

Additional Documents for Agenda Item #11
March 20, 2025

A Powerful Rethinking of Your Math Classroom

We look at strategies you can reset this year—adjusting your testing regimen, tackling math anxiety, encouraging critical thinking, and fostering a mistake-friendly environment.

By [Andrew Boryga](#) August 16, 2023

The beginning of school is a great time for teachers—both veteran and early career—to consider ways they can improve upon their classroom practices over the next year. This may be especially important for math teachers, who often spend the early days of the school year confronting [math anxiety](#), convincing students that they are indeed “math people,” and coming up with engaging practices to guide students to find pleasure in math challenges. Innovating in these areas has the potential to yield big benefits for students all year long.

To help you re-imagine some of your teaching practices this year, we’ve pulled together a collection of big and small strategies aimed at:

- helping students adopt a more productive, curious mindset when they approach math,
- engaging students as soon as they walk through the door,
- rethinking how you handle testing,
- fostering a mistake-friendly environment,
- incorporating humanities-style discussions into math, and
- building what Peter Liljedahl calls a “[thinking classroom](#).”

Tackle Negative Math Mindsets

“Most of my work as a math teacher [isn’t even math](#),” former middle school math teacher José Vilson has said. “It’s helping students believe that they can also do math.”

Striking a similar note, middle school math coordinator Alessandra King writes that supporting students—particularly students from marginalized backgrounds—to develop a “[positive mathematical identity](#)” is crucial to fostering a sense of belonging in a larger math community, boosting “their willingness and ability to engage” in challenging work.

King recommends spending the first few days of the school year spotlighting mathematicians from the past who reflect the makeup of your classroom. In her all-girls school, for example, she has students read and respond to a play about the achievements and struggles of Maria Agnesi, Sofya Kovalevskaya, and Emmy Noether, three historical female mathematicians. You can also hang up posters of famous Black or Latino mathematicians—such as Euphemia Haynes, the first African American woman to earn a PhD in math, or Robert Luis Santos, a Latino statistician and director of the U.S. Census Bureau—and devote lessons to discussing their achievements and backgrounds.

To get students thinking about—and challenging—their own math identity, educator Rolanda Baldwin suggests asking students early in the year to write a “[math autobiography](#).” They might respond to questions like: “How do you feel about math? How did your relationship with math change over time?” To draw students closer together—and make them realize that many students, of all backgrounds, struggle—have them share their responses in groups, or with the entire class.

Sometimes, our best intentions can go awry. Rachel Fuhrman, a former special education math teacher, notes that teachers can sometimes dampen a student’s math identity by wheeling out phrases that might seem helpful but can [actually demotivate students](#), like: “This is so easy.” Framing something as “easy,” she writes, can leave students feeling uncomfortable or afraid of asking crucial, clarifying questions.

Engage Students the Moment They Enter the Classroom

To set a playful tone and lower the stakes of the work so students can effectively experiment and collaborate, high school math teacher Lorenzo Robinson suggests starting off class with fun, [challenging brain teasers](#).

For example, ask students to draw a cross on a sheet of paper (you should draw one on the board as a point of reference). Ask students to draw two straight lines that will segment or cut the cross into pieces. The goal is to [cut the cross in a way that produces the most pieces](#).

You could also try math riddles: Ask students to [imagine they have two coins](#) that total 30 cents. Tell them that one of the coins is not a nickel, and ask them to figure out what the two coins are.

Robinson finds that brain teasers like these can get students primed for problem solving and critical thinking, without even realizing it.

Lower the Stakes of Testing

Big tests—centered around units or near the end of a grading period—are staples of many math classrooms. But that doesn't mean they have to be the only opportunity for students to show what they know. One way to lower the stakes for students and give them more opportunities to practice, while providing yourself more of an opportunity to both teach content and check for understanding is to give short assessments on a regular schedule.

Math coordinator Steven Goldman's school switched [from tests to checkpoints](#). These short assessments include a mix of current and past topics—retrieval practice is [a research-backed way to support greater learning](#), after all—with some repetition for the most important skills students need to know. The checkpoints are given every two weeks and are not formally graded, but mistakes are noted and teachers leave feedback to guide student revisions. The change, Goldman writes, resulted in a big reduction in student stress levels—something [research shows](#) is a benefit of frequent practice tests, alongside a boost in long-term retention. Because the checkpoints happen all the time, Goldman and his colleagues don't have to “go through all kinds of contortions to finish a unit before a break or on a Thursday so that we could give the test at the right time.”

Fresno State math instructor Howie Hua suggests lowering the stake in your classroom by [allowing students to discuss a test before starting to work on it](#). Hua recommends having students put their pencils on the floor so they can focus on their discussion. Hand out the test and give students five minutes to discuss strategies they can use to solve the problems.

Good Mistakes, Better Mistakes

Mistakes are bound to happen in any math classroom, and how you respond to them throughout the year can make a world of difference. Making light of your own mistakes is a good first gambit, but [research suggests](#) a more advanced approach: Giving students space to make mistakes—and opportunities to analyze and discuss them with peers—can better encode information in their brains than simply providing them with the correct answer.

To use mistakes as building blocks to better solutions, math teacher Emma Chiapetta uses an ingenious, small-group activity that asks students to [identify and reflect on common mistakes](#), and then explain the rationale behind them to their peers.

Here's how it works: Randomly separate students into groups and assign each group to a board to generate a problem and solve it incorrectly. Groups rotate so they're looking at a problem and an incorrect solution, and have to identify the error and solve the problem correctly. After another rotation—so students are looking at a problem and both the incorrect and correct solutions—they explain to the class the mistake made by the first group and the correct solution provided by the second. The activity, Chiapetta writes, helps students think about the same content from various perspectives, which can lead to deeper understanding.

Not all mistakes are created equal, and they often conceal thoughtful, underlying work. Former math teacher Colin Seale asks students to reflect on which wrong answer to a problem is “[more right](#).” He suggests offering students two equations that are both incorrect—perhaps one is wrong conceptually and the other computationally. Seale notes that this exercise gets students to tease out nuances around the skills and concepts they're learning, while also correcting their approach to similar problems moving forward.

Bring Humanities Strategies to Math Class

The discussion, analysis of reasoning, and argumentation that happen in humanities classrooms can be extremely useful in math classrooms to [help students slow down and think through the work they're doing](#), says middle school math teacher Connell Cloyd.

He does this in his classroom by posting four incorrectly solved math problems around the room and having students rotate around each problem in groups to discuss the error and write down (in complete sentences) a claim and supporting evidence to show why they believe the error occurred. As they rotate around, students read the arguments of peers and either support an argument or refute it with new evidence. This is like adding techniques from debate to Chiapetta's strategy.

Math journals can also inject more writing and reasoning into your classroom. Former math teacher Nell McAnelly [prompts students to reflect on concepts they're having trouble with](#). They work through a problem and then write about the strategy they used to solve it, or informally journal about other approaches they could have used. Doing so, she writes, gives students a chance to “synthesize learning and address unanswered questions.”

Driving Deep, Critical Thinking

A traditional math classroom, where the teacher demonstrates a skill numerous times before students take the reins, can inhibit higher order thinking and result in students who “mimic” teachers rather than [develop their own strategies to solve complex problems](#), says Peter Liljedahl, a researcher and professor of mathematics at Simon Fraser University.

Instead of starting lessons with direct instruction, Liljedahl says, give students novel “[thinking tasks](#)” to work on in groups. These are problem-solving activities and mental puzzles that should get students in the mindset of challenging themselves. Work groups should not be chosen based on ability or students’ preferences—Liljedahl’s research shows that students are more likely to contribute in randomized groups. Having students stand while they engage in this collaborative, messy thinking—as Chiappetta does in her mistake-analysis exercise—is another way to engage them.

Instead of using notebooks to compute, Liljedahl calls for groups to work at vertical, non-permanent surfaces, such as whiteboards, blackboards, or windows—surfaces that he says promote more risk-taking because students have the freedom to quickly erase false starts without feeling committed. As students work in groups, teachers bounce around the room and avoid directly answering questions such as “Is this right?” that circumvent student thinking and instead make suggestions that lead to further independent thinking.

Because the goal of this approach is to get students to develop perseverance, curiosity, and collaboration, Liljedahl suggests evaluating them in a way that prioritizes these competencies. He developed [formative assessments](#) that focus on informing students “about where they are and where they’re going in their learning.” These include observations, check-for-understanding questions, and unmarked quizzes. Summative assessments, meanwhile, should focus less on end products and more on the process of learning through both group and individual work.

Shifting to this thinking classroom model requires a fundamental shift in how you run your classroom, but it could result in large rewards throughout the year.

Mathematics Learning Over 15 Years: What Has Changed?

By [Michelle Ang](#) | June 30th, 2022 | Categories: [Educators](#)

Today's mathematics lessons are different.

Processes and curriculums have changed, and so have the expectations of teachers and students. How has mathematics learning in the classroom changed over the past decade? We sat down with four educators to get their thoughts.

Here are their top five changes.

1. Shift from Teacher to Student-focused Learning

Back in the day: "Follow what I'm teaching."

Now: "What are your learning goals and what do you need to do next to achieve them?"

15 years ago, a student might do a test and get a result without much feedback from a teacher.

Teachers would have been seen as the keeper of knowledge and students are vessels to be filled. One of the big changes in mathematics learning and teaching is a move away from this.

Teachers today play the role of a facilitator, guiding students to make discoveries about their learning. They help guide students to set their own goals, reflect on their learning, and be more aware of their strengths and weaknesses.

There is more feedback and collaboration between teachers and students. Students now take on a more active role in their process of learning, rather than being filled up with knowledge.

For teachers, this means having strong content knowledge, but also having a range of strategies at their disposal, so they can use it to meet the individual needs of diverse groups of students.

This may also be an uncomfortable process for some teachers, as it means letting go of 'control' and allowing students to have a productive struggle, that students will make mistakes and not get it right sometimes.

Thankfully, there are many resources out there to help teachers cater to different learning styles and needs.

2. Focus on Mathematical Process over Content

Back in the day: “Here’s a worksheet, fill in the answers.”

Now: “Show me how you solved that problem. table.”

Teaching has become highly personalised.

It’s not just about what students are learning, but how they’re learning. There is a greater focus on the process rather than the answer. Did students use communication in their answers?

The emphasis is less about students getting an answer, but more about if they articulated their steps clearly. Teachers are required to guide students to explain how they solved a problem and discuss the different ways of solving the problem. This requires many hands-on teacher involvements, such as conversations, feedback, and having other students explain it in class.

Because marking is no longer just running their eye down on answers, teachers need to look at every piece of students’ work and conversation. This has also impacted the way teachers teach.

3. The Way Teachers Teach

Back in the day: “Plan a lesson, stick to it and follow it”

Now: “Can you adapt your lesson on the spot?”

In the past, teachers planned a lesson and followed through. They were measured on how good the lesson was and how well they stuck to it.

These days, it’s the opposite of that.

Teachers are expected to be flexible and adapt to what the students are doing at that moment. It’s not just about the instruction, but how students react to their instruction. This means the set-up of the actual content in what they’re asking students to do must be rethought.

“How can I teach students in a way that allows me to know what they’re thinking in their learning process?”

It’s also thinking of ways to provide students with different avenues of feedback, so teachers can use them to know what’s going on.

4. More Meaningful Integration of Technology

Back in the day: Technology was a one-way delivery

Now: Live and responsive two-way participation

Thanks to the emergence of video conferencing platforms, online learning in classrooms have evolved from a one-way delivered instruction with little teacher feedback, to an interactive learning space where students and teachers can collaborate in.

Technology has also vastly expanded the range of information and resources available to teachers and students. Online education programs, apps, games, or video tutorials – there's a plethora of online learning resources for teachers and students.

5. Greater Parent Involvement

Then: "I can't help them with their homework because that was not how I was taught"

Now: "Show me what you're teaching in class and how I can help them at home."

There's been a shift to call parents or the wider family into a child's learning.

This was accelerated in 2020 and 2021 when parents had to home-school or supervise their children as schools pivoted to a fully remote learning environment.

Today, there is a bigger three-way triangle between student, parent, and teacher. Schools are opening classrooms to home a lot more, with teachers encouraging parent involvement in their child's education. education.

There have also been attitude shifts in parents, amidst changing education landscape. Parents are more invested in their child's development in school. They understand the importance of re-learning mathematics because the way they learned may not be aligned with what their kids are being taught today.

Having direct access to teachers through their email or the school's online portal has also led to increased parent involvement, as they can now easily reach out to teachers for support or feedback.

Looking Ahead: The Next Decade

What do we hope to see in mathematics learning in the next 10 years?

Firstly, a focus on a continuum of learning in skill development, such as critical thinking and life skills. We hope students will be able to persevere through a difficult algebra question or work collaboratively in a team to solve a problem.

Secondly, to continue the path of students as problem-solvers and teachers as facilitators, so that students can experience more learning around how to learn, instead of what to learn.

Just as the mathematical landscape continues to evolve, so do teachers. Teachers must be adaptable, life-long learners who regularly reflect on their teaching practice. It is a challenging, yet an exciting time with technology creating new opportunities for learning and connecting.

How to Select a High-Quality, Equitable Math Curriculum

Read our tips on choosing a K–12 math curriculum that fosters equity, excellence, and student agency, and discover what quality looks like in math materials.

A recent [Center for Reinventing Public Education \(CPRE\) report](#) finds pandemic recovery “slow and uneven” with historically marginalized students affected most. Another analysis estimates [an average need of over 4 months’ extra math instruction](#) for students to catch up to pre-pandemic levels.

Findings like these may not be surprising, but they continue to be deeply concerning and call upon educators to take urgent action. Fortunately, per the CPRE report, the field is “learning what works—and doing more of it,” including implementing high-quality curriculum. While many factors impact what happens in the classroom, materials have a significant influence on [teachers’ instructional decisions](#) and therefore on students’ opportunities to learn.

[Quality math materials are more available and more widely-used than ever](#). But there’s a lot of room to grow, particularly when it comes to equitable access. TNTP’s [The Opportunity Myth](#) found that “students spent more than 500 hours per school year on assignments that weren’t appropriate for their grade,” with even lower access to strong instruction and resources for historically marginalized students.

Notably, the report also found that, “when students who started the year behind had greater access to grade appropriate assignments, they closed the outcomes gap with their peers by more than seven months.” High quality materials are not an instant cure-all, but they’re a key lever for addressing long standing inequities. That’s why EdReports strongly supports the [National Council of Teachers of Mathematics’ \(NCTM\) Guiding Principle](#) “that all students have access to a high-quality mathematics curriculum, effective teaching and learning, high expectations, and the support and resources needed to maximize their learning potential.”

What makes for a high-quality, equitable math curriculum?

Content-focused indicators of quality in math materials include alignment to [content standards](#) and [the](#)

instructional shifts and integration of the Standards for Mathematical Practice. Markers of equitable curriculum include evidence of culturally responsive practices and supports for diverse learning needs, including those of multilingual learners.

However, these elements are not separate—they're interdependent and mutually reinforcing. A math program grounded in focus, coherence, and rigor allows all students to build a broad skill set via a structured, intentional learning approach. This fosters student confidence to tackle complex problems independently, developing a strong and positive sense of self as an active math learner.

Materials must also enable students to apply mathematics to the real world via the Math Practices, including making sense of problems and persevering in solving them, using modeling to test and refine hypotheses, and analyzing and questioning structures. This gives all students equitable opportunities to cultivate essential skills they need for college, careers, and future success.

Quality materials also require student supports, including giving multilingual learners access to the same grade level content as their peers. What's more, developing math vocabulary and language proficiency is vital for all learners regardless of home language, allowing them to fully engage with Math Practices such as constructing viable arguments and communicating with precision.

Finally, an equitable, quality math program is one in which students see their own experiences and communities reflected authentically and gain authentic insight into communities outside their own. As math educator Neven Holland explains, “when math materials reflect the lived experiences of students, students are then able to make sense of the content, become engaged with the content, and become more confident.”

3 key factors for selecting and using math curriculum

1. Center teachers in the selection process

Conducting an educator-led selection process is crucial if students are to benefit from high-quality, equitable materials: because materials don't teach kids, teachers do. Involving teachers in selection leverages not only their first-hand knowledge of your community and students but also their expert insight into what actually works in the classroom.

Ensuring educator representation increases transparency in the adoption process. It also builds those teachers' experience with, and confidence in, the materials once adopted. This sets them up to be trusted champions of the new program among fellow educators, helping to increase buy-in and usage of the materials. In other words, there's a direct line from centering teachers in curriculum selection to giving every learner equitable access to quality, grade-level math content.

2. Define your “why”

For a new curriculum to contribute to more equitable learning outcomes, you have to get crystal clear on your community’s needs and district priorities. This means [establishing a vision](#) for quality math teaching and learning that incorporates all relevant markers of quality, highlights the context and requirements of your community, and [emphasizes the importance of meeting the needs of all learners](#).

You also need to [analyze data](#) to compare your current state against your instructional vision. This will help you establish additional criteria to inform your curriculum search: for example, applying an equity-focused lens to confirm that any new math program you select will better serve students who have been previously marginalized.

3. Careful selection and strong implementation

How you select is just as important as what you select. Promoting equity via high-quality math materials necessitates treating curriculum choice as a decision worthy of study and prioritization.

One fundamental consideration is professional learning, and you need to consider it in two contexts. Before the adoption process, invest in professional learning for committee members to ground their work in a shared understanding of [why materials matter](#), and of the essential elements that make for an equitable, quality math program.

Then, throughout selection and implementation, [curriculum-based professional learning](#) for all district teachers must be top of mind. Whatever math curriculum you choose, educators deserve ongoing professional learning in order to make the most of the program and ensure every student gets full access to its quality content.

EdReports’ [6 Key Adoption Steps](#) provides a clear structure and a wealth of resources to support a strong selection process. This includes guidance on investigating and piloting materials, community and stakeholder engagement, planning for professional learning, a robust decision-making process, and thorough implementation.

As former NCTM president [Dr. Trena Wilkerson writes](#), “We must believe each and every student can do mathematics, and we must follow that belief with actions that support that belief.” Selecting and using high-quality math materials is imperative for teachers to hold high expectations of every student, and for every student to see themselves as a competent, versatile mathematician.