

Math Expressions

Intervention Brief | Primary Mathematics Topic Area

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WHAT WORKS CLEARINGHOUSE™

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Acquiring math skills at an early age is important for students’ long-term academic achievement and for success in learning more advanced mathematical content. *Math Expressions* is a curriculum for students in prekindergarten through sixth grade that aims to build students’ conceptual understanding of mathematics and to develop fluency in mathematical problem solving and computation. The curriculum encourages student learning of mathematics through real-world situations, visual supports such as drawings and manipulatives, multiple approaches to solving problems, and opportunities for students to explain their mathematical thinking.

This What Works Clearinghouse (WWC) intervention report, part of the WWC’s Primary Mathematics topic area, explores the effects of *Math Expressions* on general mathematics achievement. The WWC identified three studies of *Math Expressions*. One of these studies meets WWC standards. The evidence presented in this report is from one study of the effects of *Math Expressions* on students—including 37% White, 33% Black, 27% Hispanic or Latino, 2% Asian, and 1% American Indian or Alaska Native students—in first and second grades in urban, suburban, and rural districts.

What Happens When Students Participate in *Math Expressions*?

The evidence indicates that implementing *Math Expressions* has no discernible effects on mathematics achievement compared with the other mathematics curricula used in study schools.

Findings on *Math Expressions* from the one study that meets WWC standards are shown in Table 1. The table reports an effectiveness rating, the improvement index, and the number of studies and students that contributed to the findings. The effectiveness rating is based on the quality of the designs used in studies, whether the findings are favorable or unfavorable for the intervention, and the number of studies that tested the intervention. See Box 1 for more information on interpreting effectiveness ratings.

In order to help readers judge the practical importance of an intervention’s effect, the WWC translates findings

across studies into an “improvement index” by averaging findings that meet WWC standards within the same outcome domain. The improvement index can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention. For example, an improvement index of +1 means that the expected percentile rank of the average comparison group student would increase by 1 point if the student received *Math Expressions* instead of the curricula provided to the comparison group. A positive improvement index does not necessarily mean the estimated effect is statistically significant.

The evidence presented in this report is based on available research. Findings and conclusions could change as new research becomes available.

Table 1. Summary of findings on *Math Expressions* from one study that meets WWC standards

Outcome domain	Effectiveness rating	Study findings	Evidence meeting WWC standards (version 4.0)	
		Improvement index (percentile points)	Number of studies	Number of students
General mathematics achievement	No discernible effects	+1	1	8,060

Note: The effects of *Math Expressions* are not known for other outcomes within the Primary Mathematics topic area, including number and operations; geometry and measurement; data analysis, statistics, and probability; and algebra.

BOX 1. HOW THE WWC REVIEWS AND DESCRIBES EVIDENCE

The WWC evaluates evidence based on the quality and results of reviewed studies. The criteria the WWC uses for evaluating evidence are defined in the [Procedures and Standards Handbooks](#) and the [Review Protocols](#). The studies summarized in this report were reviewed under WWC Standards (version 4.0) and the Primary Mathematics topic area protocol (version 4.0).

To determine the effectiveness rating, the WWC considers what methods each study used, the direction of the effects, and the number of studies that tested the intervention. The higher the effectiveness rating, the more certain the WWC is about the reported results and about what will happen if the same intervention is implemented again. The following key explains the relationship between effectiveness ratings and the statements used in this report:

Effectiveness rating	Rating interpretation	Description of the evidence
Positive (or negative) effects	The intervention is <i>likely</i> to change an outcome	Strong evidence of a positive (or negative) effect, with no overriding contrary evidence
Potentially positive (or negative) effects	The intervention <i>may</i> change an outcome	Evidence of a positive (or negative) effect with no overriding contrary evidence
No discernible effects	The intervention <i>may result in little to no change</i> in an outcome	No affirmative evidence of effects
Mixed effects	The intervention <i>has inconsistent effects</i> on an outcome	Evidence includes studies in at least two of these categories: studies with positive effects, studies with negative effects, or more studies with indeterminate effects than with positive or negative effects

How is *Math Expressions* Implemented?

The following section provides details of how districts and schools can implement *Math Expressions*. This information can help educators identify the requirements for implementing *Math Expressions* and determine whether implementing this intervention would be feasible in their districts or schools. Information on *Math Expressions* presented in this section comes from the study that meets WWC standards (Agodini et al., 2010) and from correspondence with the developer, Dr. Karen Fuson developed the curriculum, which was later purchased by Houghton Mifflin Harcourt.

- **Goal:** *Math Expressions* teaches students mathematics knowledge and skills.
- **Target population:** *Math Expressions* is designed for students in prekindergarten through sixth grade.
- **Method of delivery:** *Math Expressions* is a print-based curriculum that is used in a combination of whole class, small group, and individual student settings. Classroom teachers guide students through hands-on activities in *Math Expressions* during whole-class instruction, introducing new information and encouraging students to solve problems using visual representations. Students then discuss in small groups to build understanding and practice.

Comparison group: In the study that contributes to this intervention report, students in the comparison group used as their core mathematics curriculum either *Investigations in Number, Data, and Space (Investigations)*; *Saxon Math (Saxon)*; or *Scott-Foresman-Addison Wesley Mathematics (SFAW)*.

- **Frequency and duration of service:** The developer recommends students use *Math Expressions* daily for 60 minutes during the entire school year.
- **Intervention components:** The key components of *Math Expressions*, which are pedagogical approaches to daily lessons, visual learning support, differentiated learning and interactive practice, and teacher training, are described in Table 2. The current version of *Math Expressions* is the 2018 edition.

Table 2. Components of *Math Expressions*

Key component	Description
Pedagogical approach within the daily lesson structure	<i>Math Expressions</i> provides instructional techniques to explore mathematical problems and solution methods. Students use problem-solving activities to develop conceptual understanding of math; for example, in the early elementary grades, students act out problems in class. In kindergarten, first grade, and second grade, students engage in daily math routines, typically first thing in the morning as they arrive at school. These routines focus on developing and supporting understanding of and fluency with place-value concepts. In all grades, the math lesson begins with a 5-minute activity called quick practice, which builds fluency with the key concepts needed for past or upcoming lessons. The teacher then leads a whole-class activity that builds on students' background knowledge and introduces more advanced concepts and solution methods. After the whole-class instruction, students discuss and practice new skills and concepts in pairs, small groups, or individually. Throughout the lesson, students are encouraged to use multiple approaches to solve problems and to explain and justify their answers. Homework is assigned daily and includes practice on content from the current lesson as well as on previously learned concepts over the course of the school year.
Visual learning supports	The curriculum uses manipulatives, drawings, and other visual tools to support student learning and to connect formal math concepts to students' background knowledge. For example, in the early grades, students use triangular shapes called "Math Mountains" to demonstrate concepts on parts and wholes and addition and subtraction. Students in all grade levels use visual supports during all parts of the daily math lesson to help them solve problems and demonstrate their work and understanding. The visual supports often serve as the starting point for student discussions, where students are encouraged to show their drawings to one another and discuss how their drawing illustrates the problem they are attempting to solve.
Differentiated learning and interactive practice	<i>Math Expressions</i> is designed to support differentiated instruction. In the print materials, each lesson includes resources for teachers to support a wide range of student needs. In addition to the print materials, <i>Math Expressions</i> includes a digital suite of resources for teachers, students, and parents to support interactive learning, differentiated instruction, and distance learning. Teachers can customize class and homework assignments for students through adaptive software that creates a personalized profile for each student and can provide extra practice, enrichment, or remediation. Students can use an interactive online textbook and engage in online games called Poggles during class. For students who need them, interactive Tier 1 and Tier 2 Response to Intervention lessons are available online. Tier 3 resources, including intervention lesson activities and progress monitoring, are also available. The studies did not provide information about whether or how study teachers implemented differentiated instruction.
Teacher training	Teachers receive several forms of informal support. Teachers receive instructional support through several curriculum materials including a lesson guide, online professional learning modules, and videos on the Houghton Mifflin Harcourt website. The lesson guide contains detailed overviews for each unit and notes for each lesson that help teachers teach the mathematics covered in the lesson. Formal professional development is also available and tailored to the needs of each district. Initial and ongoing professional development for teachers is facilitated by Houghton Mifflin Harcourt specialists. The sessions are available in person, virtually, or both. In the one study that met WWC standards, study teachers received 2 days of initial training in the summer before the first day of school. In addition, study teachers received follow-up training in the fall and spring of the school year.

What Does *Math Expressions* Cost?

This preliminary list of costs is not designed to be exhaustive; rather, it provides educators with an overview of the major resources needed to implement *Math Expressions*.

The program costs described in Table 3 are based on the information available as of June 2020.

Table 3. Cost ingredients for *Math Expressions*

Cost ingredients	Description	Source of funding
Personnel	Classroom teachers implement <i>Math Expressions</i> with their students. Before implementing <i>Math Expressions</i> , teachers may participate in professional learning activities, including both virtual and in-person training. The cost of professional development varies depending on the format of delivery, number of teachers receiving training, and the level of support chosen by districts.	School districts or schools purchase <i>Math Expressions</i> and pay for teacher training. Districts that adopt <i>Math Expressions</i> on a large scale may receive some training sessions for teachers, district, or school staff at no charge from Houghton Mifflin Harcourt.
Facilities	The intervention is typically implemented in the students' regular classrooms during regular math instruction time. Training is typically provided at the district or school in a classroom or other available room.	School districts or schools provide the classroom facilities.
Equipment and materials	<i>Math Expressions</i> includes several teacher and student components. The typical cost per teacher for teacher materials, including print and a single-year digital license, is \$646, or \$1,311 for the print materials and a 6-year license. The typical cost per student for student materials, including print and a 1-year digital license, is \$48.60, or \$150.60 for 6 years of consumable print materials and a 6-year digital license. For a class of 20 students, the cost can range from about \$1,600 for 1 year to \$4,300 for 6 years based on these costs. The teacher and student components can be purchased separately.	School districts or schools usually purchase <i>Math Expressions</i> materials.

For More Information:

About *Math Expressions*

9400 Southpark Center Loop

Orlando, FL 32819

Attn: Houghton Mifflin Harcourt

Email: k12inquiries@hmhco.com Web: <https://www.hmhco.com/forms/contact-us-math-expressions>. Phone: (800) 225-5425

About the cost of the intervention

Web: <https://www.hmhco.com/search/shop?term=math+expressions>

About the study that meets WWC standards

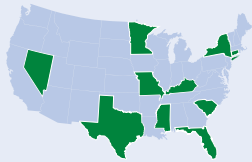
Agodini, R., Harris, B., Thomas, M., Murphy, R., & Gallagher, L. (2010). *Achievement effects of four early elementary school math curricula: Findings for first and second graders* (NCEE 2011-4001). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. <https://eric.ed.gov/?id=ED512551>

In What Context Was *Math Expressions* Studied?

The following section provides information on the setting of the one study of *Math Expressions* that meets WWC standards, and a description of the participants in the research. This information

can help educators understand the context in which the study of *Math Expressions* was conducted, and determine whether the program might be suitable for their setting.

WHERE THE STUDY WAS CONDUCTED

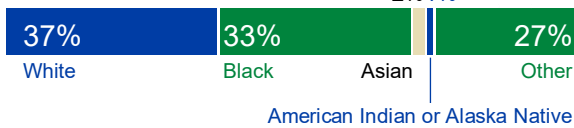


1 study, 8,060 students in 110 elementary schools in 12 districts in 10 **States**



Urban, suburban, and rural districts

Race



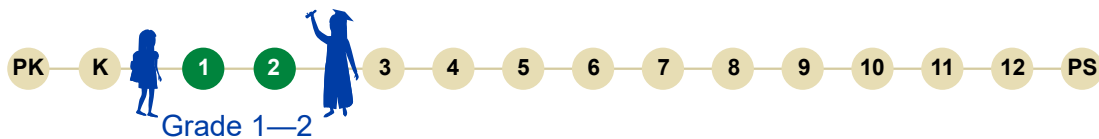
Ethnicity



Free & Reduced-Price Lunch: 51%

Gender: 48% Female 52% Male

Grades



LEARN MORE



Read more about the *Math Expressions* intervention and the study that is summarized in this brief in the [Intervention Report](#).