Making the Minutes Add Up

What Every Superintendent Needs to Know About Improving Outcomes in Math

Welcome!
Introduce Yourself in the Chat!

Share your name, district, and your role

Joining You Today…

Meet Your EAB Presenters

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Education's Trusted Partner in Solving Today's Most Complex Challenges

EAB

EAB in Brief

40+
Years helping institutions find evidence-based solutions

2100+
Partner institutions in K-12 and higher ed

8,000+
Peer reviewed best practices sourced

10 million +
Students supported by EAB's technologies

Helping Schools Support Students From Kindergarten to Graduation and Beyond

What Makes Our Model Unique

Depth of Insight

We "boil the ocean" to define what innovators do differently

Detailed Implementation Support

We take the guesswork out of planning and implementation

Relentless Focus on Turning Research Into Results

90%

of partners choose to continue our work together each year

The District Leadership Forum

A Comprehensive Partnership to Help District Leaders Accelerate Progress

Expand Team Capacity and Effectiveness | **Accelerate Progress on Key Initiatives** | **Avoid Costly Missteps and Wasted Effort** | **Stay Ahead of the Curve**

- Annual Forum research agenda
- Custom reports on district-specific issues
- Online library with research briefs and insight papers

- Executive roundtables for superintendents
- Best practice presentations and workshops for your team
- Executive skills trainings for principals

- Personalized implementation pathways
- Implementation planning cohorts, toolkits, and resources
- Unlimited access to strategic advising from EAB experts

Where Partners Have Asked Us to Focus Our Research

Annual Polls Confirm Two Primary Areas of Need

Student Success

Signature Research Areas:

- Raising early literacy
- Reducing absenteeism
- Creating conditions for positive behavior
- Supporting student mental health
- Closing college access gaps
- Scaling career readiness

EAB Enables Districts To:

- Identify common pitfalls to progress
- Implement and scale new, evidence-based practices
- Save time with ready-made resources and templates

Organizational Excellence

Signature Research Areas:

- Reimagining strategic planning
- Improving central office capacity and alignment
- Developing highly effective principals
- Boosting teacher morale and retention
- Preparing for generative AI integration
- Strengthening strategic initiative design

EAB Enables Districts To:

- Prioritize investment of time and resources
- Identify and target root causes to key challenges
- Align leadership teams around shared goals

Leaders Cite Proficiency as A Pressing Issue

80+ Interviews Revealed Nationwide Struggles with Foundational Math

*"**Kids are hitting middle school without basic arithmetic**. They're expected to do pre-algebra, but many still struggle with basic multiplication. And then the gap just grows."*

ASI of Instruction
East Coast School District

*"Teachers spend more time reteaching last year's content than teaching new material. It's not just a few kids, either, **whole classes are behind**."*

Math Coach
Midwest School District

*"It's not just about skills, it's confidence. **When students can't do last year's material, they check out.** They don't want to engage if they don't feel successful."*

Superintendent
West Coast School District

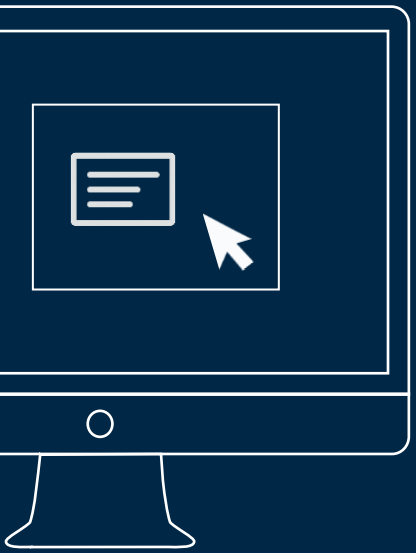
Surveys Confirm Math Skill *Recovery* is Most Pressing Challenge for K-12 Leaders

November-December 2024

School and district leaders most often rank "remediation needs/gaps in student math knowledge" as the **greatest challenge** they face for math instruction.

Sources: EdWeek Market Brief, What's Next for the K-12 Math Market?, 2025; EAB interviews and analysis.

Respond in the **chat**:



- **How do you define "math proficiency"?**

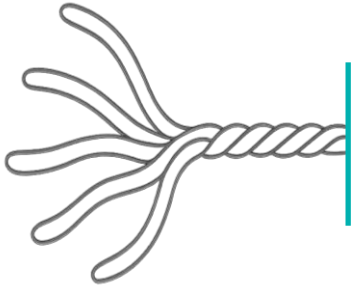
  Type in keywords, key phrases, or your own definition to share with the group.

Experts Agree on Goal for Math Education

5 Strands of Math Proficiency

National Research Council, Adding It Up *(2001)*

- **Conceptual Understanding**: Grasp of how & why math ideas, schemas, and operations are important
- **Procedural Fluency**: Skill in carrying out procedures flexibly, accurately, and efficiently
- **Problem Solving**: Ability to formulate, represent, and solve mathematical problems
- **Adaptive Reasoning**: Capacity for reflection, explanation, and justification
- **Productive Disposition**: Inclination to see math as sensible, useful, and worthwhile; self-efficacy



All strands **reinforce each other and develop iteratively** throughout K-12

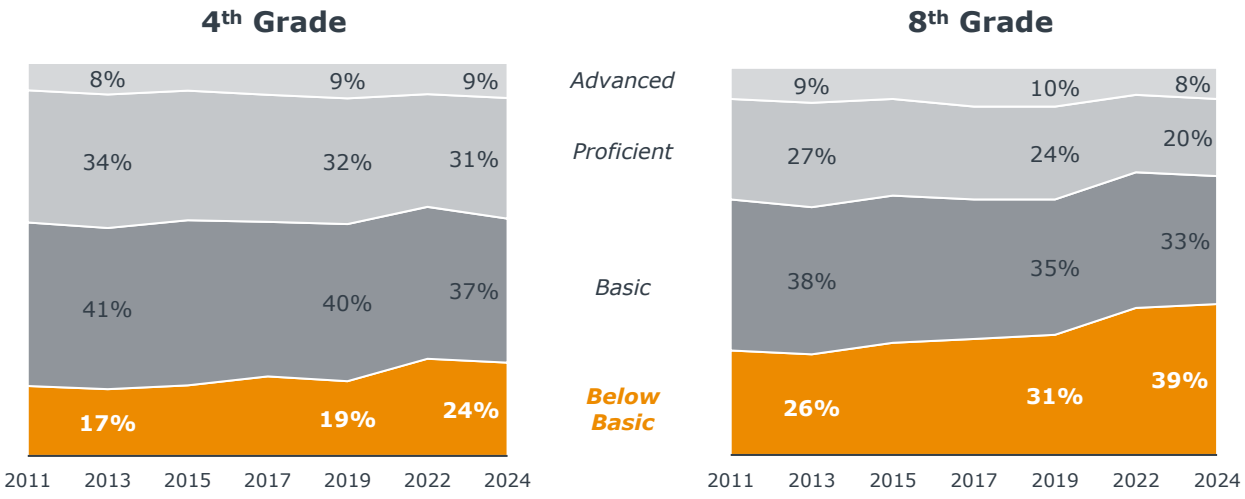
Common Core Standards Support Full Picture of Math Proficiency

> *"[Common Core State Standards] describe the strands of mathematical proficiency specified in the National Research Council's report Adding It Up."*
>
> *- Common Core State Standards for Mathematics*

Sources: National Research Council, *Adding It Up*, 2001; Rittle-Johnson, et al., Not a One-Way Street: Bidirectional Relations Between Procedural and Conceptual Knowledge of Mathematics, 2015; EAB interviews and analysis

Too Many Students Are Stuck Below Basic

Trend in NAEP Math Achievement-level Results



Key Insights:

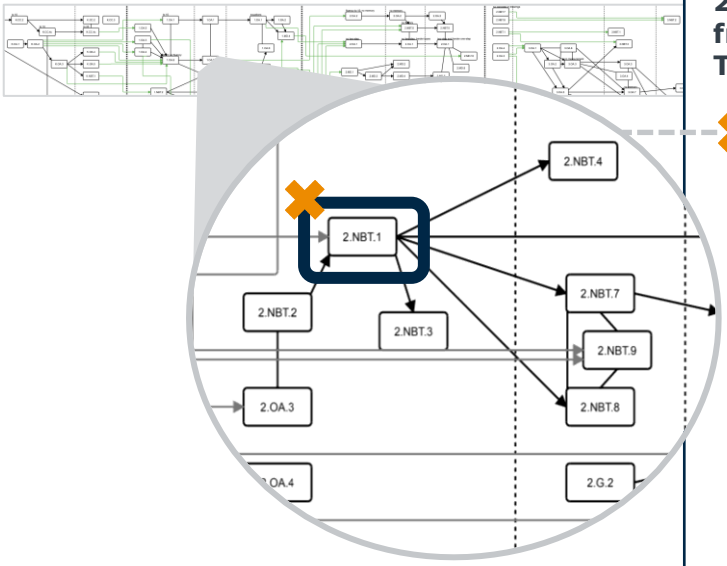
- **Performance peaked in 2013** and has since stagnated or declined for all students.
- **The lowest performers are falling faster each year**. The 10th and 25th percentile of students declined faster than students at the 50th percentile or above.

Sources: National Center for Education Statistics, NAEP Report Card: Mathematics, 2024; EAB interviews and analysis.

Students Need Help Before Skill Gaps Multiply

Math Is Relentlessly Cumulative

53+ longitudinal studies show early math skills predict later math skills



Excerpt from Common Core State Standards for Math Coherence Map

Failing to Master One Standard in 2nd Grade Directly Bars a Student from Mastering Eight Others Across Three Grade Levels

2.NBT.1[1] – Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; *e.g., 706 equals 7 hundreds, 0 tens, and 6 ones.*

- Write numbers to 1000 in expanded form
- Add and subtract using concrete models
- Round multi-digit whole numbers
- Multiply multi-digit numbers
- Compare 3-digit numbers
- Mentally add 3-digit numbers
- Mentally subtract 3-digit numbers
- Apply concepts of place value in division

1) **2.NBT.1** refers to Grade 2, Number and Operations in Base Ten, Standard 1 from the Common Core State Standards for Mathematics

Sources: Nelson & Powell, Trajectories of Mathematics Performance: From Preschool to Postsecondary, 2016; Zimba, A Graph of the Content Standards, 2012; EAB interviews and analysis

Why Are More Students Struggling in Math?

Pandemic Disruptions?

- Avg. NAEP math score declined 8 points 2019-2024…
- …yet avg. score declined 13 points 2013-2019

Socioeconomic Challenges?

- Low-income NAEP scores fell 12 points 2013-2024…
- …yet higher income scores fell 9 points 2013-2024

Increasing Screen Time?

- Adolescent screen time rose 54% worldwide…
- …yet US ranks #1 for achievement gap growth

Poor Literacy Skills?

- Reading and math achievement are related…
- …yet early math skills uniquely predict future math success

Why were scores falling even before COVID? *Why did all students decline?* *Why is the U.S. gap growing fastest globally?* *What explains declines where reading can't?*

District Math Instruction?

- ~93% of students are capable of learning math without intensive support[1]
- ...yet only 61% of students are proficient by 8th grade.

1) Dyscalculia affects 3–7% of individuals across all ages, causing persistent difficulty with arithmetic that significantly impairs calculations.

Sources: National Center for Education Statistics, NAEP Report Card: Mathematics – Performance by Student Group, 2024; Madigan, et al., Assessment of Changes in Child and Adolescent Screen Time During the COVID-19 Pandemic, 2022; Malkus, Testing Theories of Why, 2025; EAB interviews and analysis

Pedagogy Divide Distracts from Learning as a *Process*

Researchers and Practitioners Argue Over the Best Method for Teaching Math

Schools of Thought on Appropriate Instructional Methods:

Teacher-Led Instruction	Student-Led Instruction
• *"Students learn best when teachers strategically plan and deliver content."*	• *"Students develop deeper understanding when they build understanding themselves."*
• *"We must use the most efficient methods possible – otherwise we're wasting kids' time."*	• *"It's impossible to teach kids everything, so we must teach kids how to learn."*
• E.g., explicit instruction	• E.g., discovery learning

Methods Have a Right Place and Time

> *Beginners aren't 'little' experts; they know less and think differently than experts. Children also aren't small adults. They see the world very differently and* ***therefore have to learn differently.****"*
>
> - Paul Kirschner, *How Learning Happens*

Sources: Barshay, How a Debate Over the Science of Math Could Reignite the Math Wars, 2023; EAB interviews and analysis.

Bridging the Foundational Math Knowledge Gap

Three Keys to Accelerating Math Success

⚠ Current instructional approaches do not build to full mastery

Understand the Most Efficient Path to Skill Mastery

⚠ Skill gaps bar students from accessing core instruction

Hardwire the Approach into Intervention to Accelerate Skill Recovery

⚠ Scaling to core instruction hinges on working within misaligned curricula

Build Teacher Expertise to Reevaluate Practices in Core Instruction

Bridging the Foundational Math Knowledge Gap

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Build Teacher Expertise to Reevaluate Practices in Core Instruction

Research Supports Matching Instruction to Learning Stage

The Instructional Hierarchy: An Empirically Validated Learning Path

	ACQUISITION	FLUENCY	GENERALIZATION
Student Goals	**Accuracy**: Perform skill accurately and understand concept(s) behind procedure	**Efficiency**: Increase speed and accuracy	**Novel application:** Apply the skill flexibly in unstructured situations
Instructional Tactics	**Explicit instruction** (modeling, guided practice, immediate feedback)	**Maximum practice opportunities**, favoring independent and/or timed practice	**Novel problems and student-led tasks**; spiraling to ensure skill maintenance

Sources: Maki, et al., Intervening with Multiplication Fact Difficulties, 2020; Codding, et al., Using Data to Intensify Math Instruction, 2023; VanDerHeyden, et al., Randomized Evaluation of a Supplemental Grade-Wide Mathematics Intervention, 2012; Codding, et al., Comparing mathematics interventions, 2007; Burns, et al., Meta-analysis of acquisition and fluency math interventions with instructional and frustration level skills, 2010; Codding, et al., Meta-analysis of mathematic basic-fact fluency interventions, 2011

Learning Transitions at Measurable Intervals

The Instructional Hierarchy

Student Goals	**Accuracy**: Perform skill accurately and understand concept(s) behind procedure	**Efficiency**: Increase speed and accuracy	**Novel application:** Apply the skill flexibly in unstructured situations
Criteria for Moving to Next Stage	**Percent correct**	**Digits correct per minute**	

Sources: Maki, et al., Intervening with Multiplication Fact Difficulties, 2020; Codding, et al., Using Data to Intensify Math Instruction, 2023; VanDerHeyden, et al., Randomized Evaluation of a Supplemental Grade-Wide Mathematics Intervention, 2012; Codding, et al., Comparing mathematics interventions, 2007; Burns, et al., Meta-analysis of acquisition and fluency math interventions with instructional and frustration level skills, 2010; Codding, et al., Meta-analysis of mathematic basic-fact fluency interventions, 2011

Missteps Often Bar Students from Full Mastery

Common Missteps in Acquisition Phase

Using fluency tactics in acquisition (i.e., timed activities)

Rote memorization and unfinished learning

Using generalization tactics in acquisition (i.e., unstructured tasks)

Student participation, but unfinished learning

Common Missteps in Fluency Stage

Stopping at acquisition, never reaching fluency

Inefficient problem solving and unfinished learning

Source: EAB interviews and analysis

Math Instruction Must Account for Working Memory

Cognitive Load Theory ▶ Explains that all students' learning is constrained by limited working memory, requiring instructional design that builds skills systematically without introducing too many pieces of new information.

New, Unlearned Skills Take Up Limited Working Memory

4-7 Max # of items humans can hold in working memory. Students cannot increase working memory.[1]

Long-term memory is unlimited; recalling items from long-term memory is effortless.

A student must hold each piece of *unlearned* info in their working memory as a separate item.

As students learn, they can chunk learned items into a single item, freeing up working memory:

- Expert: 3+4=7 → 1 item
- Novice: 3+4=7 → 3-5 items

1) Working load for young children (~K-3) tends to be lower.

Sources: Cowan, The magical number 4 in short-term memory: A reconsideration of mental storage capacity, 2001; Doabler & Fien, Explicit Mathematics Instruction: What Teachers Can Do for Teaching Students With Mathematics Difficulties, 2013; Kirschner, et al., Why Minimal Guidance During Instruction Does Not Work, 2006; Gupta & Zheng, Cognitive Load in Solving Mathematics Problems: Validating the Role of Motivation and the Interaction Among Prior Knowledge, Worked Examples, and Task Difficulty, 2020

Explicit Instruction Best Suited for Teaching Novices

Explicit Instruction Is a Systematic Approach – Not Just Lecturing

Intentional Sequencing: Strategic ordering of instruction & content to incrementally build mastery and connect new to existing learning.

Clear Delivery: Teacher-directed presentation mixing modeling, guided practice, and frequent opportunities for student response and feedback.

Optimized for Kids' Working Memory

Breaks complex skills into simpler subskills, connects new skills to previously learned skills.

As students build mastery in skill, teacher introduces more independent tasks, less teacher-directed instruction.

Most Efficient for Teaching New Skills

Empirical research consistently finds EI a highly efficient method for teaching *new* math skills to novices.

***Some of our students don't have time to discover this stuff for themselves**. They would be better off if they were given more formal step-by-step instruction."*

Dr. Dylan William, Emeritus
Professor of Educational Assessment
at the UCL Institute of Education

Sources: Watkins, Project Follow-Through, 1997; Doabler & Fien, Explicit Mathematics Instruction: What Teachers Can Do for Teaching Students With Mathematics Difficulties, 2013; Kirschner, et al., Why Minimal Guidance During Instruction Does Not Work, 2006; Fuchs, et al., Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades, 2021; Kroesbergen, et al., Effectiveness of Explicit and Constructivist Mathematics Instruction for Low-Achieving Students in the Netherlands, 2004

"Understanding" Not Enough to Evaluate Mastery

Skill Mastery Requires Fluency: Accuracy *and Speed*

Many Leaders Discount Importance of Speed, Fail to Move Past Accuracy

"We focus on the kids' comprehension and thinking. I don't care how quickly they can do the calculation, because they'll have a calculator soon."

"My teachers don't assess how fast the student is, because faster isn't smarter."

Speed and Accuracy are Twice as Predictive of Overall Math Proficiency as Accuracy Alone

2x Factor by which 4-5th graders' speed-plus-accuracy better predicted math proficiency than accuracy alone

Speed Reflects Automatic Recall from Long-Term Memory

Manual computation, referencing tax working memory required to learn new skills and apply learned skills.

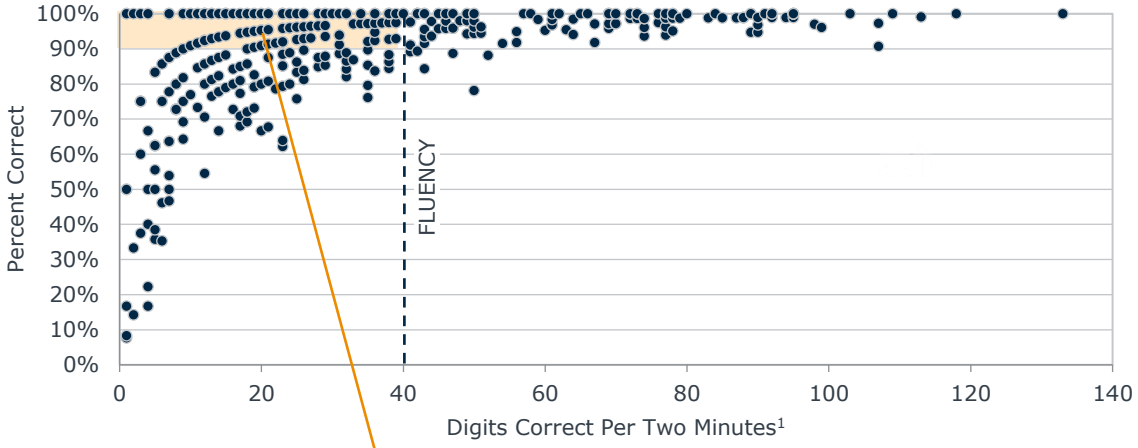
Students who rely on automatic recall of facts and procedures perform better in higher-level math than peers who rely on manual computation.

Sources: VanDerHeyden & Solomon, Valid Outcomes for Screening and Progress Monitoring: Fluency Is Superior to Accuracy in Curriculum-Based Measurement, 2023; Source: Burns, et al., Assessing the Instructional Level for Mathematics: A Comparison of Methods, 2006; Clark, et al., Putting Students on the Path to Learning, 2012; Parkhurst, et al., Efficient Class-wide Remediation: Using Technology to Identify Idiosyncratic Math Facts for Additional Automaticity Drills, 2010; Price, et al., Why mental arithmetic counts: Brain activation during single digit arithmetic predicts high school math scores, 2013; EAB interviews and analysis

Many Students Mistakenly Identified as Proficient

Many Students Will Not Reach Fluency Without Aligned Instruction

Student Performance on First Attempt of Multi. And Div. Fact Families, n=427



"The Illusion of Mastery"

Teachers often mistake these students as proficient, but they likely won't retain or apply the skill in problem solving

▶ 55% of these students were at-risk of failing grade-level math, despite being highly accurate

Source: VanDerHeyden, et al., Randomized Evaluation of a Supplemental Grade-Wide Mathematics Intervention, 2012; VanDerHeyden & Codding, Practical Effects of Classwide Mathematics Intervention, 2015

Students Build Speed via Repeated Practice

Most Students Need Frequent Practice to Build Accuracy & Speed

4th Graders Needed to Practice Multiplication Facts for **At Least…**

2 minutes per day **x** 20 consecutive school days

to achieve sufficient accuracy & speed

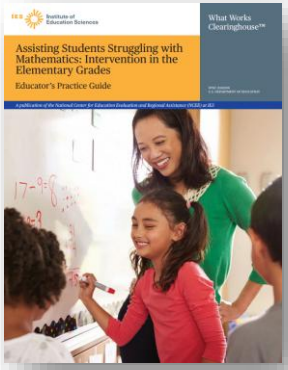
Compared to Proficient 4th Graders, Struggling Students Needed…

1.5x

more repetitions to achieve sufficient speed & accuracy with multiplication facts

Speeded Activities Maximize Practice Opportunities per Session

IES Practice Guide – Assisting Students Struggling with Mathematics (2021)



27+

Rigorous studies indicate a causal relationship between timed practice and stronger student outcomes

"Practice has a bad name in math because we've done this part wrong for so long... We are not giving students their just-right work – and they need to have work that is at their level"

Dr. Robin Codding, Professor of Applied Psychology, Northeastern University

Sources: Duhon, et al, Toward a More Comprehensive Evaluation of Interventions: A Dose-Response Curve Analysis of an Explicit Timing Intervention, 2019; Burns, et al, Number of Repetitions Required to Retain Single-Digit Multiplication Facts for Elementary Students, 2014; Fuchs, et al., Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades, 2021; Skinner, et al., Improving learning science: Evaluating and comparing academic interventions using measures of learning speed, 2023; Chalk & Talk, Do timed tests cause math anxiety?, 2023

Now, Students Are Ready to Generalize

Types of Generalization Tactics Span a Range of Activities

- Independent opportunities for distributed practice
- Cumulative review and games that combine different concepts or skills
- Deliberately novel but related activities to promote correct responding to unstructured tasks
- "Sabotaging" situations (e.g., a cooking project that requires a 1/2 cup quantity and only 1/8 or 1/4 cups are available to solve)

"Rules" for Matching Tactic Are Less Rigid in Generalization

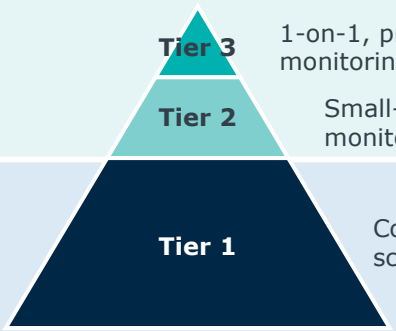
Generalization is a goal – once students reach it, learning takes many shapes

Generalization is also about skill maintenance, which can resemble additional fluency practice

Sources: Maki, et al., Intervening with Multiplication Fact Difficulties, 2020; Codding, et al., Using Data to Intensify Math Instruction, 2023; VanDerHeyden, et al., Randomized Evaluation of a Supplemental Grade-Wide Mathematics Intervention, 2012; Codding, et al., Comparing mathematics interventions, 2007; Burns, et al., Meta-analysis of acquisition and fluency math interventions with instructional and frustration level skills, 2010; Codding, et al., Meta-analysis of mathematic basic-fact fluency interventions, 2011

Districts Struggle to Balance Intervention Reach vs. Results

Intervention Designed to Help Students Recover Skills for Core Instruction



1-on-1, progress monitoring (5%)

Small-group, progress monitoring (20%)

Core instruction, universal screening (100%)

But Districts Face Two Challenges with MTSS Model

13+

states passed/introduced laws pushing "evidence-based" math instruction & intervention, but few define "evidence-based" (2023-present)

More districts where >20% of students flagged for tier 2-3, overburdening intensive math interventions

Sources: ExcelinEd, From Policy to Action: 3 States Getting Ahead of the Curve with Math Policy, 2024; Korbey, Reading Supports Abound in Schools, But Effective Math Help Much Harder to Find, 2024; Schwartz, Schools Prioritize Reading Intervention. But What About Math?, 2024; Schwartz, 7 States Now Require Math Support for Struggling Students. Here's What's in the New Laws, 2023

Systematic Classwide Intervention Balances Scale & Impact

Classwide Intervention *15 min.* + **Core Instruction** *45 min.* = 60 min. math block

What It Is

Daily, systematic instruction along a sequence of key foundational skills that closes mastery gaps for everyone in a classroom, instead of only targeting struggling students in 1:1 or small groups.

Why It Works

Feasible & Scalable So Teachers Can Be Consistent

- ✓ Requires 15[1] minutes per day
- ✓ Teacher delivers to all students simultaneously
- ✓ Students of different mastery levels work in pairs to help **both partners improve outcomes**

Stronger Outcomes than Curriculum Change or Digital Instruction

- ✓ High-quality research finds strong effects on validated math achievement measures **when teachers implement in their real classrooms**

1) May require 20 minutes in first few weeks of year, as teachers are still establishing classroom routines.

Sources: VanDerHeyden, et al., Randomized Evaluation of a Supplemental Grade-Wide Mathematics Intervention, 2012; VanDerHeyden & Codding, Practical Effects of Classwide Mathematics Intervention, 2015; Codding, et al., Using Data to Intensify Math Instruction, 2023

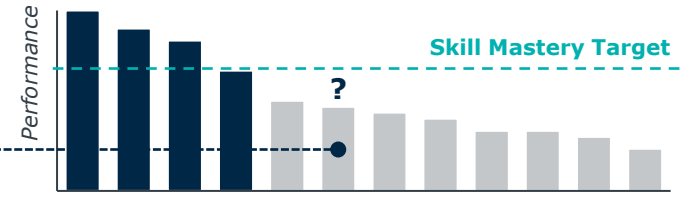
All Students Show Progress with Classwide Intervention

Many Districts See 70%+ of Students Flagged on Skill Screeners

Traditional MTSS systems can't support volume over 20% in Tier 2

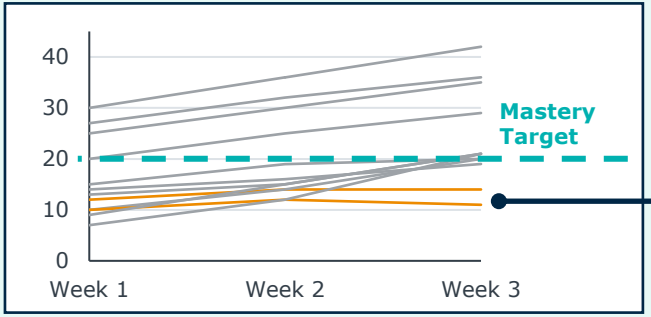
However, some of these students may not require small group intervention and will improve with whole group practice

Example: Distribution of Classroom Performance on Addition 0-20



Classwide Intervention Accelerates Learning for All, Shows Who Needs Tier 2-3

Class Progress Across 3 Weeks of Classwide Intervention on Addition 0-20



Trend data identifies student needs based on **response to intervention**, not single test performance

After 3 weeks of instruction, these students need intensive intervention. The rest of the class meets mastery target.

Sources: VanDerHeyden & Myskens, Supporting Math MTSS Through SpringMath, 2023

Introducing EAB's Math Leadership Lab

Join the 4-Part Collaborative in January 2026

Objectives:

- Plan and pilot an evidence-based math intervention protocol
- Bolster math leadership expertise

Who to Invite:

- Assistant Superintendents
- District Math Leaders

January

1

Understanding the Foundational Math Skill Problem

Bolster expertise in the research behind improving math outcomes

February

2

Creating Conditions for a Math Skill Recovery Pilot

Establish school-level factors enabling classwide math intervention

March

3

Operationalizing Your Math Skill Recovery Pilot

Assemble ready-to-use resources and procedures to ensure implementation fidelity

April

4

Planning Pilot Launch and Analyzing Results

Follow a step-by-step playbook for piloting and evaluating your math skill recovery plan

Accelerate Math Progress in Your District

Virtual Roundtable

Oct. 9, 1:00-3:00 p.m. ET

Bridging the Foundational Math Knowledge Gap

Research deep-dive into what makes math fundamentally different—and why approaches to improve student performance should differ, too. Attendees will learn:

- Tried-and-true instructional tactics for real math improvement
- How to build a math-focused skill recovery system
- Effective tools and trainings to equip teachers for confident instruction

Winter Collaborative

Launching Jan. 2026

EAB's Math Leadership Lab

Four-part collaborative designed to help your team accelerate math recovery while building long-term, sustainable improvement in student outcomes. Sessions include:

- Understand the foundational math skill problem
- Match MTSS strategy to district needs
- Operationalize a math MTSS protocol
- Launch a pilot for evidence-based math intervention

Join by September 30 to secure your spot—*Limited seats available!*

How Can We Help?

I'd like to speak with an EAB expert to…

1. Learn more about our **October Math Virtual Roundtable**
2. Get more details about the **Winter Math Leadership Lab**
3. Hear more about **other upcoming cohorts** with EAB, including **principal development**
4. **Something Else?** Choose this option and we will follow up with you.

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