visualizing the problem as it is to arrive at the right answer. Students should expect to be asked how they solved the problem and be ready to answer.

Teachers should avoid having students look for keywords, a hack used commonly to connect words with mathematical operations. In the EdWeek Research Center survey, a majority of math teachers—70 percent—said they ask their students to look for keywords "every time" they solve a word problem.

But this hack isn't foolproof, say experts like Dykema. For instance, the word "more" within a word problem may mean students need to add the numbers, but a slight variation, like "how many more," could change the required operation to subtraction. Connecting words to specific strategies won't help students when the context of the problem changes.

Research suggests that getting students to reflect on their strategies will hone their problem-solving skills for higher-level problems, too. Teachers have to prompt this thinking through task lists (identify quantities, draw out the question, find the mathematical operation) and starter questions (What is this problem asking me to find? Have I solved a similar problem before?).



How to help students who struggle to read and comprehend the problem

Students should learn to visually represent different types of word problems in the form of bars, tables, number lines, or schematic diagrams before they jump to solving the equation. This strategy, research indicates, works well for English learners and students with disabilities.

Visualizations help students break down the problem into digestible bits—what do they need to find, and how they can find it? Some visuals work well for specific problems, like strip diagrams for problems that involve comparisons.

Pro tip: Use a handful of visualizations consistently to explain the word problems, instead of confusing students with too many representations.

Before jumping into a lesson on word problems, assess your students' reading abilities. Experts suggest that teachers work with colleagues who assist English learners or those with disabilities to design their instruction accordingly. However, don't assume that students who are still learning English are unfamiliar with the underlying mathematical concepts, too.

Using "Bet Lines" for English learners can boost their engagement with word problems. Bet Lines are a discourse strategy in which teachers read half a question and then wait for students to chime in with what they think happens next.

For instance, a teacher may read out, "Five cats went to the playground. What do you think happens next?" Students could respond by adding or subtracting cats from this equation. The Bet Lines strategy, experts say, will help build a student's mathematical reasoning. ■

Additional Resource
View this article's charts

Published May 05, 2025

5 Ways Teachers Can Support Students With Math Anxiety

By Sarah D. Sparks

A little stress can motivate, but teachers increasingly report their students' fears over math interfere with their learning.

In a nationally representative survey conducted this spring, nearly all K-12 educators told the EdWeek Research Center that math anxiety is a problem for their students. More than 1 in 5 elementary educators and more than 1 in 3 middle and high school educators said their students' math anxiety is severe—which could potentially be enough to interfere with learning, or sometimes even attempting to solve problems.

Plummeting math performance and rising rates of student mental health problems have created a perfect storm for math anxiety, but emerging research shows there are clear ways teachers can build students' confidence in the subject.

This primer on math anxiety offers five research-aligned strategies teachers can use to support students who avoid practicing math and are uncomfortable with the subject.

How does math anxiety work?

Math anxiety includes both stress around testing and a broader fear and avoidance of math tasks in general. Highly math-anxious people develop more negative emotional and even pain responses in the brain.

Anxiety can develop among both high- and low-performing students in the subject, but it does create a self-fulfilling prophecy: Highly anxious students tend to think they are "not math people" and avoid math tasks, limiting their ability to improve their skills, and the same stress can interfere with their ability to recall and use the skills they do have on tests.

Over time, math anxiety reduces student performance, which in turn increases the discomfort with the subject and makes it less likely they will pursue careers in science and math fields.

And many of these students never outgrow their fears. A majority of adults report discomfort with math—including 1 in 4 educators, according to the EdWeek Research Center survey. This can lead to intergenerational and even societal disconnection from math.

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Adults' own math discomfort can also affect their students' math anxiety. Studies find highly math-anxious parents are more likely to have math-anxious children—and that interventions encouraging families to explore math can build confidence in both parents and children.

Educators aren't immune from this discomfort. More than a third of educators surveyed told the EdWeek Research Center that they felt uneasy in the math classes they took as students, and the same share said they feel anxious when they have to do math now.

Students—particularly girls and students of color, who experience stereotypes of poor math performance—have also been found to be more likely to develop math anxiety over time if they are taught by math-anxious teachers.

Building effective interventions for math anxiety

Because math anxiety is not just about a student's objective math performance, effective interventions must address a student's academic gaps, work habits, and the "emotional and cognitive issues" associated with the anxiety.

Exposure. First and foremost, anxious students must continue to be exposed to and challenged by math. In the classroom, this means encouraging whole-class discussions rather than calling on just a few students and assigning group work to ensure all students are actively solving problems.

Some interventions that improve math performance overall also reduce anxiety.

Intensive tutoring in math—involving individualized or very-small-group instruction by a trained tutor for at least 30 minutes and four days a week—has been shown to accelerate learning growth in the subject, but results are more mixed when it comes to reducing outright fear. For severely math anxious students, studies suggest it can be helpful to treat tutoring like exposure therapy, with tutors directly correcting not only conceptual misunderstandings but also false perceptions (e.g., "I'm not a math person").

Collaboration might help anxious students be more comfortable doing math in the classroom. One international study found peer tutoring in which students learned to focus on "praise, patience, and respect" improved math-anxious middle schoolers' performance and anxiety related to learning math—though they remained fearful of math testing.

Similarly, encouraging families to engage in math games and puzzles at home can help reduce anxiety in both parents and children.

Improve study skills. Anxious students study less efficiently, focusing on passive activities like reading notes.

"Solving math problems can help you to understand where gaps may be; you may not notice those things if you're just reviewing practice problems," said Jalisha Jenifer, an adjunct assistant professor of psychology at Barnard College of Columbia University who researches math anxiety. "Without challenging yourself in those ways, you're not exposing yourself to the information that you may then need for that final exam."

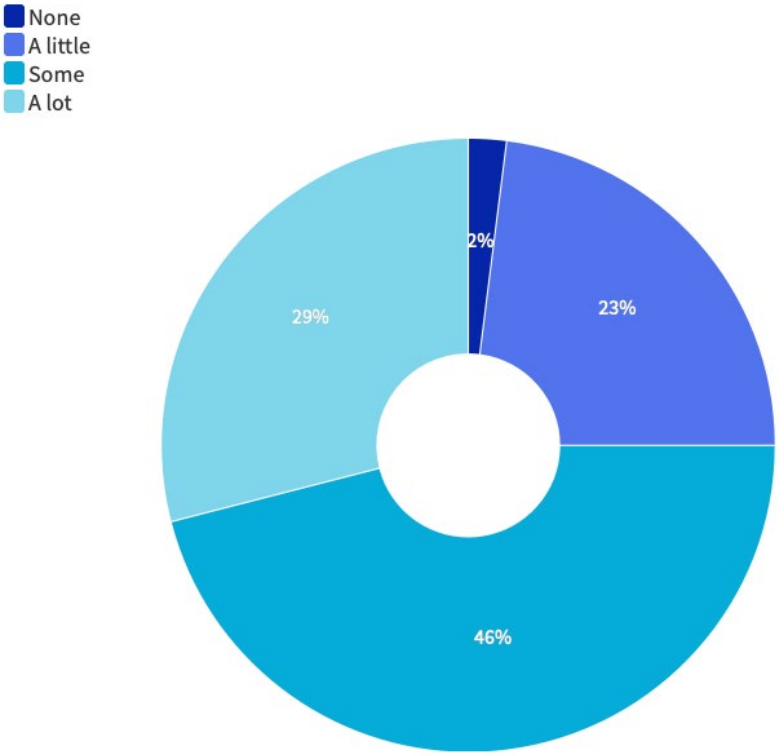
Teaching study strategies explicitly and providing both partially worked and unworked math problems as part of regular test-prep can improve math study habits, Jenifer said.

Using math journals and data reviews can help students learn to track and recognize their own progress in math, said Vanessa Vakharia, a K-12 math teacher and instructional coach in Ontario, Canada. She suggested teachers create a "failure wall," in which students post descriptions of mistakes and what they have learned from them.

"If someone comes in and they're like, 'Oh my God, I'm so upset I failed this entire quiz on integers,' I'll be like, 'Write it down, and on the back, what did you learn?'" she said. "Then [the wall is] so populated that when a student's feeling bad about failure, I'm like, 'Go read all the other ones.'"

Timing. Timed math activities like "math minutes," in which students race to calculate a high number of problems in a minute, are broadly used to help develop automaticity

To what extent, if any, is math anxiety a challenge for your students?



NOTE: Total may not add up to 100% due to rounding. *Results show responses from teachers, principals, and district leaders

DATA SOURCE: EdWeek Research Center, April 2025

with math facts. Results have been mixed about whether timed math tests increase student anxiety enough to affect performance, but experts agree that how these activities are structured and presented can make a big difference.

For example, while comparing students with each other can boost stress, challenging students to beat their own times can motivate them.

Reframing. Teachers should encourage students to manage their anxiety rather than avoid it.

Reframing and reinterpreting physical symptoms—the galloping heartbeat, sweaty palms, and swooping stomach—as signs of excitement encourages growth mindset and resilience rather than feeling threatened.

Building identity. Students from groups traditionally underrepresented in math—including girls, students of color, and students with disabilities—have been shown at higher risk for developing math anxiety.

Fostering a strong math and science identity is "paramount" to help students from traditionally underrepresented groups deal with anxiety in the subject, said Kristen Hengtgen, who studies science, technology, engineering, and math pipeline issues for the nonprofit group EdTrust.

"We have all this research that shows students of color, as well as girls and students with disabilities, are less likely to have a strong STEM identity," Hengtgen said, "but ... if you feel comfortable in the class, you feel like you belong, you feel like this is your thing, you're more likely to persist in the face of challenges.

"Fostering that identity means providing joyful STEM content—content that's relevant to students' lives and communities—and having diverse teachers who can show a positive role model as a math person," Hengtgen added. ■

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ST Math®: Math the Way the Brain Learns

How Visual Problem-Solving Expands Access to Meaningful Math

Across the country, classrooms include students who learn in dozens of different ways—different languages, different processing speeds, different strengths. Traditional math tools weren't built for this range. They rely on explanation and memorization before students have a chance to truly understand.

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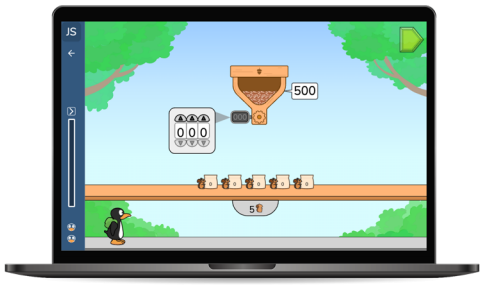
That's why districts turn to visual problem-solving, the way the brain naturally learns. In ST Math, puzzles reveal mathematical structure before vocabulary or procedures. Students see the math first, leveling the playing field and opening access to rigorous thinking.

Walk into a classroom using ST Math and you'll see students focused, collaborating, and celebrating their breakthroughs. What begins as "a game with a penguin named JiJi®" becomes a rich learning experience—one that builds confidence, deep thinking, and genuine joy.



**"They don't mind getting it wrong.
They say, 'I'll get it the second or third time.'
That grit carries into everything we do."**

—Teacher, San Mateo–Foster City School District

Districts say ST Math becomes a connective thread across classrooms and grade levels. It creates shared learning experiences —without adding complexity for teachers.

And the results show up in student outcomes.

See real classrooms in action

ST Math®
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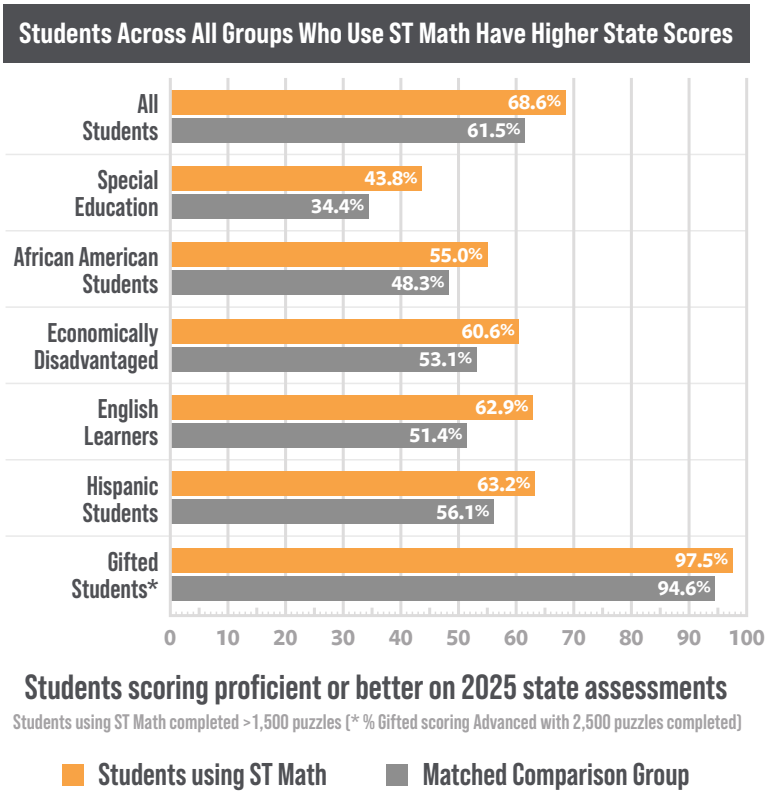
Designed for Access Proven Across Learner Groups

Because learning starts with visuals, not language, not memorization, ST Math gives every student a way into rigorous, grade-level thinking. Districts consistently see strong outcomes across diverse student groups.



Multilingual Learners

Because ST Math makes thinking visible, students don't need to wait for translation or vocabulary readiness. They can engage in mathematical thinking from day one.

Districts consistently see multilingual learners:

- Engage right alongside their peers
- Demonstrate conceptual thinking without language barriers
- Build academic confidence that transfers into core instruction

In a matched comparison analysis, Multilingual learners using ST Math outperformed comparable peers not using ST Math on state math assessments—demonstrating stronger achievement at the Meets or Masters level.

Students with Disabilities

ST Math's visual-first design reduces linguistic and working-memory demands, making conceptual learning accessible without heavy verbal scaffolds.

"ST Math shows me what my students know without needing a word."

—Olivia Kush, 5th Grade Teacher

- Across large-scale analyses, students receiving special education services **show patterns of productive engagement** comparable to their peers when working within the same performance levels.
- **When learning takes place within the ST Math environment, students receiving special education services engage in productive struggle at rates comparable to their peers.**
- A WestEd multi-state evaluation found that **schools implementing ST Math had statistically significant gains in standardized math performance** compared to matched schools without ST Math.

Educators report greater persistence, independence, and confidence—traits that carry into core math instruction.

Expanded Learning (After-School & Summer)

High-quality extended learning programs need engaging, research-backed content that complements, not duplicates, the school day.

Expanded Learning staff report:

- High student engagement
- Improved collaboration and behavior
- Strong conceptual progress outside the school day

ST Math becomes a unifying experience across school and after-school settings—**one learning architecture supporting every learner all day.**

"The program is so thoughtfully designed - there are so many hands-on instructional opportunities and we saw double digit growth from pre- to post-assessment."

—Jerry Gargus, Ed.D., Assistant Superintendent of Educational Services, Fountain Valley School District, California

Explore the research behind these results

Why Districts Choose ST Math

- **Visual-first access:** removes linguistic, memory, and processing barriers
- **Concepts before vocabulary:** ensures deep understanding
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Designed for Equity. Built on Neuroscience. Proven at Scale.

ST Math is grounded in how the brain learns: through perception, action, prediction, and feedback. Students don't just memorize solutions—they build them.

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ST Math is successful because it doesn't separate students to support them. Instead, it brings learners together around shared problem-solving experiences that build access, agency, and perseverance.

This is what equitable math learning looks like when classroom tools match how the brain learns.

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Courtesy of Milken Family Foundation

Louisiana teacher Charday Wilson takes questions from her students shortly after winning a $25,000 Milken Educatino Award. She and two other teachers were recognized for their innovative math teaching.

Published January 02, 2025

How 3 Top Math Teachers Nurture Students' Ability to Tackle Challenge

By Sarah Schwartz

Some of the biggest challenges in teaching math aren't about the numbers and operations themselves, but students' attitudes toward them.

Getting students to think deeply about problems, persevere through difficult questions, and simply feel confident in math class can be tall hurdles in a subject that many children say makes them anxious.

Education Week spoke with three award-winning math teachers about how they try to lower these roadblocks in the math classroom.

All three—Jenna Stewart, Ashley Davis, and Charday Wilson—are recipients of the 2024-25 Milken Educator Award, a $25,000 cash prize for early- to mid-career teachers, principals, and other educators who have embraced innovative teaching practices and advanced student learning. The contest has run since 1987; Davis is the 3,000th awardee.

Read on to learn how these teachers build students' conceptual understanding, navigate wide ranges of student ability, and work with colleagues to replicate promising practices.

Jenna Stewart

5th grade teacher, Longbranch Elementary School, Boone County schools, Ky.

When Jenna Stewart was a math student, she was a "kind of a nervous Nellie," she said, worried about getting questions wrong.

Now, in the math classes she teaches, Stewart encourages her 5th graders to see mistakes not as evidence of failure, but as an opportunity to learn. It's part of her broader goal to encourage deep thinking in her classroom.

Often, Stewart will pose one question to the class, asking students to work out the answer on a white board. When everyone finishes, students hold up their white boards to compare answers. There are always students who hesitate to share, she said, and immediately want to erase wrong answers. But Stewart stops them.

She has explained to her students: It's better to know that you gave it "110 percent," said you were confused and asked for help, and got the answer wrong, than to not try at all. After drilling that message again and again, Stewart said, "I usually see a mindset shift."

Even when students have mastered the steps to complete a problem correctly, she pushes them to dive deeper into the concepts and relationships that underpin math. With her more advanced students, she offers enrichment activities that aim to develop further conceptual understanding—for example, asking students to write an explanation of how they solved a problem, using mathematical vocabulary.

Sometimes, she challenges them with logic puzzles that require abstract thinking, an activity that can initially cause some high-performers to "crumble," Stewart said.

She wants them to push past that discomfort, so that when answers don't come easily to them, they know what to do.

Ashley Davis

4th grade teacher, Central Intermediate School, Central Community school district, La.

Ashley Davis knows that 4th grade is a transition point for some big ideas in math.

It's around this time that many of her students are learning how to represent core concepts of addition and subtraction in more abstract ways—instead of using counters or pictures, they're mastering the skills involved in using the standard algorithms, like regrouping.

Still, not everyone is ready. Davis co-teaches in an inclusion classroom with a special education teacher. About half of their students have individualized education programs, or IEPs. Many of Davis's special education students need additional practice with more concrete representation of operations. Throughout the day in small groups, "we go back to the basics," she said.

In whole class time, though, Davis and her co-teacher have worked to develop methods that support their general education and special education students alike.

"Within the classroom setting, what I try to do is I teach the lesson as it's intended to be taught," she said. "But there's no harm in also showing the concrete and pictorial methods, even when we're trying to move to the abstract."

In practice, this might mean having the whole class practice the same concept, but in different ways. One group might work on a subtraction problem with four-digit numbers, using the standard algorithm, while another might gradually work up to that point—first starting with two-digit numbers represented by blocks or counters.

Davis hopes all of her students feel that they're on a level playing field, she said. "My goal is, if a visitor were to walk in, for them not

to be able to tell which one is the special education teacher."

Charday Wilson

Master teacher, Logansport High School, DeSoto Parish schools, La.

Charday Wilson wants math teachers to be able to learn from each other.

"If we stay in the classroom that we're in, then we have the perspective from one classroom in the building," she said.

At Logansport High School, which serves grades K-12 in Louisiana's DeSoto Parish, Wilson facilitates educator observations between classrooms and professional learning communities so that teachers can try out practices that have worked well for their colleagues.

Through these conversations, educators at the school have discovered that they share a lot of the same challenges, Wilson said. One big issue that crosses upper elementary, middle, and high school grades is stamina—helping students develop the ability to persevere through multi-step word problems, for instance.

Another is showing their work. Many students think that being "smart" means having the ability to do math quickly, in their heads, Wilson said. But when students don't show their thinking, it's harder for teachers to address any misconceptions that can lead to wrong answers.

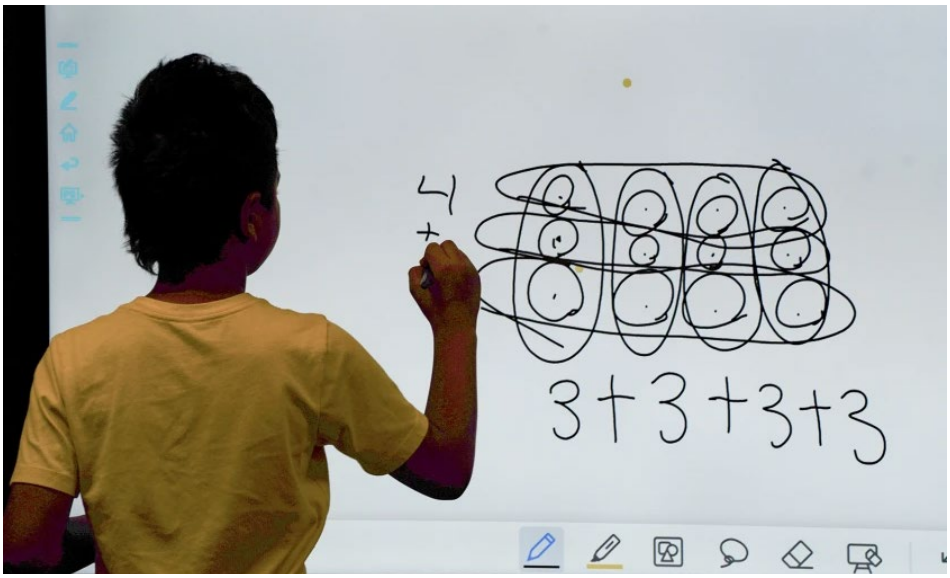
To address this, teachers have shared strategies for encouraging "visible thinking." And schoolwide, teachers are promoting a new idea: that being "smart" isn't just about getting the right answer, but being able to show all of the steps taken to get there.

Making that shift, Wilson said, "has been a game changer for us." ■

Published June 23, 2025

A Third of Students Don't Identify as a 'Math Person.' Can Teachers Change That?

By Sarah Schwartz



Rebecca Slezak/AP

A student works a problem in a second grade math class at Place Bridge Academy in Denver. Early experiences with math can shape whether a student decides they're a "math person" or not.

Are you a "math person"?

It's a question that gets settled at an early age: Most students have made up their mind about whether they identify as a math person by the time they're in middle school, according to a new report from the RAND Corporation.

The study, funded by the Bill & Melinda Gates Foundation, analyzed survey responses from a nationally representative group of more than 700 children and young adults between the ages of 12 and 21 from summer and fall 2024. Researchers asked respondents about their attitudes toward math and their comfort with the subject. (The Gates Foundation provides general operating support for Education Week, which retains sole editorial control over its articles.)

The results paint a sobering picture—many students are disengaged in their math classes and don't feel confident in their abilities.

Thirty-eight percent of respondents said they first identified as a "math person" sometime in or before 5th grade. Another 23% said they first claimed that identity in grades 6-8, while only 7 percent said they started to feel like "math people" in high school. About 1 in 3 said they have never identified with the label.

The end of elementary school represents a turning point that might shape students' self-perceptions, said Heather Schwartz, the vice president and director of RAND Education and Labor, and the lead author on the study.

"By the time that kids are in middle school, that's when math courses start to differentiate," she said. "Are you in the fast track, the advanced track, or are you in regular math?"

These distinctions give kids an "external signal" about what kind of learner they are, she said.

Half of teens say they're disengaged from lessons

The RAND survey offered a few other major findings. About half of middle and high school students said they lost interest in math lessons at least half of the time. Those students who were most engaged shared some key traits: They were confident they could do well, they enjoyed the subject and felt supported in class, and they reported that they could understand math well.

> **"By the time that kids are in middle school, that's when math courses start to differentiate. Are you in the fast track, or are you in regular math?"**
>
> **HEATHER SCHWARTZ**
> Vice president and director
> RAND Education and Labor

These results invite the question: Does developing greater math skills make students like the subject more? Or do students who like the subject more tend to engage more deeply?

"The survey doesn't disentangle the chicken-egg issue," Schwartz said.

But research does offer clues for how to up student engagement, she added. "We don't have to throw up our hands and say, 'Oh well, teens get bored, that's just how it is.'"

The RAND report offers a list of evidence-based suggestions—which includes teachers modeling excitement about, and engagement in, the math students are learning, starting at a young age.

"That comes from teachers themselves knowing the content," Schwartz said. "That content expertise is so important for elementary math teachers."

States vary on requirements for elementary math teacher-preparation programs

Studies have found that teachers' knowledge of, and attitudes toward, math can affect

their students' achievement in elementary school. When teachers have a deeper understanding of elementary math and how to teach it, students do better.

But not all prospective elementary school teachers get the same grounding in math content and pedagogy.

A separate recent analysis from the National Council on Teacher Quality, a research and advocacy organization, found that only 21 states provide "clear, detailed" guidance to teacher-preparation programs for what content to cover in four main areas of elementary math: numbers and operations, algebraic thinking, geometry and measurement, and data analysis and probability.

Fifteen states didn't outline what future teachers should be taught about math pedagogy—how to convey the knowledge and skills to students.

"Without clear, detailed guidance on what teachers are expected to know, aspiring teachers may not learn essential math concepts during their training, ultimately weakening the quality of instruction they provide to students," according to the report.

Despite the lack of specific state guidance, it's likely that most future math teachers are trained in some of the same pedagogical skills, data from the EdWeek Research Center suggests.

A nationally representative 2023 survey of postsecondary instructors who teach math education asked how often these instructors taught their students how to implement different approaches in the K-12 classroom.

When asked about the skill of connecting new math content to prior knowledge, 96% of instructors said they discussed this extensively in class, with most also offering opportunities for students to practice. Eighty-eight percent said the same for identifying and responding to math misconceptions. ■

Published June 02, 2025

How This Teacher Makes Math A Team Sport—and Gets Kids Excited To Participate

By Sarah D. Sparks

Multiplication and long division rarely get pep rallies. But Michaela Sicuranza, a 5th grade teacher at Sinking Springs Elementary, in York, Pa., thinks building an exciting, competitive identity around math can help motivate students to learn.

Sinking Springs' 630 students won a $100,000 grant for their high-poverty school in a national math competition held this May by the education technology group Prodigy Education. The students correctly solved nearly 729,000 problems, more than 30,000 more than the next highest among the 70,000 schools that participated.

Principal Heather Dick credited Sicuranza, an eight-year teaching veteran, for driving the schoolwide math project this spring, which "brought us together across every grade level and made math feel like a team sport."

Sicuranza teaches math, science, and social studies in a co-taught class of about 50-students. In January, she signed her students up for a state competition on the Prodigy game-learning platform, one of several she uses for math enrichment. Over the spring, she steadily recruited more of her math colleagues in the school to encourage their own students to join smaller monthly state contests.

Rather than having academic teams compete against each other, students in any grade or class banked correct answers to earn points for their schools. The problems are set based on an initial placement test and gradually increase in difficulty based on the platform's algorithm. Teachers even coordinated their class schedules in May to allow students to practice math together in the cafeteria at the end of each day.

"Students feed off of your energy level, so the crazier you are about it, and the more excited you are about it, they definitely absorb whatever mood you're bringing to the table," Sicuranza said.

She spoke with Education Week about how teachers can build schoolwide motivation in math. This interview has been edited for length and clarity.

DigitalVision Vectors

Where were your kids academically in math when your school entered the competition?

We have a wide range in all of our classrooms—we have kids that are really struggling in math, and then I have a kid in my class who goes up to [grade] 6 for math this year. So they're all along the spectrum. When kids finish their work, we have a choice time; we provide options that are either giving them a little bit of support or taking them further.

How do you build school spirit around math?

Keep it exciting as best you can. On the daily, we try to recognize kids for different types of achievement. Whether you're in 4th grade, 5th grade, or 6th grade, when you master your multiplication or your division facts, you go ring a bell. And that's a big deal for the kids.

We also have schoolwide incentives; we call them spirit tickets. And these tickets can recognize kids for more than just academic success—we could dig into a kid who is working extra hard on a given day and persevering. It doesn't mean they mastered something, but we see that they had growth. Every week, the school does drawings and they can come down with prizes. ... The next one coming up is, who gets to play against the teachers in the end-of-the-year football game. We really use those to help rally kids and help build their confidence.

We're not in [the Prodigy National Cup] competition forever, but going forward, the things that we were doing for this, we could work in a multitude of different ways within our classrooms. For any goal you set for the kids, you can do things to celebrate it. For example, kids are taking turns sitting at my desk now for the rest of the school year because one of my incentives was if they answered so many questions, they could sit at the teacher's desk. It doesn't have to cost a lot, but the kids can get excited about it.

How common is math anxiety among your kids, and how do you help them overcome that?

It's something we definitely see every year. We try to recognize them for more than a test score, and when you recognize their growth, that helps to build their confidence. We also have time in our schedules where we can work in small groups with kids. I feel like when you work in those small groups with them, they become more comfortable, whether it's asking you a clarifying question that will of course then help them be more successful with what they're working on, or them just being more

willing to participate in that small group than when they're in the whole group.

A lot of these kids that have that math anxiety, they generally can perform better than they think, but sometimes just that small group interaction with a teacher is what they need to build their confidence to do it.

How can teachers use technology in math effectively, without it becoming a distraction?

I think it's good to keep the variety going because otherwise the kids definitely get sick of certain things. We use different online tools in the math that we teach ... like [one] that has great visual models that kids can manipulate on their devices while they're learning different skills.

[As teachers] we have in-service [training] on technology every few months. How can we use AI to support our classroom and to help make improvements within the classroom to help with our jobs or maximize what we're doing in the classroom?

How can administrators best support teachers in motivating their students for math?

I think the biggest help [during the competition] from our principals was making sure math teachers knew that they were supported—that, you know, we understand who might spend some extra time [on math]. ... We had fabulous support from our assistant principal, who's a very fun guy. He would come in our classrooms ... and get them pumped up. It kept it fresh for students to know their principal and assistant principal were excited and on board with it.

In general with math instruction, I think most teachers would tell you we just want to be heard by our administrators. ... We can share our thoughts on what is working in our programs, the way that it's written, but then we can also share what we think could be better to help meet the needs of our kiddos, and our administrators are there to listen and hear us out.

Just having administrators value your opinion and trusting that you know what is best for kids, I think is what helps improve morale. And in turn, you're doing your best teaching when you feel supported by your administration. ■

J.R. Bee for Education Week

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Parents Are Often Nervous About Math. They Can Still Help Their Kids Learn It

By Evie Blad

It's a common scenario in many households: A child's struggle with their math homework quickly becomes a frustration for their parents, too.

A child wrestles with a problem. His mom, trying to help, soon realizes she doesn't understand it, either. Irritated with the situation, she either blames the school for teaching math in a newfangled way that doesn't make sense to her, or she blames herself for being "not a math person."

The result, educators say, is that a counterproductive attitude about math is handed down from one generation to the next, and a child misses out on a chance to learn.

It's a misconception that parents and guardians have to be skilled at math to affect their children's mastery of the key subject, researchers say. For one thing, many adults underestimate their own math skills. For another, even those with gaps in their own understanding can benefit children by modeling a positive attitude and a willingness to work through challenging ideas.

"When you get to the edge of hard, you are learning. That's when you are really growing," said Kelly DeLong, the executive director of the Kentucky Center for Mathematics, which helps schools throughout the state improve math instruction and outcomes. "If [adults] continue to purport that 'I am not a math person,' we do a disservice to the children in our home."

As they work to address plummeting math achievement following pandemic-related school closures, more schools have sought to harness adult attitudes to help children learn. Educators have engaged parents with games, family activity nights, and materials that help them understand unfamiliar math content.

In the process, they've had to confront years of baggage around what many adults consider the most stressful academic subject.

Adults' role in children's math learning

For parents, math has a bit of a PR problem. While everyone from actor LeVar Burton to major organizations like the American Academy of Pediatrics has stressed the importance of reading out loud with children at early ages, early numeracy—the ability to understand how numbers work—does not have a similar flashy ad campaign, at least not in the United States.

"It's easier to see reading as something casual and recreational," said Laura Overdeck, the founder of Bedtime Math, a nonprofit organization that seeks to change math attitudes by creating accessible story problems families can complete with their children. "There is an accountability in math that you just don't have in reading."

After reading a picture book, a parent may ask a child to reflect on the motivation or emotions of the main character. Such conversations come naturally, and a child learns by thinking through and vocalizing a response, not by saying the correct answer, Overdeck said.

"With math, you get the answer right or wrong," and that can be stressful for parents, she said.

Many adults also have a distorted understanding of their own math abilities, Overdeck said, and some had subpar math instruction in their own K-12 schooling.

The key for parents is not suggesting that the right answer doesn't matter or asking them to pretend that math isn't difficult; rather, they need tools to help children retrace their steps and rework problems to identify where they went wrong in finding a solution, Overdeck said.

When parents expose their children to that secondhand math stress, it can actually weaken their ability to reason through a problem, said Kerry Friedman, a senior researcher who has helped develop family math interventions for the Regional Education Laboratory Appalachia.

"We know that when people have some level of anxiety around math, that interrupts your working memory," Friedman said. "It stops even strong performers from being able to solve more complex problems."

Rewriting the math narrative for families

Educators in West Virginia and Kentucky have taken a fun approach to confronting math stress as they worked with REL Appalachia to pilot family math nights in their schools.

It's not unusual for 400 to 500 students, parents, grandparents, and siblings to pour into a Monticello, Ky., school for an evening of math games, math instructional coach Jamie Reagan said. The district also offers drive-thru math nights, a strategy it developed during COVID-related closures, in which families pick up materials and instructions for math games they can use at home.

Educators invite families to use math skills to make pizza with their children, to face off in arithmetic-related challenges, and to learn about how math concepts apply in real life. They decorate with themes like "Jurassic

Park" or Halloween, invite uniformed high school athletes to drum up excitement, and even hold family costume contests to encourage turnout.

"We are building that parent-child engagement piece, and they are having fun," Reagan said.

The REL family math night toolkit includes activities to demonstrate the importance of math and to reduce stress by making math concepts fun and familiar. One problem asks families what equation they would use to get "11" to appear on a calculator screen without hitting the 1 key. In another game, designed for young children, families work together to identify shaped blocks—a core early geometry skill—and put them together to build pictures of animals.

In a card game meant to build computational fluency, players five draw cards with numbers and mathematical operations on them, exchanging cards until they can arrange their hands into a math problem that results in an answer of 24 (for example: 1x4x6).

All games include instructions for facilitators at schools and for parents at home to ask each family member to explain how they reasoned through each challenge.

"There is a disconnect between parents and schools, just from the pandemic," Reagan said. "Through these family learning nights, it's starting to build that rapport again."

The events have also given teachers a chance to explain new approaches to math instruction that may seem puzzling to older parents and guardians.

Reagan once met a farmer who was raising his grandchildren and confused by the conceptual approach to estimation in their homework. She explained it in terms he understood: Farmers might estimate the size of a field by walking across it, counting every three steps as a meter.

"We are introducing that conceptual understanding of what does 3 feet look like before we pull out a ruler," she told the grandfather.

The school also offers materials developed by Kentucky's education department that explain math learning standards in digestible, jargon-free terms.

The math-night strategies also aim to introduce parents to the concept of a growth mindset: the idea that students can acquire new skills through perseverance.

"We say, think about your journey. What was it that made you feel that way?" said DeLong, who helps Kentucky districts pilot math nights. "We want to be able to empower your child."

Fun makes a difference

Research demonstrates the role adult attitudes play in their children's math learning.

In a study published in the April 2022 edition of the journal Child Development, researchers at the University of Illinois Urbana-Champaign asked parents to log their time spent assisting children with math homework and with low-stakes math-related activities, like measuring ingredients for a recipe or playing a card game that involves addition. Parents also took daily surveys to rate how "happy and content" or "irritated and anxious" they felt assisting their children, and they responded to questions about their own comfort with math.

The researchers found that parents with low confidence in their own math abilities were more likely to experience negative feelings helping their children with homework than with more routine math tasks. Those negative parental feelings correlated with lower children's participation in math activities over time and poorer performance on math assessments a year after the surveys were conducted.

Tasks designed to help parents feel more confident in supporting their children's math development may translate to better attitudes and improved achievement in the long run, the researchers concluded.

Similarly, in a 2018 study, researchers at Barnard College and the University of Chicago found that children whose parents regularly played games with them on the Bedtime Math app showed about three months more math learning gains than their peers in a control group, with the biggest benefits shown for children of parents who were highly stressed about math.

In other words: A spoonful of games might help the math anxiety go down.

"There is no more noble use of your time than to engage your community to have a positive math mindset," DeLong said. "It translates into children who can persevere, children who learn at the edge of productive struggle, and then children who have the skills that can define a workforce for your community." ■

Additional Resource
View this article's charts

OPINON

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How to Make Every Student Feel Like a 'Math Person'

Advice from teachers and researchers

By Mary Hendrie

iStock/Getty + Education Week

Across the country, educators continue to wrestle with big questions about math curricula. Two years ago, the California education board's adoption of a long-gestating new math framework added more fuel to some big questions roiling the field. Should math classrooms embrace an inquiry-based approach or focus on explicit instruction? When is the optimal time for students to take Algebra I, an important gateway for both higher-level learning and high school graduation? What exactly does "evidence based" math entail?

Even as big curricular battles rage on, some teachers are looking to modest pedagogical tweaks they can embrace now.

In a 2022 post, Opinion blogger Larry Ferlazzo combed through 11 years' worth of columns to identify some teacher advice for improving math instruction. Featuring practical strategies from nearly 30 educators, "10 Teacher-Proofed Strategies for Improving Math Instruction" is an excellent place to start for anyone looking for classroom inspiration.

Before getting into the nitty-gritty of instructional strategies, however, there's one recurring problem that has troubled math educators writing in EdWeek's pages: students who lack the self-confidence to even try.

"Too often," Wendy W. Amato wrote in an Opinion essay last month, "students believe that success in math is about being 'naturally good' at it, which makes mistakes feel like evidence they don't belong."

Drawing on her background as a classroom teacher and her current work at an education product designer, Amato shared six accessible tips for building a "mistake-friendly" math classroom. This encouraging approach helps students develop the resilience they need to stick with math rather than chalk their missteps up to an innate incompatibility.

When math professor Viveka Vaughn's occupation comes up in conversation, she explained in a 2023 essay, countless people disclose the same vivid recollection: a math teacher who embarrassed them in front of the class.

In "Math Trauma Is Real. Here's How You Can Prevent It," Vaughn argued that these humiliations make for more than just the occasional painful memory; they add up to a systemic barrier that leaves many students checking out of math for good.

Academic strategist Alex Baron identified a similar problem earlier this year. Reflecting on the meager levels of 8th grade math proficiency in the NAEP results, he observed that "100 percent of kids get the message that math matters, even though only 27 percent of 8th graders get the math itself. That discrepancy is a recipe to damage self-confidence." In his conversation with Education Week Opinion blogger and AEI senior fellow Rick Hess, Baron expanded on why "Math Can Make Smart People Feel Dumb"—and what to do about it.

Even once students have rejected the persistent notion that they may not be "math people," getting them to stay plugged into math can be a challenge.

In "One Thing We Get Wrong About Teaching Math (and How to Fix It)," math curriculum developer Sara Delano Moore shared an observation from her years in front of the classroom: "Students seemed to turn off their 'math brains' as soon as we switched subjects, struggling to retain what they'd just learned." The solution, as Moore saw it, was a total restructuring of her math class to rotate through smaller chunks of learning rather than covering a single topic then moving on.

For Kendall Stallings, physical movement is an important ingredient in keeping students focused on math. In "Get Kids Moving During Math Lessons. Trust Me, It Helps Them Learn," the 1st grade teacher laid out strategies for doing just that in early-elementary school. Crucially, these physical activities should be rooted in learning the math content itself, not just brief brain breaks to get the wiggles out.

A sense of play is also central to what Kathy Liu Sun would like to see more of in math lessons, particularly in early grades.

Writing shortly after the birth of her first child and reflecting on her research collaborations with early-childhood educators, the Santa Clara University professor was having qualms about the direction of math instruction. As teachers felt increasing pressure to catch up with learning standards, Sun worried, would her new daughter eventually enter a math class that buried her natural curiosity under a forest of stultifying worksheets?

The call to action she landed on is right there in the headline of her 2019 essay: "Ditch the Math Worksheets and Stop Killing Kids' Curiosity." Read the essay for her three prescriptions for how ed. leaders and practitioners can make it happen. ■

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Vanessa Solis/Education Week + Getty

OPINON

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Want Students to Gain Math Confidence? Celebrate Their Mistakes

6 ways teachers can use student errors to deepen understanding

By Wendy W. Amato

In the late 1980s, the Biosphere 2 project sealed a team of scientists inside a self-sustaining miniature world. Their goal was to see if a closed system could support human life, serving as a potential blueprint for survival on Mars. A surprising phenomenon emerged: Once the trees inside the dome grew to a certain height, they simply toppled over. Scientists discovered the trees lacked "stress wood," a crucial feature that develops only when a tree is exposed to the resistance of wind.

This same principle applies to education: If students never meet resistance from mistakes, they fail to develop the resilience necessary to achieve great growth. Mistakes are the "wind" that helps them grow strong in mathematical thinking and prepares them to stand in the face of the complex problems of the real world.

Across the United States, math scores are slipping, and anxiety about math is negatively affecting students as early as elementary school. I've watched students hesitate, doubt themselves, and disengage from a subject all over a mere mistake.

This mistake-celebrating approach we need instead begins with a shift in mindset. Too often, students believe that success in math is about being "naturally good" at it, which makes mistakes feel like evidence they don't belong. A growth mindset flips that narrative, reframing mistakes as an essential part of learning. When teachers create a classroom culture that normalizes error-making and encourages students to analyze, discuss, and understand their missteps, mistakes can be powerful tools for learning.

The advantage occurs when teachers are not just telling students mistakes are valuable but structuring learning so errors become productive. Here are several strategies I've used as a classroom teacher, instructional coach, and student-teacher adviser that can reshape how math is taught and experienced.

1. Have a 'favorite no'

One of my favorite practices is called My Favorite No. In this routine, students solve a problem (ideally anonymously) on index cards, which the teacher collects and publicly sorts by right and wrong answers ("yes" and "no"). The teacher then selects a "favorite no"—a wrong answer that illustrates a common error or a frequent misconception—and uses it as the starting point for discussion. Students are intrigued: Whose "no" card will be chosen? Will they have made the same mistake? Students see that errors are not shameful but a normal part of learning. Teachers can say things like: "Let's look at this answer—what can we learn from it?" or "Why do you think this mistake happened, and how can we fix it?" This approach transforms mistakes into illustrations and helps students understand processes, not just answers.

2. Identify and label types of mistakes

I encourage teachers to classify mistakes to help students understand what went wrong. A smart mistake occurs when a student follows a rule correctly, but an exception exists. A speed error happens when a student rushes and overlooks a step. A completion error arises when directions are misunderstood or only partially followed. Finally, an out-of-alignment mistake may occur when numbers or steps are spatially misaligned, leading to a wrong answer despite correct thinking. Teachers can guide students by saying: "This is a smart mistake—we followed the rule correctly, but there's an exception here," or "Looks like a speed error—you rushed and skipped a step. Let's go back and check."

Students can be encouraged to recognize when their errors fall into patterns ("Gee, I keep making the same kind of mistake!") and can course-correct accordingly (slowing down, lining up the decimal point, etc.) rather than tragically labeling themselves as "bad at math." Naming errors normalizes them, removing the stigma and turning mistakes into learning moments.

3. Anchor quizzes in correction

Traditional quizzes can penalize students for mistakes without giving them a real chance to learn from them, even when a teacher offers "recovery points" to students who correct problems they missed. I recommend giving students quizzes that are already fully solved, though solved incorrectly with intentional errors to find and fix. Everyone begins by analyzing the problem with a critical lens that asks students to affirm or challenge the work in front of them. This shift transforms assessments away from penalizing and instead promotes understanding and boosts confidence.

4. Practice with provided answers

Consider assigning problems where the correct answer is provided upfront and have

students show the steps that lead there. The emphasis is on showing the work, not simply reproducing the answer. (Not to mention, many texts provide answers at the back of the book.) This practice strengthens procedural understanding, discourages shortcuts, and builds the habit of verifying one's reasoning at every step.

5. Adopt the language of 'still learning'

Classroom culture is shaped by the language we use. I remind students and myself that we are all still learning. When mistakes occur or a student says "I don't know," I say, "We're still learning how to solve these." This phrasing frames errors as part of an ongoing journey, not a final judgment. Teachers who model their own mistakes, especially in subjects like math where they may have struggled personally, demonstrate that even experts grow through trial and error.

6. Encourage ongoing answers

Picture the classroom where a teacher asks, "What did you get?" In traditional classrooms, once the right answer is given, discussion often stops. I advocate ongoing answers: Continue asking for contributions even after someone gets it "right." Ask, "Are there other answers?" or "Did anyone get anything else?" Encourage students with prompts like: "Great, that's one way—who has another way to solve this?" or, when appropriate, "Let's hear some more ideas; there isn't only one right answer." This approach honors diverse thinking and allows students to explore multiple solution paths, rather than reinforcing a single "correct" approach.

In my decades of teaching and leadership, I have learned that the strongest mathematical minds are not those who never err; they're the ones who learn deliberately from mistakes and persist through challenges. By celebrating and spotlighting errors rather than fearing or hiding them, we equip students to develop confidence, curiosity, and lifelong resilience in math, and maybe life. In the end, embracing mistakes may be one of the most powerful—and most joyful—ways to help students reach their highest potential. ■

Wendy W. Amato is the chief academic officer at K12 Coalition, which provides educational products and services. She also teaches in the University of Virginia's School of Education and Human Development.

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How to Help Students See The Relevance of Math

By Larry Ferlazzo

Today's post continues a series highlighting ways teachers can help students see how math and science are relevant to their lives.

Listen!

Emily Burrell has taught high school mathematics for 23 years. For the last 10 years, she taught at Fairfax County's South Lakes High School in Reston, Va.:

Although students may be doubtful, math is relevant to their lives. Teachers can help students understand this by posing questions in real-world contexts or by engaging in project-based learning. Math is also relevant as a general practice that builds problem-solving ability.

But more importantly, students must learn that they are relevant to mathematics. Students' ideas about math are important in building their own agency and for supporting their peers' understanding. Many students believe that their math teacher is the holder of all knowledge and the student's job is to memorize and repeat. They often don't know the value of their own thoughts until a teacher asks for them.

One of my favorite questions to ask is, "Was math invented or discovered?" This question has both depth and accessibility and has led to enthusiastic debates. Routine questions to ask include, "What patterns do you see?" and "What would be a reasonable estimate of this answer?" and "How is this problem related to one you know how to solve?" In general, ask questions that are open-ended and pose problems that can be solved with multiple methods.

Students know their thoughts are valuable when people listen. Teachers are often in a hurry to help as many students as possible in the limited time we have with them. But stopping to listen carefully to a student's question, asking about what approaches they tried and what ideas they have next can build a student's confidence in their ability to tackle problems without teacher help. Patient listening will pay off with students who understand the importance of their ideas.

Students also need to share ideas with their peers. This might not happen naturally if they don't feel confident in their understanding or don't know their classmates well. Teachers can create structures for students to share their ideas with routines like "sage and scribe." They can assign expertise with structures like "jigsaw" so every student has something important to contribute.

When you think about what is important to you, often you have found a way to make your own impact in this area. Math is no different. Thoughtful questioning and structures for discourse allow students to make meaningful contributions to the class and to their peers' understanding. Students become relevant to math when they are empowered as independent mathematical thinkers.

'Giving Students a Purpose'

Deborah Peart Crayton is the founder and CEO of My Mathematical Mind and speaks on a variety of topics related to math identity, elementary math content and instruction, and literacy connections to mathematics. She is the author of Born a Mather: Leveraging Literacy for Mathematical Understanding*:*

Elementary students are excited to solve problems and become the hero in someone else's story. As teachers, we can offer this gift by giving students a purpose for "doing the math." One way to do this is to show students how math can help them advocate for themselves and others.

When teaching 3rd grade students in Atlanta, our grade was assigned the last lunch block. Just before us, the 4th and 5th grade students had lunch. Each Thursday, there was a limited supply of chocolate milks, which by our lunchtime meant very few to go around. Week after week, my students complained about not getting chocolate milk, so I challenged them to find a solution. They immediately turned to mathematics under my guidance and with a few "wonderings" to probe their thinking.

- I wonder how many chocolate milks are ordered each week.
- I wonder if all of the students like chocolate milk.
- I wonder how many chocolate milks students are allowed to drink.
- I wonder how we could find out how much chocolate milk would be enough.
- I wonder who could help us solve this dilemma.

Even though it was not a formal assignment, my students were fully invested. They interviewed the lunchroom manager who was responsible for ordering milk. They created a survey for students to find out how many actually like chocolate milk.

They worked together to determine how many chocolate milk cartons should be ordered, with a few extra for good measure, and took their case to the principal. They had graphs, charts, and accurate calculations to demonstrate the problem and their proposed solution. Their diligence was rewarded with a solution that involved ordering more chocolate milk and limiting the number of cartons each student could have. These 3rd graders recognized math as a sense-making superpower.

When designing or modifying tasks, we must ensure the contexts are relevant to the students. Even when following a curriculum, we must feel empowered to adapt the contexts to match our students' lives. When scenarios are a mismatch for the students, we have a responsibility to keep the math intact while adjusting the context to make it more relatable and meaningful.

When I taught in New York City, we had a survey and graphing task about how the students get to school. The choices were: ride in a car, take the school bus, or walk. I knew my students also traveled by city bus, taxi, or train, so this survey didn't match our context. It was an easy fix.

Students can help us figure out what is relevant to them, but we need to ask. Student-generated tasks can be included for practice, homework, or group work allowing students to see themselves as creators of mathematics and not doers only.

Another way to include student voice is to launch math with warm-up routines and community builders that invite student discourse. As we get to know our students, it becomes easier to ensure that students see themselves represented in the contexts of our math tasks and as assets to our math communities. We want all students to know they are "mathers."

As teachers, we often get the question, "When will I ever use this?" If we help students view mathematics as something that can help them make sense of the world, they are more willing to hone their skills.

It is important for them to recognize that practice doesn't always look like application. You may never need this exact task in life, but you are learning valuable skills in the process of finding solutions. We can turn to the Standards for Mathematical Practice for support with the language we can use with students to help them embrace the habits they learn from working hard in math class.

Below is a student-friendly version of the standards designed for students to have language to describe the skills, habits of mind, and practices they are learning that will serve them not only in math class but in life. Students need to know that as they become deep mathematical thinkers, they are also becoming problem-solvers who can solve all types of problems for themselves and others.

'Think Long Term'

Ralph Pantozzi is a Presidential Awardee in Mathematics Teaching and has been a classroom teacher and supervisor in New Jersey schools for 32 years:

First, always be honest about why you are teaching a particular topic. Often, the reason is simply to prepare for a future topic. Students will appreciate your candor.

Many educators teach topics that have limited (immediate) relevance, so think long term. Highlight short stories of real people who use the ideas of math and science in their lives and careers. Find out about your students' interest, concerns, and hobbies. Allocate space on your classroom walls for images of people and objects from the local community and the larger world that have connections to math and science.

Resources like Profiles of Professional Mathematicians and Computational Scientists and Mathematical Moments are also good places to start, but think also about everyday objects like toasters or the newest game show where contestants are trying to strategize their way to victory. A classroom that is connected to the larger world is one where students will always see relevance.

Just as essential: Leave time in your classroom for students to ask questions about topics of interest. Every once in a while, have the "do now" be "ask me a question you've been pondering," letting the students know that their questions need not be restricted to ideas they might think of as having a mathematical connection.

When you read these questions, you learn things about your students and have material for your own investigation. You may not know an immediate through line to math and science, but you will often be able to find one—or you can ask The Math Doctors!

In students' day-to-day work, another way to show that math and science has meaning is to continually note that mathematical and scientific words are used in other areas of our lives: power, function, degree, origin, term, hypothesis, translate, expand, factor ... the list is nearly endless.

When humans chose these words for specialized use, they were thinking of the world beyond math or attempting to make an analogy or metaphor. Math often seems separate from other human endeavors, but at its basis, it is our attempt to understand our world and our experience in it. Let the Online Etymology Dictionary be your guide.

Lastly, relevance is often found simply in what inspires curiosity. A garbage can and a lampshade can be the same shape. The occurrence of floods is much like rolling dice. You only need a mirror half your height to see the full length of your body. the age of geologic structures, and the sound of a bouncing ball all have something in common. Be on the lookout for everyday phenomena that can be used to raise questions about the world we inhabit. A classroom full of interesting questions is one where students often find relevance all on their own.

'Cooperative Learning'

Sarah Nichols is a national board-certified teacher and a Utah Teacher Fellow in Salt Lake City:

One of my favorite teaching assignments as a special education teacher is co-teaching in a secondary math classroom. As much as I love math, it's pretty hard to convince teenagers that they are going to spend a lot of their adult life graphing lines using slope intercept form or that imaginary numbers are going to be critical to their future happiness.

Secondary students can sniff out half-hearted rationalizations and lame attempts at making connections. It may be fun for me to graph a system of equations to determine when spending $40 on a reusable popcorn bucket at the movie theater would pay off, but despite the widespread appeal of popcorn and personal budgets, it doesn't seem to be as fun for the students. To an extent, I'm jealous of elementary teachers whose lessons translate into more common real-life applications.

The best way I have seen to make math relevant to students' lives is to emphasize the real, math-adjacent skills that they can practice and acquire through hard work in math class.

First, and most important, is the ability to persevere through a challenging problem. Instead of giving up at the first sign of frustration, they can hone their skills of struggling through, trying a new tack, and checking to see if an answer is correct. This is especially important in the post-COVID era. Too many students were able to avoid the discomfort of struggling through problems and disengaged significantly during online schooling. It's easy to make a case for the relevance of being able to stick with a problem until a solution is found

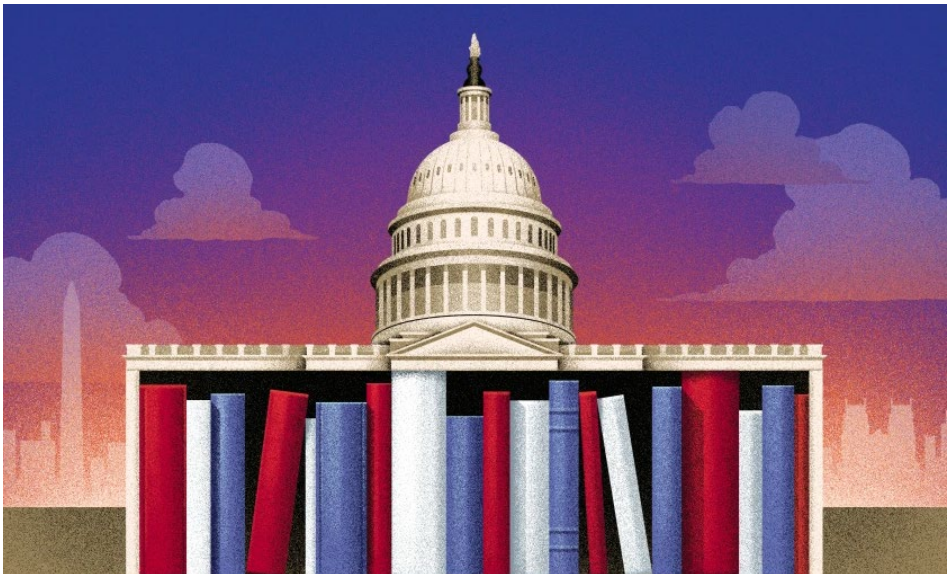
or accessing past knowledge and previously used strategies to apply to a new problem.

In addition, students in math classes that utilize cooperative learning or discourse-promoting strategies have the benefit of practicing communication and cooperation, two skills that are crucial in almost every work context and in current or future relationships. Math teachers can help students learn more than just math—they can teach and support the social skills needed to be successful in life, such as explaining thoughts clearly, listening to others, adding on to others' ideas, and challenging thinking errors.

When teachers link math standards to esoteric or less-than-relatable future applications, they lose the opportunity to show students what they are really learning— concrete, relevant skills that successful adults need in their relationships, workplaces, and homes.

Thanks to Emily, Deborah, Ralph, and Sarah for contributing their thoughts! ■

Larry Ferlazzo is a former award-winning high school English and social studies teacher of more than two decades. He is currently a volunteer tutor to English-learner newcomers at a local school and to youth in juvenile hall.



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Math Can Make Smart People Feel Dumb

What it could take to allay students' fears of numbers

By Rick Hess

There's a familiar divide between practice and policy. When it comes to grading, devices, equity, choice, student behavior, and much else, the views from inside and outside the schoolhouse are very different. That's a big part of why educators and policy types tend to talk past one another. To delve into this disconnect, I reached out to Alex Baron, the director of academic strategy at a District of Columbia charter school, an Oxford Ph.D., and a former early-childhood and high school math teacher. Together, we'll try to bridge a bit of the practice-policy chasm. —*Rick*

Rick: Earlier this year, we got some brutal results on the National Assessment of Educational Progress. The math results were disheartening, showing we're still mired in over a decade of slumping student achievement. I'm inclined to look at an issue like this through a policy lens. But that's not always the most useful approach, especially when discussing this with a longtime math teacher like you. In fact, you've just published a new book on math, Counting On Yourself, that offers some useful ideas. Before I weigh in, do you want to say a bit about the book and how you think about our challenges in math?

Alex: Math often makes smart people feel dumb. Since math has objectively right answers, it also has objectively wrong answers; when we get a wrong answer, it can feel like there's something wrong with us. I've taught math at the primary, secondary, and college levels; I've seen how math can torpedo academic confidence, which curdles into general intellectual insecurity that can last into adulthood. We get adults who say, "I'm not a math person," who then pass math-phobia to young people, and the cycle continues.

This cycle has created a dire reality regarding mathematics. According to the 2024 NAEP scores, only 27 percent of 8th graders are "proficient" in math. On the 2022 PISA, the most recent iteration, American 15-year-olds placed 31st out of 36 tested OECD countries. These grim outcomes have real economic implications. A 2017 AIR study found that only 21 percent of students who never passed Algebra 1 graduate from high school in four years. Additionally, improving math scores has been shown to have a positive impact on earnings later in life. Two-thirds of community college kids and 40 percent of undergraduates take remedial-math classes, decreasing the likelihood of graduating and increasing college debt.

Rick, we know math is foundational for academic and professional success, but we haven't found a way to explain it in a sensible, relevant manner. To help math make sense rather than create stress, I recently published Counting On Yourself: An Adult-ish Guide to Math and Money. The book offers a guided tour of math from preschool up through high school. It's not just meant for students—but for a general audience, including adults, college students, and anyone who feels like math passed them by or steamrolled them.

I wrote Counting On Yourself with three key qualities that differentiate it from other math books. First, the book connects all math concepts back to addition. If you can add, you'll see that "advanced math" isn't as inscrutable as it seems. Here's a sample about logarithms. Second, the book connects all math concepts to personal finance. People want to learn money management and also don't see how math applies to their lives—Counting On Yourself addresses both. Finally, the book uses math to bolster self-confidence rather than undermine it. When you read Counting On Yourself, you'll find math less miserable—and yourself more intelligent—than you'd thought. If you can learn math—something that you may be convinced you can't do—what does that mean about your other self-beliefs? Maybe you can do a lot more than you think.

Rick: I find some of this really compelling. I'd like to give you a chance to get me on board with the rest. First, I get it when you talk about how bringing it all back to addition can make "advanced math" seem more intuitive and less intimidating. I'm always struck by the power of a compelling analogy. Second, I'm also mostly with you on the value of making math feel practical by linking it to finance, though I worry that making something "relevant" often means either eviscerating the substance or embracing a pretty tortured notion of "relevance." Third, I guess I'm most skeptical of the notion that everyone can be a "math person." I mean, a lot of students struggle with poetry, world languages, chemistry, or music. I don't usually imagine that everyone can be a "poetry person" or a "music person." I'd love to hear your thoughts about how self-confidence works in math relative to other subjects.

Alex: Kids know that poetry, chemistry, and music have lower stakes for them, which de-

creases how much their self-confidence hinges on those subjects. Kids also know that math comprises half of their SAT score, that annual high-stakes tests occur in math but not science or social studies, and that people who get math are automatically seen as smart in some ineffable way. In short, 100 percent of kids get the message that math matters, even though only 27 percent of 8th graders get the math itself. That discrepancy is a recipe to damage self-confidence.

To be clear, I'm not asking everybody to "love math." I just don't want math to stop kids from making it through high school, or for ambitious twenty-somethings to miss out on graduate school because of the GMAT math section, or for parents to viscerally fear supporting their kids with math homework. When people don't get math, it makes them feel dumb in a way that struggling in poetry and dance does not. Maybe we don't all have to be math people, though I imagine we'd be highly concerned if our child approached us and said, "I'm just not a literacy person." But if our society maintains its twin proclivity to both prioritize math and yet tacitly sanction innumeracy as we plunge into the technological age, then I think we're risking a lot more than kids' self-confidence.

Rick: Fair points. Now, before we close this out, I want to bring up the issue of where practice and policy intersect when it comes to improving math instruction. In reading, there's widespread agreement that good early reading requires a significant dose of phonics—and that it's taken legislation and state leadership when it comes to instructional materials, professional practice, and teacher preparation to set things right. Left to their own devices, many teachers lack the skill, resources, or training to get this right. Are there analogous examples in math? Do you see places where policymakers or system leaders can provide a crucial boost in the right direction?

Alex: It's a good question, Rick. As far as I can see, no "science of math" consensus has emerged à la the "science of reading." But upon deeper reflection, even the science of reading is better framed as the "science of decoding" and mostly applies to—as you indicated—early reading; that is, the phonics breakthroughs do not address how we teach higher-order skills like comprehension and analysis. Reading is a complex family of skills that don't have an instructional silver bullet; the same is true in math. As Zearn founder Shalinee Sharma said in your recent column, conceptual understanding and procedural fluency matter in math. That is, one needs both the procedural ability to solve $2x - 3 = 12$ and the conceptual knowledge about why inverse operations help us isolate an unknown. That dual approach may sound like the math equivalent of "balanced literacy," but to me, a balanced approach seems right in math.

Yes, math nerds bitterly disagree on how to weigh procedural versus conceptual instruction, and some popular curricular materials likely overindex on the conceptual side. But most serious stakeholders agree that we need some balance of both. Ultimately, being an educator is all about exploding false dichotomies: Procedural vs. conceptual. Social-emotional learning vs. core academics. Restorative vs. punitive justice. Nonfiction vs. fiction. Direct instruction vs. inquiry-based learning. In these debates, good educators exercise a lot more both/ands than either/ors. This is because practitioners understand that kids learn differently and that the skills we teach are complex. Like most things in schools, it's as simple, and as complicated, as that. ■

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