

How Educators and Caregivers Can Create Supportive Conditions for Success in PreK-12 Mathematics

Math Matters for All Learners

- Success in elementary school math predicts future achievement in middle and high school math and other subjects.^{1,2}
- Family involvement is a strong predictor of school success, including math learning.^{3,4,5}
- Completing higher-level math courses in high school increases graduates' chances of enrolling, persisting in and completing college.^{6,7}
- Students who complete higher-level math in high school earn higher incomes in the future.⁸

Charting a Path to Effective Math Instruction

The eight effective mathematics teaching practices⁹ outlined by the National Council for Teachers of Mathematics (NCTM) provide a map of how teachers can engage students in math learning. Additionally, What Works Clearinghouse (WWC) has several [math practice guides](#) with specific recommendations for educators to implement evidence-based practices. These recommendations are supported by a comprehensive review of findings from rigorous research studies.

Find what works! The What Works Clearinghouse provides information you need to make evidence-based decisions in your classrooms and schools.
Access: <https://ies.ed.gov/ncee/wwc/>

Eight NCTM effective mathematics teaching practices⁹

1. Establish mathematics goals to focus learning.
2. Implement tasks that promote reasoning and problem-solving.
3. Use and connect mathematical representations.
4. Facilitate meaningful mathematical discourse.
5. Pose purposeful questions.
6. Build procedural fluency from conceptual understanding.
7. Support productive struggle in learning mathematics.
8. Elicit and use evidence of student thinking.

WWC math practice guides

1. [Preparing Young Children for School](#) (PreK)
2. [Teaching Math to Young Children](#) (PreK-K)
3. [Assisting Students Struggling with Mathematics: Intervention in the Elementary Grades](#) (K-6)
4. [Developing Effective Fractions Instruction for Kindergarten Through 8th Grade](#) (K-8)
5. [Encouraging Girls in Math and Science](#) (K-20)
6. [Assisting Struggling Students with Mathematics: Response to Intervention \(RtI\) for Elementary and Middle Schools](#) (1-8)
7. [Improving Mathematical Problem Solving in Grades 4-8](#) (4-8)
8. [Teaching Strategies for Improving Algebra Knowledge in Middle and High School Students](#) (6-12)

A Framework for Supporting Math Learning

But a map alone will not get you to your destination. You need supportive conditions - the infrastructure that facilitates teaching and learning - to achieve success in PreK-12 mathematics.

Eight NCTM effective mathematics teaching practices⁹

WWC math practice guides



Positive math identity →

High math achievement →

Postsecondary success →

Well-paying jobs →

Supportive Conditions for Math Learning



Classroom Teachers

- Positive math mindsets
- Pedagogical content knowledge
- Positive teacher-student relationships
- Culturally relevant instruction
- Communicating high expectations for math learning



School and District Leaders

- Research-based, aligned curricula
- Ongoing, effective, and practical professional learning opportunities
- Culture of continuous professional learning and improvement
- Addressing barriers to math participation for all students
- Community engagement to promote math learning



Families and Caregivers




- Supporting positive math mindsets
- Connecting math to everyday experiences
- Identifying opportunities to engage in math talk

How Can Educators and Families Create Supportive Conditions for Math Learning?

Regional Educational Laboratories (RELs) support educators by taking the recommendations from the WWC practice guides and other research and making them practical and easy to use. Classroom teachers (🍎), school and district leaders (🏫), and families and caregivers (❤️) can use these resources to implement evidence-based math practices and create supportive conditions for success in mathematics.

Resource name	Grade band	Audience		
		 Classroom Teachers	 School and District Leaders	 Families and Caregivers
Teaching Math to Young Children for Families and Caregivers (website collection)	PreK-3	✓	✓	✓
Teaching Math Along a Developmental Progression Can Help Improve Early Math Skills (blog)	PreK-3	✓	✓	
Language, Discussion, and Questions in Early Math (webinar)	PreK-3	✓	✓	
Two Strategies to Help Your Child Learn to Love Math (blog)	PreK-5	✓	✓	✓
Supporting children's early math instruction at home (infographic)	PreK-5	✓	✓	✓
Assisting Struggling Students with Mathematics: What Works for Tiered Interventions in Elementary and Middle Schools (webinar)	PreK-8	✓	✓	
Implementing a Professional Learning Model to Improve Mathematics Teaching Webinar Series (webinar)	PreK-12		✓	
Six Steps to Build Research into Cohesive Math Professional Learning (infographic)	PreK-12		✓	
Building Positive Math Attitudes Training Series (webinar)	PreK-12	✓	✓	
Resources Educators Can Use and Share with Families to Promote a Mathematical Mindset (infographic)	PreK-12	✓	✓	✓

Resource name	Grade band	Audience		
		 Classroom Teachers	 School and District Leaders	 Families and Caregivers
The Sum Is Greater Than the Parts: Engaging Community to Promote Math Learning (infographic)	PreK-12	✓	✓	
Supporting Your Child in Developing Math Skills For Future Success (infographic)	PreK-12	✓	✓	✓
Are there any evidence-based professional learning models, products, or tools that support effective and equitable mathematics instruction? (factsheet)	PreK-12, postsecondary	✓	✓	
Two Classroom Strategies to Reduce Students' Math Anxiety (video)	K-5	✓	✓	
Community Math Night Facilitators' Toolkit (tool)	K-5	✓	✓	
Student Success in Mathematics Partnership Meeting: Strengthening Mathematics Instruction (training materials)	K-12	✓	✓	
Multiplicative Reasoning: Part of the Development of Mathematical Reasoning (infographic)	K-12	✓	✓	
Proportional Reasoning: Part of the Development of Mathematical Reasoning (infographic)	K-12	✓	✓	
What Does it Mean to Think Additively? (infographic)	K-12	✓	✓	
Functional Reasoning: Part of the Development of Mathematical Reasoning (infographic)	K-12	✓	✓	
Encouraging Girls in Math and Science: Three Powerful Female Role Models (activity sheet)	3-8	✓	✓	✓

Resource name	Grade band	Audience		
		 Classroom Teachers	 School and District Leaders	 Families and Caregivers
Using the Practice Guide to Improve Mathematical Problem Solving in Grades 4-8 (webinar)	4-8	✓	✓	
Supporting Mathematical Problem Solving at Home (infographic)	4-8	✓	✓	✓
Professional Learning Community: Improving Mathematical Problem Solving for Students in Grades 4 through 8 (tool)	4-8	✓	✓	
How to Boost Your Middle Schooler's Math Confidence and Success (video)	5-8	✓	✓	✓
Shining a Light on Algebra I Access and Success: Embracing Equity at All Levels (blog)	6-8	✓	✓	
Designing & Implementing Mathematics Transition Courses for College & Career Success (infographic)	6-12, postsecondary	✓	✓	

¹ Claessens, A., & Engel, M. (2013). How important is where you start? Early mathematics knowledge and later school success. *Teachers College Record*, 115(6), 1-29. <http://eric.ed.gov/?id=EJ1020177>

² Siegler, R. S., Duncan, G. J., Davis-Kean, P. E., Duckworth, K., Claessens, A., Engel, M., Susperreguy, M. I., & Chen, M. (2012). Early predictors of high school mathematics achievement. *Psychological Science* 23(7), 691-697. DOI: [10.1177/0956797612440101](https://doi.org/10.1177/0956797612440101)

³ Harris, B., Petersen, D., & Wulsin, C. S. (2017). Integrating mathematical thinking into family engagement programs. Mathematica Policy Research. Retrieved September 14, 2021, from <https://www.mathematica.org/publications/integrating-mathematical-thinking-into-family-engagement-programs>

⁴ Weiss, H. B., Boufard, S. M., Bridgall, B. L., & Gordon, E. W. (2009). Reframing family involvement in education: Supporting families to support educational equity (Equity Matters Research Review No. 5). Columbia University Teachers College, Campaign for Educational Equity. <https://eric.ed.gov/?id=ED523994>

⁵ Van Voorhis, F. L., Maier, M. F., Epstein, J. L., & Lloyd, C. M. (2013). The impact of family involvement on the education of children ages 3 to 8. MDRC. <https://eric.ed.gov/?id=ED545474>

⁶ Jonas, D., & Garland, M.W. (2014). *Virginia's 2008 on-time graduation rate cohort four year college enrollment, persistence, and completion*. Richmond, VA: Virginia Department of Education.

⁷ Adelman, C. (2006). *The toolbox revisited: Paths to degree completion from high school through college*. Washington, DC: U.S. Department of Education.

⁸ Achieve. (2008). *The building blocks of success: Higher-level math for all students*. <https://www.achieve.org/publications/building-blocks-success-higher-level-math-all-students>

⁹ National Council of Teachers of Mathematics. (2014). *Principles to actions: Ensuring mathematical success for all*. National Council of Teachers of Mathematics.

To access this infographic and the linked resources digitally, follow this QR code.



This document is the result of a collaboration across [all ten RELs](#), led by [REL Appalachia](#).

Learn more about REL Appalachia and find additional resources: <https://ies.ed.gov/ncee/rel/region/appalachia>

This document was prepared under Contract No. 91990022C0008 by Regional Educational Laboratory Appalachia, administered by SRI International. The content does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.