

**The *Math Expressions* Mastery Learning Loop:
Keeping All Students on the Grade-Level Learning Path
by Giving More Time and Support in Periodic In-Class Interventions
and Out-of-Class Tier 2 & Tier 3 Follow-Up Interventions**

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Differentiating During Whole-Class Lessons

Math Expressions provides high quality classroom instruction using a **Four-Phase Learning Path Teaching-Learning model implementing a Math Talk Community** in the classroom (see below). This model allows for considerable differentiation within whole-class instruction as students solve and explain a variety of solutions to problems. Teachers in Phase 1 help students learn math drawings for concepts and elicit student methods. In Phase 2 *Math Expressions* provides research-based mathematically desirable and accessible methods that enable less-advanced students to advance rapidly. Math drawings made by students help with meaning-making and explaining. In Phase 3 students practice a general math method without math drawings to obtain fluency. Phase 4 focuses throughout the year on maintaining and integrating fluency as students use the Remembering pages and relate old topics and concepts to new topics/concepts.

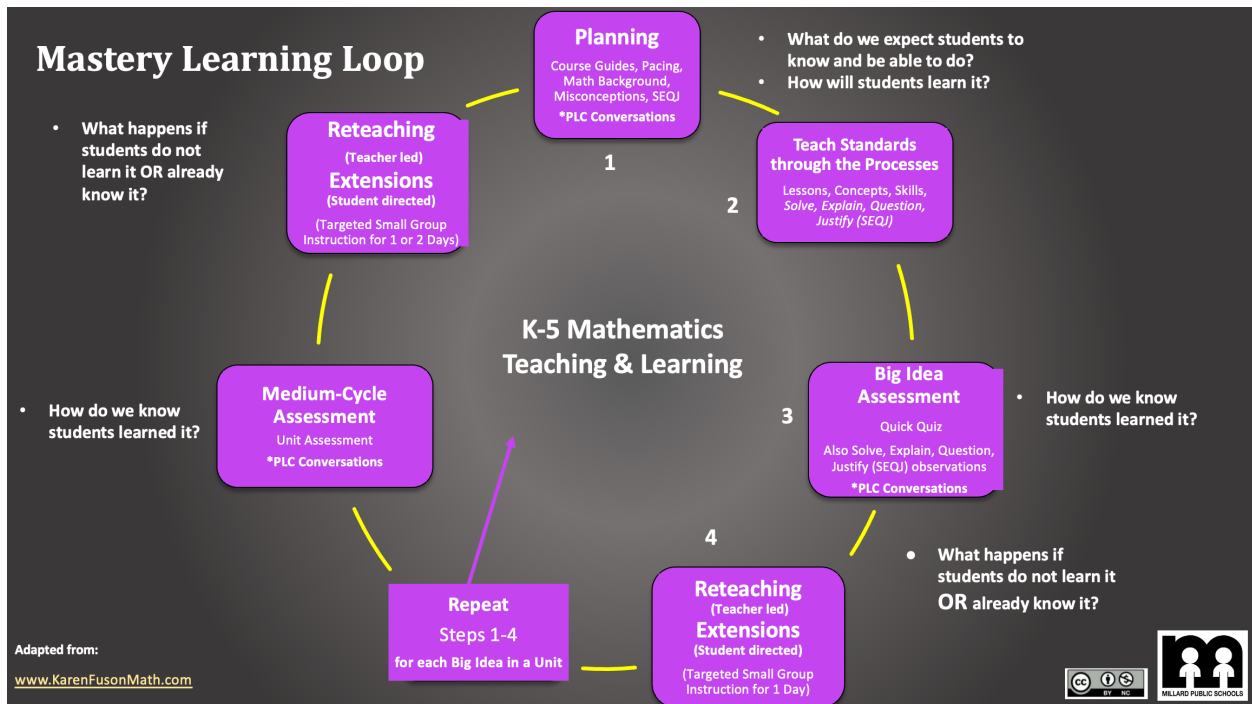
Phases for a Math Topic	Student Methods Used
<p>Phase 1. Guided introducing <i>Introduce topic, very short phase, visual models</i> Students share methods. <i>Teacher elicits solution methods and addresses common errors when necessary.</i></p>	<p>Phase 1 methods Methods-with-Errors Concrete & Slow methods Phase 2 methods are possible</p>
<p>Phase 2. Learning unfolding <i>Student Activity pages, Solve and Explain classroom structure</i> 2a. Students explain methods with drawings to stimulate correct relating of concepts and symbols. Model (show) & Instruct/Explain 2b. Students discuss and compare methods so the math aspects become explicit. Focus: Clarify, Question Extend: Question, Give Feedback <i>Teacher models and explains only when necessary.</i></p>	<p>Phase 1 methods begin to disappear Phase 2a good Helping Step methods and good Compact methods appear Phase 2b good 2a Helping Step methods and good Compact methods are still used 2b less-good Compact methods appear</p>
<p>Phase 3. Kneading knowledge <i>Student Activity Pages, Homework, Quick Practice</i> Students gain fluency with reflection and some explaining as needed.</p>	<p>Phase 3 and Phase 4. Fluency with one 2a good Compact method or one 2b less-good Compact method without a visual model (some students are fluent with more than one method)</p>
<p>Phase 4. Maintaining fluency & relating to later topics <i>Remembering pages are cumulative review</i> Occasionally discuss and relate old and new methods/concepts.</p>	<p>Methods in Phases 1, 2a, 2b are initially linked to a visual model/math drawing to support understanding.</p>

Use the Mastery Learning Loop to Target Intervention Help

The Math Talk Community allows the teacher to do continual formative assessment to modify instruction so as to address errors and extend good mathematical thinking during lessons. But some students need more time and help than others. The *Math Expressions* Mastery Learning Loop was designed to provide **periodic in-class interventions** for students who need this additional support **without slowing down instruction so much** that on-level students cannot learn all of the grade-level content. This approach is usually sufficient to keep most students on grade level throughout a unit.

Math Expressions units are divided into Big Ideas of 3 to 6 lessons. A Quick Quiz is given at the end of each Big Idea. This quiz provides data for the teacher to differentiate the class **in one intervention day at the end of that Big Idea**. The Unit Test in the Student Activity Book given without review provides data for **one or two more intervention days at the end of each unit**.

After each Big Idea Quick Quiz differentiate for one day.
After the unit test differentiate for one or two days.



Teachers need to read 5 lessons ahead to help see how the lessons build on each other and reduce the need for mastery of each lesson before going on. Some concepts and methods take multiple days for most students to understand, so you do not need to stop and review. **JUST KEEP GOING** using Math Talk in the lessons until you reach the Quick Quiz for a Big Idea.

Then give the **Big Idea Quick Quiz** at the end of the last lesson for that Big Idea.

- Analyze the quiz results to plan differentiation and intervention.

- Flexibly group to **differentiate instruction for one day** during which:
 - o above-level and on-level students work in self-directing groups on various tasks (see details below in Differentiation Days and Response to Intervention);
 - o the teacher works with students who need more support in a small group using the Quick Quiz results and formative assessment observations from teaching that Big Idea;
 - o students who need more help also attend teacher-led Response-to-Intervention (RtI) meetings 3 times a week (see below).

Repeat the above steps for each Big Idea in the unit.

Then **give the Unit Test** that is in the Student Activity Book without any review.

- Based on what students missed on the test, **differentiate as above for 1 or 2 days**. Do any more needed remediating during the teacher-led Response-to-Intervention sessions.
- If needed for grading, give Form A of the test in the Teacher Assessment Guide. Use the results on the first Unit Test for those students who did well on that test.
- Students who need help beyond 1 or 2 days attend teacher-led Response-to-Intervention meetings 3 times a week (see below).

Repeat the above for each new unit.

Students who have trouble on the Phase 4 Cumulative Review Remembering pages can attend the Response-to-Intervention teacher-led meetings or get help from peers on those items during the intervention days.

In-Class Intervention Days and Extra Response to Intervention (RtI) Sessions

In the Mastery Learning Loop, an in-class intervention day occurs after each Big Idea and for one or two days after giving the Unit test without review. **On-level and advanced students will work in self-directed activities** alone, in pairs, or small groups on appropriate activities in the learning stations as described below. **The teacher will work with students who need more support** as identified through an item analysis of the quiz and/or by ongoing formative assessment in the classroom. *Math Expressions* has summative unit assessments with multiple forms that identify similar content and strategies. The unit test in the Student Activity Book is given at the end of the unit, and the results—as well as all of the teacher’s knowledge about individual students for that unit—are used to determine the intervention levels for another day or two days as needed. Form A of the test in the Teacher Assessment Guide can be used to assess learning after the intervention days. Students who did well on the first unit test do not need to take it again.

When students demonstrate a need for **sustained and in-depth Tier 2 or Tier 3 intervention**, schools need to provide for additional time outside of class for students to receive support and more time with the *Math Expressions* lessons and concepts with which those students are experiencing difficulty. This will usually be most effective **when done by the regular classroom teacher**, who knows the individual students and their difficulties because of the ongoing observational of student work on student activity book pages, homework, and formative

assessment questions. Such Tier 2 and Tier 3 out-of-class intervention can be a combination of post-teaching concepts to meet the needs remaining after the Mastery Loop intervention, pre-teaching class lessons to reduce the need for the Mastery Loop intervention, and teaching and practicing concepts from earlier grade levels to support on-level learning. Such interventions usually require at least three 20-minute periods with 3 to 6 students at a time. Tier 3 students may require even more time.

The Mastery Learning Loop in-class intervention sessions will contain a mixture of high needs students who often need extra learning time and support and students who missed class or had special difficulties with the given Big Idea concepts on the Quick Quiz. Some students will be able to move fairly quickly during the intervention time to independent practice while others will need more problems and support directed at particular aspects of difficulty (and perhaps later additional out-of-class support). **The teacher plans systematic and explicit instruction focusing on the contextual representations and math talk during the intervention period.** This facilitates diagnosing individual student problems and aspects of needed support. The instruction can use earlier lessons and problems quite closely because many intervention students just need to consider and solve the same or additional problems when help is available.

Small Group and Learning Station Implementation on the Intervention Days

Math Expressions provides a wide range of resources to support teachers to arrange **differentiated activities for on-level and advanced students** in flexible groups using learning stations. During the first Mastery Learning Loop intervention day, the teacher focuses on supporting all students in learning how to engage in purposeful practice and/or enrichment activities. On subsequent intervention days, **on-level and advanced students manage themselves with minimal teacher support** while **the teacher works with struggling students**. Having a whole-class period for the interventions allows students to understand how the learning stations function and experience more than one such station during the class period if they desire. If regular math class is more than 60 minutes, such differentiating can be done more frequently to enable the teacher to work with students who need it between quizzes. This approach should not slow up the rate at which lessons are done by extending lessons over to a second day.

Teachers who have followed the pacing guide for *Math Expressions* and used the Mastery Learning Loop rather than reteaching or differentiating more frequently **have time to finish all needed units before spring testing dates**. Teachers then can use the rest of the year to catch up students who need additional work and to extend and deepen learning for students already on grade level using learning stations.

Math learning stations can occur anywhere in the classroom: small clusters of desks, tables, and even on the floor. Students can work independently, with a partner, or a small group of 3 to 4 collaboratively to use materials that will expand their mathematical thinking. The purpose of each station is to provide activities that reinforce concepts, extend prior instruction, and/or allow students to deepen mathematical understandings.

The number of stations set up varies with class size and student needs. In the first unit

there may be two or three stations with the same activity in order to establish routines, management, and teach students how to function independently in work stations. The station time can be shorter, with perhaps one or two rotations for the first few times. With experience, students will become familiar with the station structure, and the amount of independent time and number of rotations can be increased. Students can and should be involved in setting up the stations by finding the resources they need to complete the activities. Additional ideas for using stations or centers in the classroom can be found in the Center Planning Guide in the *Math Expressions* Math Activity Center Tri-fold and in the online version of the Math Activity Center.

On the first day of use of the learning stations, **the teacher introduces the work stations** and can use much of the class period to allow for explanation of the stations, establish the expectations for self-management, and teach students the routine of what to do if they have a question while the teacher is working with other children. This first lesson should be used to:

- model how to use and find materials for using the leveled Activity Cards from the Math Activity Center;
- model how to write a good response to one of the writing prompts found on the back of the leveled Activity Cards from the Math Activity Center;
- discuss where to find materials for completing station work;
- discuss what to do if they finish before it is time to switch to a new station.

After students can function well independently, 10 to 20 minutes of a regular class period can be used with such activities while the teacher catches up and helps struggling students. Fewer learning stations might be used in this case. New kinds of work stations used later on in the year may take some extra time to introduce, but the initial expectation is that students will figure out and manage themselves in stations and can propose and design new stations for future days.

Learning Station Ideas

Station activities should allow students to practice problem solving, communicating, and making connections between big mathematical ideas as well as representing mathematics in many ways. Students also need opportunities for choice in how they engage in the mathematics. Many of the resources listed below are included in the *Math Expressions* Math Activity Center Tri-fold and in the online version of the Math Activity Center.

Literature Station

- The Math Readers from the Math Activity Center or the *Math Expressions* Literature Library books can help students broaden their understanding of the mathematical idea or even develop a stronger conceptual understanding of the big idea. Teachers can either use whole group time to read aloud the book (depending on the difficulty of the book) or have the students read the book in the station.
- The Math Readers include questions and activities at the end of each book. The Teacher Guides that come with the Literature Libraries offer suggestions or activities that students can do to engage with the text or content of the book.

Enrichment Station

- Challenge Activity cards and
- Challenge copy masters from the Math Activity Center.

Fluency Station (choose some and vary as needed):

- Strategy Cards

- Check ups
- Quick Practice activities
- Fact fluency triangle cards (Math Mountain cards)
- Board games from the Math Activity Center
- Interactive Games and Fluency Builders from the online Math Activity Center

Vocabulary Station

- Record vocabulary words in a math dictionary, use graphic organizers (for example, the Frayer Model) to define, draw, find similarities and differences, etc.
- Play matching/concentration games with vocabulary and definitions.
- A Vocabulary Game can be found in the Math Activity Center and additional activities are in the back of the Student Activity Book.
- Vocabulary Cards are at the beginning of every unit in the Student Activity Book.
- The free downloadable Study Pop App can also be used to practice vocabulary.
- Use suggestions in the lessons for English Learners.

Writing and Problem Solving Station

- Use the Math Writing Prompts found on the backs of the leveled Activity Cards in the Math Activity Center.
- Create your own word problem and make a drawing and explain the solution on the back.
- Solve or write multi-step problems.
- Anytime problem (Gr. 3-6): Students solve and then write 2 more related Problems of the Day.
- Solve problems written by classmates.
- Use questions from the PARCC, Smarter Balanced, or High Stakes test prep books online (Grades 3 to 6).

Catch up or Helping Station

- Student Activity book page
- Homework or Remembering page (past or present)
- Solve and Explain activities with word problems
- Reteach and Practice copy masters in the Math Activity Center.
- Interactive Response-to-Intervention Tier 1 or 2 in the online Math Activity Center

Place Value Station

- Hundreds board activities- patterns, hundred chart puzzles
- Math Board drawings representing various numbers
- Secret Code Card activities
- Daily Routines for K, 1, 2

The In-Class Interventions

Working with intervention students at the board where each can solve is one good approach because teachers can see student work easily, everyone can group around a given problem as it is explained, and the teacher can offer corrective feedback as students solve the problems. On-level or advanced students can help individuals or ELL students during this activity, differentiating their own thinking as they do the challenging task of helping someone else with their own ways of thinking.

Tier 2 and Tier 3 students may need to solve more problems than the on-level and faster learners, and **they often need help at different individual critical points** where they do not understand some specific concept or idea. Some children just need the extra practice with the teacher available to help (even if the teacher is not needed for most problems), and then the problem solving begins to come together and flow more smoothly and confidently. The intervention can reuse the same problems used in class. This gives confidence to students. Teachers can also make up similar problems or have students begin doing the homework with the teacher available to help. Resources for Tier 2 and 3 intervention can also be found in the online Math Activity Center.