



Math Fluency Mini-Guide

Supporting Students to Be Flexible Users and Doers of Mathematics

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Why Math Fluency?

Math fluency is widely misunderstood by students, families, and even educators. Too often, fluency is reduced to speed, memorization, and accuracy. As a result, instructional time can overemphasize quick recall while underemphasizing understanding, strategy development, and the kind of practice that actually builds fluency.

This mini-guide is intended to clarify what mathematical fluency is and what it is not by grounding the conversation in research and standards. This guide draws on research from the National Research Council (NRC, 2001), the National Council of Teachers of Mathematics (NCTM, 2014), and Wisconsin Academic Standards for Mathematics (Wisconsin Department of Public Instruction [WI DPI], 2021). It highlights why fluency matters and how educators can support students in becoming flexible, confident, and capable users of mathematics.

What Do We Mean by Procedural Fluency?

Procedural fluency is commonly defined as the ability to apply procedures efficiently, flexibly, and accurately (National Research Council [NRC], 2001; Kilpatrick et al., 2001; National Council of Teachers of Mathematics [NCTM], 2014).

- **Efficiency:** Solving a procedure in a reasonable amount of time by selecting an appropriate strategy and implementing it effectively.
- **Flexibility:** Knowing and using multiple strategies and adapting them based on the numbers and context of a problem (Baroody and Dowker, 2003; Star, 2005).
- **Accuracy:** Correctly carrying out procedures and arriving at a correct solution (Bay-Williams and SanGiovanni, 2021).

These three components work together. Fluency is diminished when any one of them is missing.

Why Fluency Matters to Students

Fluency Supports Student Identity and Agency

When students develop fluency, they are more willing and able to engage in challenging tasks, persist through struggle, and share their mathematical thinking with others. This supports the development of positive math identities and positions students as capable, flexible doers of mathematics.

Identity, agency, and flexibility are central shifts in the Wisconsin Academic Standards for Mathematics (WI DPI, 2021). Fluency plays a critical role in helping students experience mathematics as something they can do rather than something that happens to them.

Fluency Makes Problem Solving and Application Possible

Procedural fluency allows students to devote their cognitive energy to reasoning, decision making, and sense making rather than getting stuck in calculations. Without sufficient fluency, students' access to meaningful mathematical experiences, particularly those involving problem solving and application, is limited.

Fluency is not separate from conceptual understanding or application. It is essential to all three aspects of rigor.

Fluency Is About Flexibility, Not Speed

Fluency is more than memorization or fast recall. Fluent students can choose, adapt, and justify strategies based on their understanding of numbers and operations. To make a strategic choice, students must have multiple strategies available and opportunities to develop and compare them.

Speed may emerge over time, but it is an outcome of understanding and practice, not the goal of fluency instruction.

How Can We Build Math Fluency?

Research consistently points to several key instructional practices.

Provide substantial and enjoyable practice:

Students need frequent opportunities to practice in ways that are engaging and meaningful. Brief, daily practice of approximately ten minutes is far more effective than infrequent or extended drills (Bay-Williams & Kling, 2019).

Make fluency goals clear and visible: Share grade level fluency expectations with students and support them in setting individual goals. Provide regular feedback so students can monitor their progress and reflect on their growth.

Build procedural fluency from conceptual understanding: Procedural fluency develops most effectively when instruction explicitly connects procedures to underlying concepts (NCTM, 2014). Learning is strengthened when students understand why procedures work, not just how to carry them out (Fuson, Kalchman, & Bransford, 2005; Hiebert & Grouws, 2007; Osana & Pitsolantis, 2013).

In Practice: A 10-Minute Fluency Routine

- Students are introduced to a fluency activity, or are provided an activity they are familiar with.
- Students are provided time to “play” with the activity.
- The teacher moves around the room, supporting students to play as intended, and poses purposeful questions that support students thinking about the mathematics of the activity.
- Turn and talk: the teacher pauses the students and asks them to turn and talk with a partner about what they notice about the activity. *What patterns are present? How does this connect to previous learning?* Students share with a partner and then a few share with the whole class.
- Students go back to the activity and play for a few more minutes.
- Closing: the teacher makes the concepts visible by posing purposeful questions that draw from student observations and experiences with the activity.



Progression of Fluency Standards in Wisconsin

In 2021, Wisconsin updated the State Academic Mathematics Standards. Language shifted away from the term “fluently” and toward “flexibly and efficiently”. Expectations for grade level fluency also changed, particularly in grades 3 and 4 for multiplication and division (WI DPI, 2021).

Summary of the Wisconsin Math Standards Fluency Expectations across Grade Levels.

Addition and Subtraction

K.OA.A.5: *Flexibly and efficiently* add and subtract within 5 using mental images and composing or decomposing numbers.

1.OA.C.6: Use multiple strategies to add and subtract within 20.

- A. *Flexibly and efficiently* **add and subtract within 10** using strategies that may include mental images and composing or decomposing numbers.
- B. Add and subtract within 20 using objects, drawings, or equations and multiple strategies such as making ten, decomposing numbers, using the relationship between addition and subtraction, and creating equivalent but easier sums.

2.OA.B.2: *Flexibly and efficiently* **add and subtract within 20** using multiple mental strategies.

2.NBT.B.5: *Flexibly and efficiently* **add and subtract within 100** using strategies based on place value, properties of operations, and the relationship between addition and subtraction. In grade 2, subtraction with decomposition may include drawings or representations.

3.NBT.A.2: *Flexibly and efficiently* **add and subtract within 1,000** using strategies based on place value, properties of operations, and the relationship between addition and subtraction.

4.NBT.B.4: *Flexibly and efficiently* **add and subtract multi digit whole numbers** using strategies or algorithms based on place value, properties of operations, and the relationship between addition and subtraction.

6.NS.B.3: *Flexibly and efficiently* **add, subtract, multiply, and divide multi digit decimals** using strategies or algorithms based on place value, visual models, the relationship between operations, and the properties of operations.

Multiplication and Division

3.OA.C.6a: *Flexibly and efficiently* **find products and quotients within 100** using strategies, properties of operations, and relationships between operations **with multiples of 0, 1, 2, 5, and 10**.

4.OA.D.6: *Flexibly and efficiently* **multiply and divide within 100** using strategies such as the relationship between multiplication and division and properties of operations.

5.NBT.B.5: *Flexibly and efficiently* **multiply multi digit whole numbers** using strategies or algorithms based on place value, area models, and the properties of operations.

6.NS.B.2: *Flexibly and efficiently* **divide multi digit whole numbers** using strategies or algorithms based on place value, area models, and the properties of operations.

6.NS.B.3: *Flexibly and efficiently* **add, subtract, multiply, and divide multi digit decimals** using strategies or algorithms based on place value, visual models, the relationship between operations, and the properties of operations.

What Fluency Is and Is Not

Fluency is	Fluency is not
Strategy comparison	Memorization without meaning
Students explaining and justifying reasoning	Timed Tests
Students choosing strategies	Using the same procedure repeatedly for every problem
Students making sense of errors and adjusting strategies	Avoiding making mistakes or only valuing correct answers
Using number relationships and structure	Relying on rote recall
Supporting confidence by focusing on progress	Being fast as soon as possible
Becoming more efficient overtime through substantial and enjoyable practice	Focusing on speed

References and Recommended Professional Reading

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About the Author

Matt Hayden is CESA 2's Math Consultant and Instructional Coach. He has served in various educational roles, including 4K-12 Math Instructional Coach, Middle School Math & Science Teacher, and Equity Team Leader, bringing extensive experience in co-teaching and the co-plan to co-serve model. Matt holds a bachelor's degree in horticulture from the University of Wisconsin-Madison, a Master of Arts in Education and Science Minor from Cardinal Stritch University, and a K-8 Mathematics Certificate from UW-Madison. He is also a certified Mindfulness-Based Stress Reduction (MBSR) Teacher through the International Mindfulness and Meditation Association (IMMA). Matt believes that when teachers believe in their students and create supportive, reflective learning environments, all students can achieve at high levels. He values curiosity, critical thinking, and the power of mindful reflection as essential ingredients in both teaching and learning.

