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Cultivating Math Mindsets

State and District Policies That Support Teachers and Student Learning

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Summary

The United States persistently lags other countries in math achievement, and students are increasingly disengaged with the subject. As states adopt new high-quality instructional materials to address these challenges, supporting teachers in cultivating classroom environments will be essential to helping students make the most of their learning opportunities. This brief summarizes case study findings from 10 middle school math teachers who promoted positive classroom learning conditions and examines the school- and district-level factors that enabled or impeded these efforts. Given the key role that state policymakers can play in scaling effective math practices, this brief concludes with policy considerations for state leaders, such as (a) including instructional guidance for mathematics educators on creating positive classroom conditions, (b) ensuring that teacher education programs establish the importance of these conditions for students' math learning, and (c) allocating professional learning funds to support in-service math teachers.

The report on which this brief is based can be found here.

Introduction

Recent data point to a persistent and deepening math achievement challenge in the United States. The country has long lagged behind international peers in math achievement, falling consistently below average on the Programme for International Student Assessment (PISA) among countries with similar democracies and market-based economies. Research suggests that instructional approaches may be a contributing factor: Other countries with stronger PISA math scores tend to emphasize conceptual understanding alongside procedural fluency, apply math to real-world problem-solving, and concentrate instruction on fewer topics to support deeper learning.[1] In the United States, learning disruptions that occurred during COVID-19 compounded long-standing challenges and triggered sharp declines in math performance from which students have yet to recover. These converging pressures have brought renewed urgency to the need for improvement in math instruction, and several states have recently passed legislation that focuses on improving student learning and math outcomes.

Students' disengagement with math learning is also a concern. A recent RAND Corporation study found that half of U.S. middle and high school students reported losing interest in math class half or more of the time, and nearly 1 in 10 reported that they were rarely engaged at all. Math teachers feel this disengagement. Compared to other teachers, math teachers report significantly lower confidence in engaging students in their middle school classrooms.[2]

The science of learning and development offers valuable insights for policymakers seeking to strengthen students' math achievement. This brief synthesizes evidence on the conditions that support students' emotional and cognitive development, both generally and in math classrooms specifically. It draws on findings from a recent study of middle school math teachers to examine how these conditions were cultivated in practice and what school- and district-level factors enabled or impeded these efforts. This brief concludes with policy considerations to help state leaders improve math learning conditions for all students.

Classroom Conditions That Support Math Learning

Recent syntheses of research about how youth learn and develop from across the fields of neuroscience, psychology, and other development and learning sciences—commonly referred to as the "science of learning and development"—make it clear that students' learning environments matter greatly for their academic success. Students learn best in environments where they feel safe physically, emotionally, and in their identity; hold positive relationships with adults and peers; and experience belonging, purpose, and affirmation. Coupling these factors with meaningful math activities that prioritize curiosity, inquiry, and engagement can build students' academic capacity and motivation for learning.

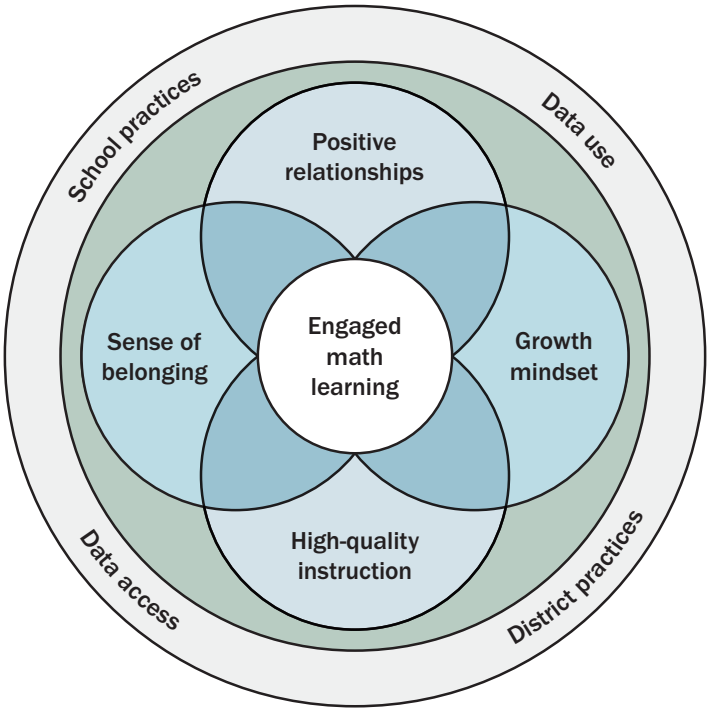
Studies that focus specifically on math learning reinforce findings from the science of learning and development. In a recent publication synthesizing this literature, we reported on evidence that students have more positive and productive math learning experiences in classrooms where teachers (see Figure 1):

- foster positive relationships,
- develop students' sense of belonging,
- encourage a growth mindset, and
- deliver high-quality math instruction.

Cultivating this set of positive classroom learning conditions can help all students achieve their full potential in math. Furthermore, there is evidence that students from historically marginalized groups and in the middle school years—a time when students' general school motivation and math engagement can sharply decline—particularly benefit from these developmentally supportive classroom conditions.

In states working to improve math outcomes, one common strategy has been to require the adoption of high-quality instructional materials in math classrooms. This approach holds promise for improving the quality of instruction happening in classrooms. But these materials alone do not teach students. Policies that encourage districts, schools, and teachers to treat students' classroom relationships, sense of belonging, and mindsets toward learning as essential complements to high-quality instruction—and provide supports for doing so—can help students engage more fully with and benefit from instructional improvements.

Figure 1. Classroom Conditions That Support Students' Math Learning



Source: Learning Policy Institute. (2025).

Research Findings

The findings in this brief are drawn from a qualitative case study of 10 math teachers across five southern California middle schools in three districts. (See Table 1.) The study explored how these teachers promoted positive learning conditions in their classrooms and how school and district practices facilitated or hindered their ability to do this work.

Table 1. Districts and Schools of Participating Teachers

District	School
Long Beach Unified School District	Marshall Academy of the Arts
	Stephens Middle School
	Tincher K–8 Preparatory
San Diego School District	Knox Middle School
Sweetwater Union High School District	National City Middle School

Source: Learning Policy Institute. (2026).

Positive Conditions for Math Learning in Practice

Teachers' practices illustrate how the four positive classroom conditions come to life in math classrooms.

Positive Relationships. The teachers in this study shared a deliberate approach to building classroom environments where students had relationships that helped them feel emotionally safe, seen, and connected. Teachers maintained a consistently warm and steady presence, responded to off-task behavior calmly rather than punitively, and took care to protect students who carried anxiety about math from experiences that were likely to heighten it. They also made concerted efforts to learn about students' backgrounds, interests, and cultural contexts, and they used that knowledge to make instruction feel relevant and inclusive for all students.

Equally important was how these teachers structured peer interaction. Recognizing that adolescents are inherently social, they designed classroom routines that channeled students' adolescent energy into learning: collaborative problem-solving, brief peer exchanges, and group work. Clear norms governed these activities. These forms of engagement helped students build relationships with their peers under assured classroom expectations of respect and kindness.

Sense of Belonging. Teachers developed students' sense of belonging through deliberate, personal connections: greeting students at the door, circulating systematically during work time, and incorporating activities that gave students space to share their personalities and get comfortable with peers.

Teachers also developed students' sense of belonging in *math*—specifically, their sense of being viewed, both by themselves and by others, as someone who could succeed at mathematics. One shared strategy was to design tasks that invited participation from all students, regardless of prior knowledge, using open-ended problems with no single correct answer. Teachers expressed that these types of problems reduced anxiety and made whole-class discussion feel safer. Another shared strategy was publicly recognizing student success. Teachers reinforced students' sense of math competence and math belonging by highlighting individual students' mathematical thinking and watching carefully for genuine moments of growth. Teachers emphasized the importance of math-specific, authentic praise. One teacher said that praise should be structured around "finding something to celebrate, but in a way that is authentic, that is not fake. 'You can do it'—no, that doesn't cut it with them because they've been hearing that, but they have not felt that before."

Growth Mindset. The teachers in this study helped students develop a growth mindset toward math by communicating—consistently and explicitly—that math skills grow through effort and that early struggle is a typical part of learning. They reinforced this message verbally and with posters. For example, one teacher said, "Today we're starting brand new. So, today's the first day we're doing it. No one is expecting you to know it perfectly today." They also reinforced this message with instructional choices: assigning groups randomly rather than by ability, praising students' reasoning rather than correct answers, normalizing and destigmatizing mistakes, and allowing students to revise assessments.

High-Quality Instruction. The teachers in this study structured instruction in ways that embrace how students learn. Rather than delivering lengthy lectures, they taught in short segments of direct instruction followed by substantial time for collaborative practice. They circulated to observe student thinking in real time and deliver immediate, targeted feedback before misconceptions could take hold. Collaborative work time also allowed students to translate the lesson to each other in, as one teacher described it, "kid language." Teachers built reviews into lessons to ensure students had the prerequisite knowledge to access grade-level content, and they consistently explained the conceptual reasoning behind mathematical procedures rather than teaching steps alone.

These teachers paid close attention to how students talked about mathematics. When students used informal or imprecise language, teachers affirmed the underlying understanding while gently introducing correct terminology, framing vocabulary as a learning target rather than a prerequisite. This emphasis on mathematical language often reinforced conceptual understanding at the same time.

The above practices are not incidental qualities of effective teachers. They embody evidence-based and purposeful practices that teachers learn. Districts, schools, and state-level policymakers can offer supports to help teachers cultivate these practices.

School- and District-Level Conditions That Support Math Teachers

At the school level, teachers pointed to three key supports:

1. **In-classroom support staff** (e.g., educational specialists, paraeducators, and student teachers) enabled more personalized instruction and allowed teachers to implement more ambitious group activities than they could manage alone.

2. **Collaboration with colleagues** in their building was consistently named as a primary source of professional growth, with teachers valuing subject-specific planning time, shared instructional materials, and the ability to learn from early adopters of new approaches.

3. **Clear norms from school or department leadership** help to make collaboration opportunities especially productive. These provided structure to ensure improvement-focused conversations. For example, school administrators at Stephens Middle School established shared instructional routines across all math classrooms and held regular staff meetings focused on student outcomes and implementation challenges. They also redesigned the master schedule to add a math support period for students performing below grade level. (See Math-Focused Leadership at Stephens Middle School.) Their math-focused leadership created a coherent, schoolwide system of support for math improvement.

Math-Focused Leadership at Stephens Middle School

At Stephens Middle School, located in the Long Beach Unified School District, the school administration adopted a focus on improving student math outcomes and implemented several schoolwide instructional norms that shaped teachers' lesson design and delivery. One norm included the use of specific "math routines," or short, structured learning activities intended to improve student engagement. For example, across the math classrooms, teachers implemented a collaborative learning framework that involved students getting out of their desks to work in groups at vertical whiteboards and closed each lesson with a "Prove It" activity that held students accountable for demonstrating their learning.

Other routines were normed schoolwide and used by teachers regardless of subject area, which allowed these practices to become routine for students. One example was the ClEvR model—which stands for Claim, Evidence, and Reasoning—which provided teachers with a shared model for teaching short response writing to develop students' ability to explain their thinking. The school administration held teachers accountable for implementing focal instructional routines throughout the school year by reserving time during staff meetings to discuss student outcomes and troubleshoot the implementation of these new practices to best meet their students' needs.

Furthermore, school leadership redesigned the master schedule to add Math Development, an additional period of math for students who were performing below grade level. This course afforded students additional time to build their math skills, allowing them to develop missing skills from previous grade levels during one period and learn grade-level content in another. Importantly, they designed the schedule so that these students did not miss out on elective courses, and the course was taught by their same math teacher.

By establishing shared priorities for math instruction (e.g., implementing specific instructional routines) and reinforcing focus on them throughout the school year, school leaders gave teachers clear incentives and support for adopting new instructional approaches. School leaders implemented a multipronged approach to math instructional improvement. These efforts provided teachers with resources for classroom instruction, time for personalized remediation to enable students' access to grade-level content, and support from colleagues as they implemented new practices.

Source: Learning Policy Institute analysis of teacher interviews and classroom observations. (2025).

At the district level, teachers valued several resources that supported their instructional practice. Professional development was highlighted across sites, particularly in the Long Beach Unified School District, where district-funded training helped teachers implement a collaborative math learning framework and embed specific math routines into their lessons. Teachers also appreciated ready-made and high-quality instructional materials—such as pre-designed "Which One Doesn't Belong?" and "Notice and Wonder" tasks—that reduced the time burden they associated with adopting new materials. Math coaches were valued by teachers, especially when they provided on-site, contextualized support for instructional improvement.

On the other hand, teachers identified certain district-level structures as sources of tension. Rigid pacing calendars pressured some teachers to move through material before students had mastered it, and standardized district assessments that prohibited student retakes were discouraging for students. Teachers expressed how these two structures felt at odds with the growth-oriented learning approaches that teachers were working to build. Teachers also found it difficult to use the district data on student perceptions of their learning environments because it was too disconnected from the students' experiences in their classrooms. (See Using Data to Improve Classroom Conditions.)

Using Data to Improve Classroom Conditions

Although all teachers in this study had access to formal student perception survey data, structural barriers—including heavy workloads, infrequent survey administration, and data reported only at the grade or school level rather than by classroom or student group—prevented most teachers from using it meaningfully. As a result, teachers relied primarily on informal, observational approaches: reading nonverbal cues, noticing engagement in real time, and learning about individual students' experiences through direct conversation. Teachers felt confident in these methods, and their positive classroom environments reflected real skill. However, research shows that what teachers notice is never fully objective—their own backgrounds and beliefs shape what and who they pay attention to and how they interpret what they see. This suggests that even skilled teachers can benefit from structured supports to increase use of formal data. Teachers wanted more systematic and timely classroom-level data that was integrated into school improvement priorities.

Source: Learning Policy Institute. (2026).

Considerations for State Policymakers

As policymakers and practitioners work to improve student math outcomes, a focus on students' experiences in math classrooms is an essential part of the equation. Like all learning, math learning requires an environment where students feel socially connected and safe. Research makes it clear that the ways in which students participate in classroom instruction are shaped by classroom relationships, students' feelings about whether they belong and are able to learn math, and teachers' approaches to teaching math content. Likewise, the ways in which teachers engage with students in their classrooms can be shaped and supported by how schools and districts structure their practices and policies. Key examples include instructional guidance, clear expectations, reconstruction of schedules for collaboration, and availability of support staff.

Beyond schools and districts, state policy can lay the groundwork for improving the conditions for math learning by influencing the math-related support and guidance that school and district leaders provide to teachers. The findings from this study point to three areas where state policymakers can help.

1. **Include the importance of creating positive classroom conditions in instructional guidance for mathematics educators.** While teachers have received ample guidance on *what* to teach in their math classrooms, they have received considerably less guidance on *how* to teach their content. In

recent years, many states have pursued math improvement by continuing to lean heavily on the *what* by encouraging the adoption of high-quality instructional materials in math classrooms and investing in professional learning that supports teachers' usage of these materials. This approach holds great promise for improving the classroom experiences of many students who currently lack opportunities to engage with appropriately rigorous and well-scaffolded math content. At the same time, the evidence recounted in our report emphasizes that attending to classroom relationships, student belonging, and mindsets toward learning can help create environments where students feel safe to take the risks needed to fully engage with high-quality math instruction. States can issue guidance that, in accordance with the research evidence, establishes each of these factors as essential for students' classroom engagement and math learning. Guidance can provide concrete recommendations to teachers for cultivating developmentally supportive math learning environments.

One example of state-level guidance is the 2023 California Mathematics Framework, which incorporates research-informed instructional components, including elements of supportive math classrooms that are known to promote positive outcomes for each and every student, coupled with practice-based examples. Maryland's PreK–12 Mathematics Policy presents another example. Its vision for effective math instruction elevates the importance of students' attitudes toward math and sense of belonging in the classroom, and it presents other research-informed pedagogical practices. Such frameworks can inform district vision-setting for math instruction and guide instructional supports provided to teachers. These frameworks can also create a shared language between districts and educator preparation programs as they collaborate to prepare preservice teachers and support those in service.

2. **Ensure that teacher education programs instruct future teachers on how to establish positive classroom conditions for students' math learning in their own classrooms.** State policymakers can shape the instructional priorities and capacities of new teachers by updating accreditation and licensing requirements for teacher preparation providers and candidates. States can create or update preparation standards for teachers. These standards should integrate research about the positive classroom conditions that support student math learning, as well as provide techniques for how teachers can establish those conditions in their classrooms.

   For example, the recently updated New Mexico Teacher Preparation Standards set the expectation that all new teachers can cultivate safe, engaging, and collaborative learning environments in which students feel that they belong and "feel safe to express identity, participate, and take academic risks."[3] They also expect that aspiring teachers will be taught to utilize instructional practices aligned with how people learn. Specifically, they note that preparation should explain how factors such as relationships influence learning, in addition to providing guidance on effective instructional approaches. By ensuring that all new teachers enter with this set of skills and knowledge, states can increase the likelihood that students will experience the classroom conditions that research shows best support their math learning.

3. **Allocate funds for professional learning to support in-service math teachers.** While many math teachers feel highly invested in improving the quality of their students' classroom learning experiences, they often lack access to high-quality professional learning opportunities that could

help them do so. Research shows that teacher participation in in-service professional learning can positively affect K–12 student math outcomes. Therefore, state investments that increase teachers' access to these opportunities could meaningfully boost students' math learning. The math teachers in our study placed a high value on learning from their colleagues, suggesting that a professional learning model in which expert teachers support their colleagues over time could be an effective way to maximize the impact of such investments.

Another investment option is to provide or augment funds for training and hiring math coaches or to provide other forms of professional learning. For example, Alabama's 2022 Numeracy Act allocated one to two math coaches to all public K–5 schools and specified that these coaches would receive training and ongoing support on evidence-based coaching practices. As of 2025, the Alabama legislature had appropriated $27 million to continue and expand the program. In a somewhat different approach, the recent Texas House Bill 2 mandated professional development for classroom teachers, math coaches, interventionists, and building leaders working with students in grades K–3. To fulfill this mandate, the state education agency is launching a statewide professional learning initiative called Texas Mathematics Academies. This initiative will provide Texas educators with structured learning modules that aim to strengthen math pedagogical content knowledge, instructional practices, and leadership capacity.

Conclusion

The teachers in this study demonstrate that the work of establishing positive developmental conditions for math learning—relationships, sense of belonging, and growth mindsets—is not in competition with the delivery of high-quality instruction. Instead, these practices are mutually reinforcing, and they set up students to engage productively, without fear, in classroom instructional opportunities.

Policymakers can revise policy systems to encourage districts, schools, and teachers to center the developmental needs of students in math classrooms. Incorporating evidence-based practices holds promise for improving the learning experiences and math achievement of all students, particularly for students from groups that have historically been most underserved in math education.

When policy, practice, and research align around students' developmental needs, more students can experience math as a subject they belong in and are capable of mastering—an outcome that has positive implications for individual students. Addressing math disinterest and disengagement through developmentally supportive, evidence-aligned instructional practices may offer a meaningful pathway to improving math achievement at the state and national levels.

Endnotes

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