

Math Fluency Myths: Math Facts and Math Fiction

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Fluency: No part of math education is more polarizing or misunderstood. Some people love it and see its value everywhere. Others think it's an outdated, tedious area of work. How did this happen?

When you talk to people about math education, the reasons for this split start to shake out. Incomplete and incorrect definitions of math fluency have become common knowledge. Inefficient and unhelpful strategies for developing math fluency have become common practice. Simple myths have replaced nuanced understanding. The reality is that math fluency is a sophisticated aspect of education that deserves a closer look.

MYTH

1

Fluency is being able to spit out math facts quickly.

If I asked you what math fluency was, that would have been your answer, right? But answering basic math fact questions quickly is actually math fact automaticity, which is only one aspect of math fact fluency—and that's only part of a broader concept: procedural fluency. Let's define these terms.

Procedural fluency is the ability to:

- Apply procedures accurately, efficiently, and flexibly
- Transfer procedures to different problems and contexts
- Build or modify procedures from other procedures
- Recognize when one strategy or procedure is more appropriate to apply than another

Think of it like playing chess. Knowing the rules of the game and what moves the pieces can make is one tiny slice of the game. To be a fluent chess player, you need to recognize patterns, choose strategies that fit each situation, and apply sets of moves to new situations and opponents.

For example, I have poor chess procedural fluency. I know the rules of the game and some basic strategy concepts, but I can't use them effectively. I can use my queen to wreck pieces across the board and my knights to capture errant pawns, but I can't use my pieces in a coordinated attack. I have chess move fact fluency, but not chess procedural fluency.

Once you recognize the differences between procedural fluency, fact fluency, and fact automaticity, it becomes easier to see how important procedural fluency is and the roles that fact fluency and fact automaticity play in it.

Math fact fluency is the ability to solve core arithmetic problems accurately, efficiently, and flexibly through recall and the application of strategies.

Math fact automaticity is the ability to accurately recall math facts in three seconds or less.



MYTH
2

Math fact fluency isn't necessary in modern society.

"Why do I need to learn this? My phone has a calculator on it," said at least one student in every class every year. Answers like, "You can't use your phone on the test," or "Because it's for a grade," may be true, but they're so weak that they reinforce the myth ("Clearly you'd have a better answer if this actually mattered, Ms. Gasaway") and don't persuade students (or families).

First, students need math fact fluency because, although technology has changed, our brains haven't. We can still only pay attention to a limited number of things and can get confused or distracted easily.

When students use their problem-solving and attention resources to look up (or inefficiently calculate) a math fact, they have less capacity to think about the problem they're trying to solve. Having math fact fluency and math automaticity means that instead of spending cognitive resources on basic calculations or breaking their train of thought to enter something into a calculator, students can think about actually solving the problem.

Second, math fact fluency isn't developed in a vacuum. As students build math fact fluency, they discover relationships between facts, learn strategies that can be applied to other contexts, and improve their number sense, making related mathematical tasks like estimation and checking answers easier. Using a calculator all the time means missing out on the interconnectedness of math fact fluency and other mathematical skills.

MYTH
3

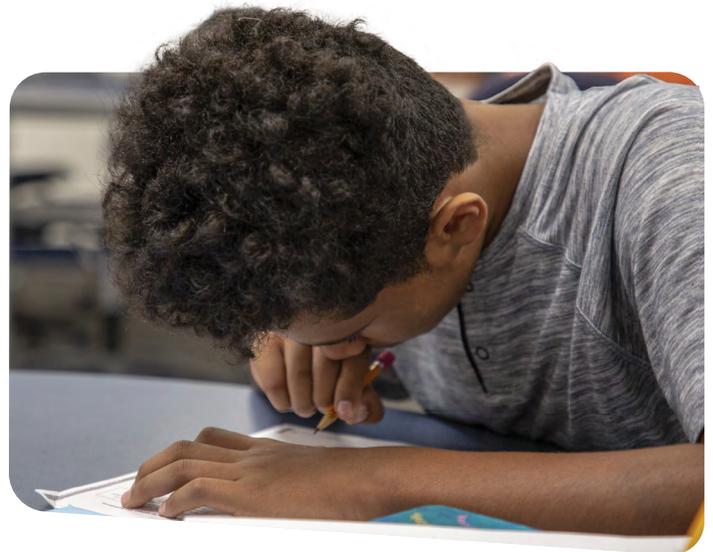
Fluency practice provokes math anxiety.

No math curriculum can eliminate anxiety from all students. Some students, like some adults, will experience anxiety regardless of the external circumstances. Although the origins of math anxiety are not well understood, it is correlated with test anxiety, and people report feeling more anxious when doing timed rather than untimed math assessments.

[Research](#) suggests that anxiety eats up cognitive resources that could otherwise be applied to problem solving. This makes answering math questions even harder for people with math anxiety and masks their actual skill level.

Given these findings, improving students' math fact automaticity (and thereby reducing the cognitive load of using those facts) could be especially helpful for students with math anxiety.

To do this, a well-designed fact fluency program creates a solid foundation of conceptual understanding, strategy, and pattern recognition and ensures that students consistently respond accurately before even thinking about encouraging them to work faster.



MYTH
4

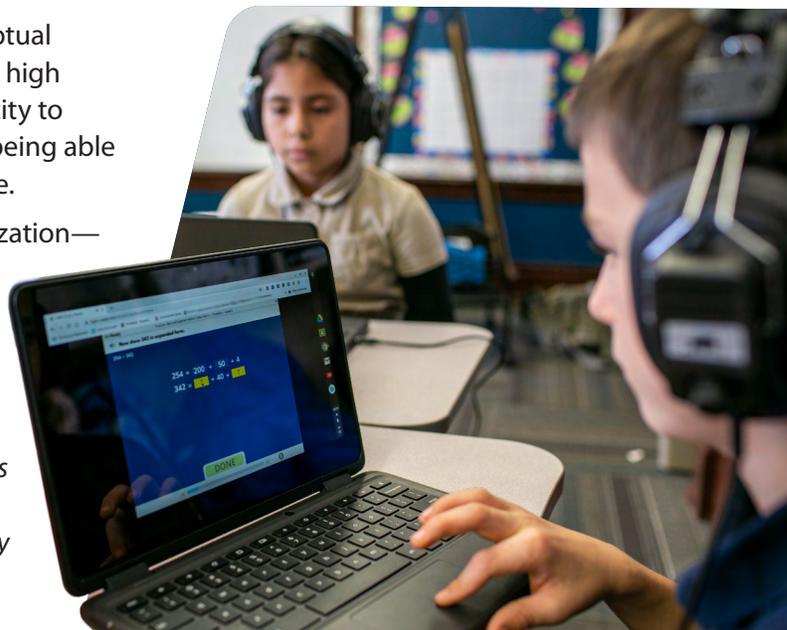
Speed is not an important part of procedural fluency.

This myth is a reaction to the overemphasis on early speed work often seen in math fact fluency programs. We know that early speed work isn't effective and provokes anxiety, but that doesn't mean work that encourages speedy answers should never happen.

It just means it should happen at the right time—after conceptual understanding is well established and accuracy has reached a high enough level. Ultimately, students need to develop automaticity to become flexible, confident problem solvers, and that means being able to recall and use basic math facts with minimal effort and time.

All these myths have the same root: Fluency isn't just memorization—it's an important set of skills and knowledge that allows students to be modern, adaptable, mathematical thinkers. Understanding what fluency is makes it possible to recognize what sets an effective fluency development program apart from one that's brittle, inefficient, or counterproductive.

Note: Special thanks to Coram Bryant, director of Learning Games analytics, and Jacob Klein, senior director of Learning Games, for fact-checking this post, providing definitions for math fact fluency and math fact automaticity, recommending reference materials, and nerding out with me about cognitive psychology.



Learn about supporting your Grades 2–5 students' math fact fluency development with Fluency Flight by visiting CurriculumAssociates.com/FluencyFlight.

About Kate Gasaway



Kate Gasaway taught middle school math at the Neighborhood House Charter School in Dorchester, MA for six years before joining Curriculum Associates. Kate's professional experience includes writing assessments, analyses, and blog posts for Match Fishtank, an education company that creates and disseminates open-license, standards-aligned curricula. She holds a bachelor's degree in psychology from the Georgia Institute of Technology and a master's degree in effective teaching from the Spasato Graduate School of Education. Kate is passionate about researching how students learn and tries to use her math powers for good.

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