Effective Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.



National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. Reston, VA: Author.

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Elementary Math Teaching Guide: Strategies That Work

10 research-backed teaching strategies to help every elementary student build a strong math foundation by Katie Wickliff

Helping students build a strong mathematical foundation is one of the most important responsibilities for any elementary teacher, but it doesn't have to feel overwhelming. While most students benefit from personalized instruction, many effective teaching strategies can help all learners succeed in math. From creating purposeful lessons and activities to encouraging a growth mindset and celebrating progress, the strategies in our guide are intentional, engaging, and focused on making sure students truly understand (and enjoy!) learning **elementary math**.

What does elementary math typically focus on?

Elementary math focuses on a wide range of concepts and skills, starting with basic knowledge such as counting, cardinality, and shape identification, and progressing in complexity as children demonstrate understanding. In the early elementary years, students approach math concretely, using manipulatives (physical objects) and other learning tools before moving to visual representations and, eventually, to more abstract thinking and problem-solving.

Key focus areas include:

Number Sense

Number sense, the ability to understand numbers and how they work together, is an essential part of a child's math development. Students with strong number sense can confidently explore numbers and develop efficient, flexible strategies for approaching and solving problems.

- **Place Value**

Developing number sense allows students to understand place value, that the value of a digit depends on its position (hundreds, tens, ones). Place value is the foundation of many mathematical concepts, including addition, subtraction, multiplication, and division. Understanding the value of a number is essential for solving problems accurately and applying math to real-world situations. When students understand that numbers *mean* something, they often become more active participants in their own learning.

Operations and Computational Fluency

Number sense and operations go hand in hand. While number sense is understanding what numbers mean, operations are the "action," or computation performed on those numbers. In elementary math, students focus on developing fluency with math facts and calculations, as well as strategies to solve real-world problems.

Algebraic Thinking

Algebraic thinking in elementary school focuses on recognizing and identifying patterns, describing quantities and how they change, understanding mathematical rules, and working with

unknown values in equations. Students begin to understand how to make generalizations by noticing patterns or representations and realizing that these patterns and representations work in many situations. Early algebraic thinking matters because it helps develop reasoning and problem-solving skills, encouraging students to think logically and move beyond simply finding the answer.

Geometry and Measurement

In elementary math, students focus on developing spatial reasoning, which is the ability to “see” and manipulate shapes in their minds. They recognize and classify 2D and 3D shapes and eventually learn to create more complex shapes from simpler ones. They also begin measuring angles and calculating perimeter and area, applying these skills to real-world situations and problems.

Data Analysis

Students learn to collect, sort, classify, represent, interpret, and present data using hands-on materials, simple graphs, or tally charts. Early on, students focus mostly on categorical data, which describes categories or groups, often based on similarities, such as “favorite sport,”

10 Effective Strategies for Teaching Elementary Math

1. Conceptual Understanding First

Making sure that your students truly understand a concept is the **most** important part of **teaching elementary math**. Conceptual understanding is not a separate math lesson; rather, it is incorporated into lessons from the very beginning and is the foundation for all effective teaching strategies. Students develop understanding through hands-on exploration, visual models, discussion, reflection, and connecting math to daily life. Teachers should allow students to solve problems in different ways so they understand that math is about reasoning, flexible thinking, patterns, and relationships between numbers.

2. Purposeful Lesson Planning

When you are designing strategies for your students, make sure to identify clear objectives and learning goals. What do you want your students to understand and be able to do? This will inform the rest of your strategies and ensure that your math lesson is purposeful, effective, and focused.

3. Clear Instruction, Modeling, and Guided Practice

With direct instruction, the teacher explains the concept step-by-step. Then, they model the skill and demonstrate how to do the work. Next, guided practice allows students to try the activity with the teacher’s support and feedback, building the confidence to work independently. These three steps are important because they provide a clear, structured way for students to receive instruction and demonstrate understanding before moving to independent work.

4. Differentiated Instruction

Every student is unique, and differentiated instruction allows teachers to adjust learning goals, activities, and assessments based on individual needs and learning styles. Simply put, there is no “one size fits all” approach to **teaching elementary math**. In fact, implementing effective strategies allows teachers to tailor lessons to their unique learners.

5. Meaningful Games and Activities

Games and hands-on activities encourage active learning, which increases engagement and motivation. Purposeful activities can also help simplify complex concepts, encourage deeper understanding, and develop problem-solving skills. For example, DreamBox Math, an interactive online math program, uses games and fun challenges to help reinforce math concepts.

6. Small Group and Partner Work

Small-group work allows students to actively discuss their ideas and listen to different approaches to solving a math problem or challenge. This discussion and collaboration also help students develop confidence in explaining their own mathematical process, which deepens their understanding. Teachers can also provide more individualized instruction, for example, by pulling a small group to reteach a concept or give students an extra challenge.

7. Formative Assessments

Formative assessments allow teachers to quickly gather information throughout the lesson to monitor student learning in real time. These assessments can also help identify misconceptions to correct before the lesson progresses. Examples of formative assessments include “think-pair-share,” where students discuss with a partner before sharing with the class; online polls or quizzes on an interactive learning platform; or exit tickets to find out what students understand and what questions they still have.

8. Connect Math to the Real World

Connecting **math for elementary teachers** to daily life is an essential teaching strategy because it allows students to see that numbers are everywhere! Hands-on activities like cooking, building, or even designing their “dream home” make learning new concepts exciting. Even the youngest students can connect math to the real world.

9. Provide Feedback

While teachers should always communicate with students’ parents or caregivers, providing direct, individual feedback to students themselves is an invaluable way to gauge how they feel about their math progress. Meeting one-on-one is also a great way to build relationships and show students that they are valued and respected.

10. Encourage a Growth Mindset

When students see mistakes as an important part of learning, it encourages grit and perseverance. When teachers celebrate effort and progress, rather than perfection, it encourages students to take educational risks and tackle challenging concepts.

Mathematics Learning Over 15 Years: What Has Changed?

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.

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 a 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.