



**ST Math**  
Created by MIND Education

# Meeting the Moment: The ST Math Buyers' Guide

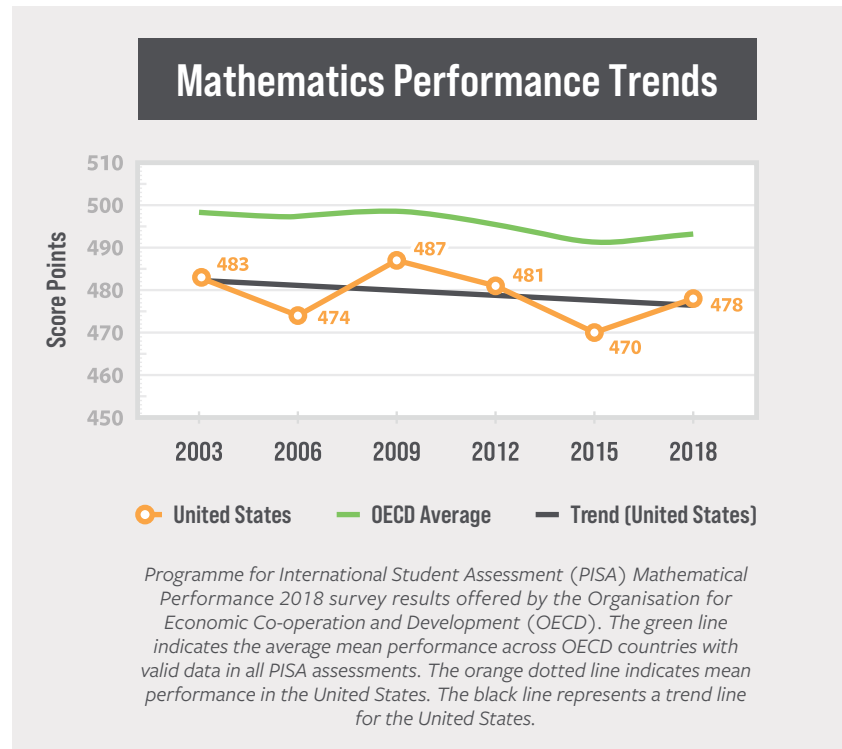


## Introduction

We have a math crisis in the U.S. In fact, there are some who believe that America's poor math skills are a threat to our national security and our place in the global economy. "The advances in technology that are going to drive where the world goes in the next 50 years are going to come from other countries because [they have the intellectual capital](#) and we don't," said Jim Stigler, University of California, Los Angeles psychology professor.

The Defense Department is supporting a major STEM initiative because it says there are eight times as many college graduates in these fields in China. Russia has four times the number of engineers the U.S. does. "We are no longer keeping pace with other countries, particularly China," said leaders at the Aspen Institute, urging decision-makers to [make education a national security priority](#).

The Bureau of Labor Statistics predicts that math will be of increasing importance as math-focused occupations will increase by [more than 30,000 per year](#) through the end of this decade. However, in the international PISA assessment, U.S. students scored lower than students from 36 other countries. According to the [National Science and Technology Council](#), only one in five college-bound American high school students is prepared for a college-level STEM course.



### Most Students Have Severe Needs in Math

Math Proficiency by Grade

4th Grade: 36%

8th Grade: 26%

Source: [2022 NAEP Mathematics Assessment](#)

As a result of the pandemic, students' math proficiency is about [half a year behind](#) where it should be. Students' skills fell significantly particularly for traditionally underserved students. Although the pandemic complicated the picture of math learning, there has been a long-term conversation about how math should be taught. [Experts say](#) the pendulum "has swung between procedural learning such as teaching kids to memorize how to solve problems step-by-step, and conceptual understanding, in which students grasp underlying math relationships."

Some math leaders argue for [greater relevance and application](#) of mathematics to students' lives, such as more mathematical thinking and problem-solving, and a focus on statistics and data science. Leaders must focus on making math relevant and interesting for students while also preparing them for advanced courses, such as algebra, geometry, and calculus.

## High Levels of Anxiety About Math

A recent reader survey conducted by the [Hechinger Report](#) confirmed that there is a lot of anxiety about math. For example, middle school students during the pandemic lost more ground than any other group and struggled more to get back to grade level. Survey responders made suggestions for improving math proficiency:

- [Reducing anxiety](#) of fear of math among students and helping to understand why it matters.
- Highlighting the importance of basic arithmetic and focusing on a strong foundation before advancing to more conceptual lessons.
- Learning in detail about what effective math instruction looks like for preschoolers and kindergartners.
- Understanding the holes and gaps left over from remote learning.

Giavanni Coleman, an experienced math teacher who teaches fifth- and sixth-grade math said, “Schools must [build a stronger foundation](#) in math early on. We need more investment in teacher training and childhood math to help infuse a love of numbers at a young age.”



## Math Anxiety in Elementary School Educators

Decades of research demonstrate that math anxiety is common for adults, particularly women, who make up 90% of elementary teachers nationwide. Helping teachers in the early grades gain confidence in math could be one key to unlocking post-pandemic math recovery.

“There’s a [misbelief](#) that in order to teach early childhood math, you don’t really need to know math well,” said Lauren Solarski, a consultant and coach with the Early Math Collaborative at the Erikson Institute. “But having that deep content knowledge, research finds, makes you able to draw out what’s happening in a child’s play around math—what they’re doing and know those trajectories, know the math inside and out so that you can be that expert when you’re with the child.”

According to a [2022 analysis](#) from the National Council of Teacher Quality (NCTQ), schools of education do not spend much time on elementary math content. “Teacher preparation programs should not only show future educators how to teach math to young students, but the programs should also spend a substantial amount of time ensuring educators understand math pedagogy and have a firm understanding of math concepts themselves,” said Heather Peske, president of the NCTQ.

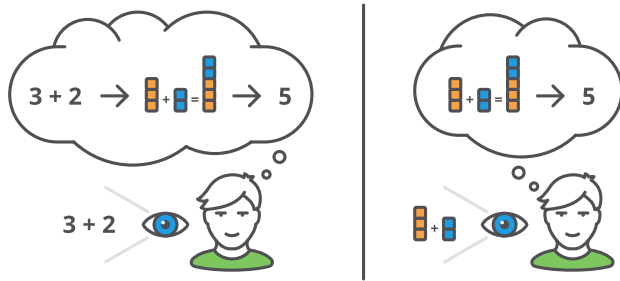
“If we prepared teachers better, they would be stronger in both their math content knowledge as well as their ability to teach math, and this would reduce their anxiety and improve student outcomes,” she said.

# LEARN BY DOING

## Can Math Be Taught Another Way?

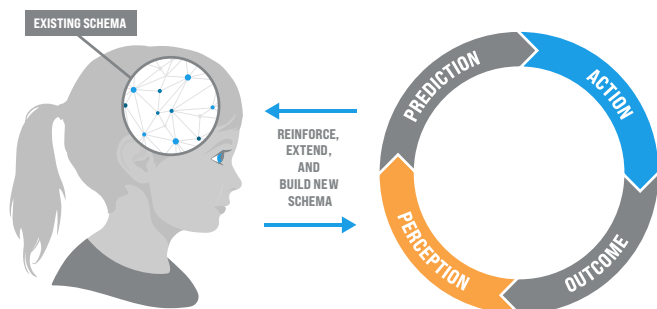
What if math could be taught the way the brain learns? About 25 years ago, a group of neuroscience researchers from the University of California, Irvine, decided to find answers to this question by looking at spatial-temporal reasoning, its connection to music and creativity, and further connections to learning mathematics.

### Spatial-Temporal Approach



[Spatial-temporal reasoning](#) is the brain's ability to manipulate objects in space and time to solve problems. And the result of that research is ST Math for grades PreK-8. There are no verbal or written instructions in ST Math. At the start of each learning path in ST Math, everything is visual. This means there is no barrier to learning. Students learn by testing out their ideas and learning from the feedback. This is the neuroscience at work in a fundamental brain learning cycle: it's called the perception-action cycle.

### Perception-Action Cycle



[Click to Watch Video](#)

Whenever we are tasked with a problem, we use our existing neural networks (schema) to make a prediction: here's what I think will happen. Then we complete an action, and our brains compare our prediction to the result of the action we took. If correct, the schema that caused me to make that prediction is strengthened. Chemicals from the hippocampus flood that neural network making it bigger and stronger. The next time a similar problem occurs, it's more likely this schema will make the prediction. This is how we build conceptual understanding, such as schema for spatial reasoning, proportional reasoning, or numeracy.

But learning doesn't happen just when we get things right. When our prediction and perception don't match, theta waves from the hippocampus tell the brain that it's time to build a new schema. Work from Jo Boaler and other math experts stating that students learn from mistakes is accurate and based on fundamental neuroscience.

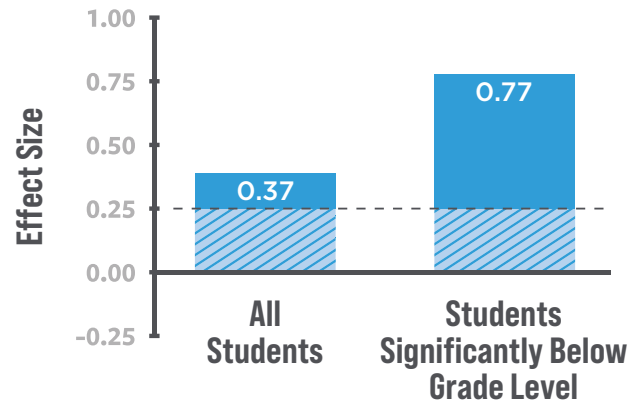
This is what happens in every ST Math puzzle. To complete a grade level of ST Math, students will solve more than a thousand puzzles. Learning by doing is active participation in the learning process, of testing hypotheses and seeing exactly what is right and wrong.

Saying someone has a good conceptual understanding of math means they have a deep schema—a rich web of connection between the ideas they can use to solve very complex problems. The connections do not happen by accident. Students make them as they experience learning that is explicitly designed for them.

The real power of ST Math occurs when students spend significant time on math tasks where they need to use creative and critical thinking to solve non-routine problems. At MIND Education, we have many large-scale data studies done on the efficacy of ST Math [at schools just like yours](#).

While students don't know they've activated their perception-action cycle, they do understand productive struggle—the idea they're learning when they make mistakes and how powerful it is when they figure things out for themselves. The efficacy of the program is simply stated: students who play ST Math have higher mathematics self-beliefs than non-ST Math students.

## ST Math Impact on Student Self Belief



*Anything over 0.25 is considered highly impactful for educational interventions*



# TEACH MATH the Way the BRAIN LEARNS

## How ST Math Works

ST Math is a patented approach to manipulating objects in space and time—teaching math how the brain learns. The program starts by teaching the foundational concepts visually and then connects the ideas to the symbols, language, and robust discourse. With visual learning, students are better equipped to tackle unfamiliar math problems, recognize patterns, and build conceptual understanding. Without language barriers, the problem is accessible to all students, regardless of skill level or language background.

ST Math is mastery-based so students must pass each level with a 100% score before the next level in a sequence becomes available to them. Each student's journey is individualized and takes as

long as the student needs to achieve mastery. This ensures that students are building and demonstrating a strong conceptual foundation. Animated formative feedback motivates students by showing them the mathematical consequences of each answer. Students don't have to wonder why they got an answer wrong.

ST Math supports all teachers and all students by providing teacher-facilitated/student-centered lessons that enhance Tier 1, Tier 2, and Tier 3 math instruction. Learning objectives target essential grade-level concepts and skills. ST Math is a flexible instructional program that can be used to enhance any math curriculum.

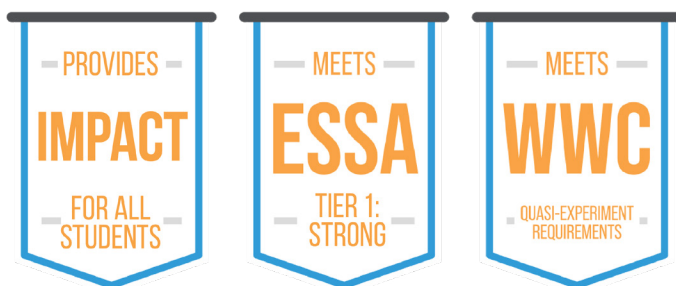
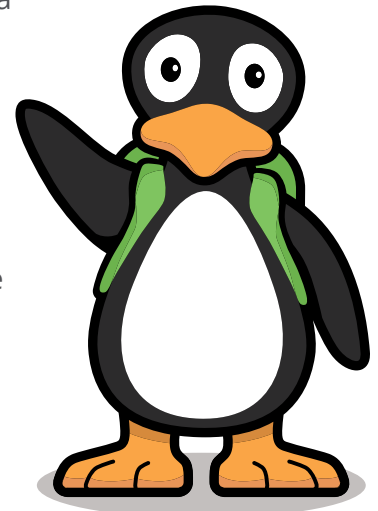
## District Spotlight: Los Nietos School District, CA

Former Assistant Superintendent for Educational Services Dr. William Gideon was familiar with neuroscience and wanted to prove how a game and a penguin could change how students felt about math. As soon as students showed enthusiasm for ST Math and the character Jiji, their math scores went up. “And once teachers saw the evidence that students were gaining success in their math learning—and that they’re actually experiencing joy from playing ST Math—we received more buy-in,” he said.

Initially, students played at least three times per week for fifteen to twenty minutes. They also worked in small groups instead of whole class direct instruction. Over time, educators grew convinced of ST Math’s efficacy. Students engaged in productive struggle which helped them build a deeper conceptual understanding of math. Educators were also able to see where and how the transition took place. Students were much more engaged with math than they were before.

“Just know that students will gravitate to ST Math faster than adults—and that’s okay,” says Dr. Gideon. “We want students to become self-advocates of their learning. This is an opportunity for them to have something they can take ownership of and change their self-esteem when it comes to learning math.”

In the two years following the implementation of ST Math, the Los Nietos School District saw a dramatic improvement in their math scores as indicated by their California Assessment of Student Performance and Progress (CAASPP) scores.



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*Research-Based Design  
Product Certification*

## Efficacy of ST Math

ST Math measures their impact on standardized math assessments based on the data collected from thousands of ST Math users. This data determines which learning objectives are critical for efficacy and which learning objectives are not optimal and need modification.

ST Math’s [patented, evidence-based approach](#) makes it the only math program that delivers equitable impact for all student groups. Whether they are above or below grade level, classified as gifted and talented or special education, emerging bilingual or native English speakers – all thrive when they finally experience math [the way every brain learns](#).

## Questions to Consider When Choosing a Supplemental Math Program

	Yes	No
Is the program based on neuroscience, the science of learning math?		
Does the program positively change a student's relationship with math?		
Do students build perseverance and develop intrinsic motivation to become problem solvers?		
Does the program deepen students' conceptual understanding of foundational math concepts?		
Does it support strategic learning goals and objectives for your students?		
Does the program provide equitable access through visual, game-based learning?		
Do students learn by doing through productive struggle?		
Does it promote rich classroom discourse focused on sense making rather than just getting the right answer?		
Does the program include immediate, formative feedback to students?		
Is it mastery-based so students only progress when they've achieved objectives?		
Does the program provide interactive, teacher-facilitated/student centered lessons that enhance Tier 1, Tier 2, and Tier 3 instruction?		
Do teachers find the program easy to implement?		
Does it offer professional learning on the how students learn math?		
Does the program support building a positive math culture in your district, one where everyone loves math?		
Does the program have evidence that students who use it improve their state assessment scores?		
Does the program have evidence of impact results that are recent?		
Does the program show evidence that regardless of which state, assessment, or type of school, it will boost math scores?		
Does the program show evidence of impacting all student subgroups on state assessments?		
Has the program obtained ESSA Tier 1 Strong Evidence?		

## What Customers Have to Say About ST Math

*ST Math is the best program choice for us because it aligns to our established district priorities, is accessible to all students, and keeps grade-level content a priority."*

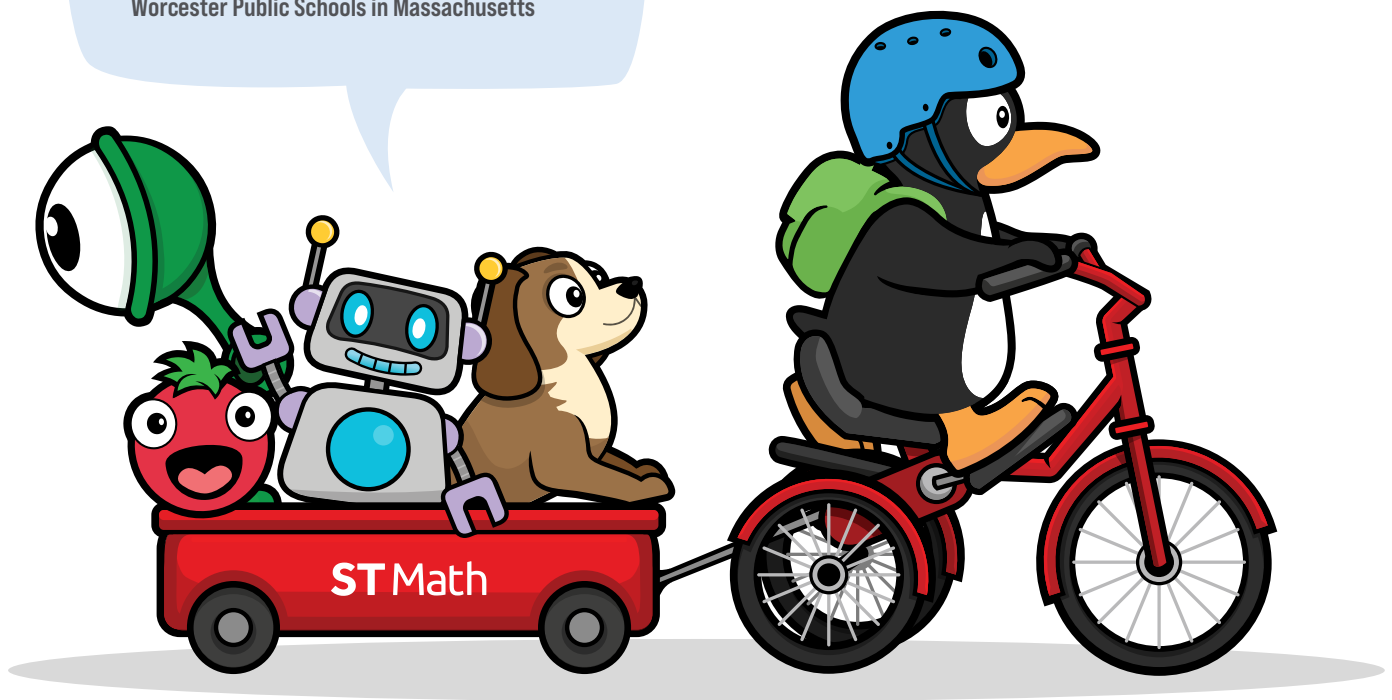
— Courtney Davis  
Blended Learning Coordinator  
Crowley ISD in Texas

*ST Math offers students an engaging and innovative way of learning mathematical concepts. Building a solid foundation in the primary grades is critical and the scaffolding offered in ST Math will help set up students for success."*

— Patti Sanchez  
Assistant Superintendent for Elementary Instruction  
Northside ISD in Texas

*What ST Math has already done for our students has changed their entire mindset on what math is and how they can problem solve through math."*

— Mary Beth Juneau  
Math Coach  
Worcester Public Schools in Massachusetts





# Math Instruction Based on the Science of Learning Can Solve Our Math Crisis

Today's math is more rigorous than the math most of us learned as children. There is a larger emphasis on understanding concepts and the application of math than memorizing rules, formulas, and procedures. Teachers need to fully understand math concepts themselves to teach them effectively.

Recent NAEP reports show that math performance declined substantially for fourth- and eighth-graders during the pandemic. There was as much as a 10-point difference in students scoring at grade level. Then they got worse in the 2021-22 school year after students returned to school. Instead of returning to traditional math instruction that emphasizes procedural fluency in working math problems, some math experts are advocating for greater relevance and application of mathematics to students' lives, more mathematical thinking, and problem-solving.

By using the findings of neuroscience on math instruction and learning in a program like ST Math, U.S. schools can change the trajectory of math competency in this country. We can graduate students with a deep understanding of mathematical principles and how to apply them to new and novel problems while enjoying the process. We can improve our mathematics and STEM pipeline in order to protect our national security and hold our place in the global economy.

**Experience ST Math**  
Visit [stmath.com/demo](https://stmath.com/demo)

