Math Module 2 Overview
Module Title: Multiplicative Thinking: Ratios and Rates
Grade Band: 6–9

In Module 2 ,participants develop a common understanding of the idea of multiplicative thinking and how it is used in reasoning with ratios and rates. This work represents a key shift required by the Louisiana Student Standards for Mathematics (LSSM). Participants will study the role the standards play in effective mathematics teaching and learning.

In Sessions 1 and 2, participants investigate the vertical alignment of standards to determine how multiplicative thinking, as it relates to ratios and rates, progresses across the grade levels. Participants will identify implications for instruction at grades 6, 7, and 8, and in the Algebra I course.

Session 3 provides time for participants to experience a lesson from EngageNY to see how the key shifts intended by the standards look when executed well in curriculum and instruction. After engaging in the lesson in the role of a student, participants will reflect on the learning experience by connecting the lesson to content standards and the components of rigor.

In Session 4, participants explore the important features of *Standard for Mathematical Practice (SMP) 4: Model with mathematics*, and the high school conceptual category of the same name. Participants dig into the idea that modeling is fundamental to how mathematics is used and applied in everyday life. Participants directly apply this knowledge to their instruction by determining strategic opportunities for students to model with mathematics, recognizing when EngageNY and other Tier 1 resources provide authentic opportunities to engage in the modeling cycle. Most importantly, participants learn how to use this knowledge to promote rigor in the classroom.

In Session 5 ,participants explore the question, "How do we encourage students to value struggle, failure, and perseverance in our classrooms?" The session is grounded by the Agile Mind article, "Persistence and effective effort," to enable participants to reflect on their own experiences with struggle—and to connect these experiences to support students in productive ways. Participants connect the research to the curriculum by examining the EngageNY lesson from Session 3 and identifying places in the lesson that support students in persistence and effective effort. Additionally, participants identify ways to increase opportunities for students to persist through the EngageNY lesson. Participants walk away from Session 5 with key ideas from research and clear action steps to foster persistence and effective effort in the classroom.

Key Understandings

After Module 2, participants will know:

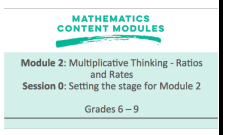
- Students' use of multiplicative thinking using ratios and rates begins with an understanding of equivalent ratios in grade 6, then moves in grades 7 and 8 to analyzing proportional relationships, and finally, after grade 8, to interpreting rates in Algebra I.
- Studying the standards in a vertical team is necessary to understand how specific grade-level expectations fit into the development of a big idea across grades, which has implications for grade-level teaching.
- The EngageNY teacher materials provide information about standards, including focus standards, foundational standards, and Standards for Mathematical Practice.
- The key shifts are evident in an EngageNY lesson and are supported by the content and practice standards.
- *Modeling with mathematics* is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, understand the situations better, and improve precision and processes for decision-making.
- How to provide authentic opportunities within the EngageNY resources for students to engage in the modeling cycle.
- Adults play a significant role in helping students develop persistence and apply effective effort—proven strategies paired with attitudes and beliefs that enable students to achieve the greatest benefit.
- How to develop and enact action steps to foster persistence and effective effort in the classroom.

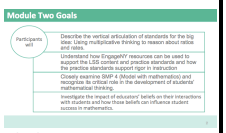
Module 2: Facilitation Recommendations	
Session Length	Six-hour module and additional 35 minutes for opening and closing slides. Session 0: Setting the Stage for Module 2 (5 minutes) Session 1: Deepening Mathematical Content Knowledge for Effective Instruction (60 minutes) Session 2: Exploring Coherence in the LSSM (60 minutes) Session 3: Key Shifts in Action Through an EngageNY Lesson (90 minutes) Session 4: Instructional Strategies to Improve Curriculum Implementation (90 minutes) Session 5: The Role of a Productive Classroom Culture in the EngageNY Curriculum (60 minutes) Plus: Module 2 Closing Slides and Participant Evaluation Survey (15 minutes)
Session Pairing Options	The recommended facilitation of module two is to be done as a full six-hour day of professional learning, with all five sessions facilitated back to back. If module two must be facilitated in separate sessions, it is highly recommended to facilitate Sessions 1 and 2 together in one session. If Session 4 cannot be facilitated as a single 90-minute session, it is suggested that you facilitate slides 1-5 together (the bulk of the reading and analyzing), then facilitate the remaining slides in another session (actively participating in a modeling lesson).
Time of Year	First six weeks of the school year; If possible, within 4 weeks of Module 1.

Preparing to Facilitate *What materials and supplies are needed to facilitate this session?* *What must the facilitator do to prepare for the actual session?*	

Session Materials:
• Handout **M2_P-00 Module 2 Presentation Slides**
 	
Additional Supplies:
• Chart paper
• Markers
• Sticky notes
	Facilitator Pre-Work and Prep:
	• Create the following blank posters titled:
	  ○ Parking Lot
	  ○ Group norms (optional)
	• Review **M2_CL-01 Posters and Handouts Guide**

Time & Slide Thumbnail	Facilitator Notes Session 0	Materials


Slide 1
Time Allotted:
3 minutes
	Session 0: Setting the Stage for Module 2
	Slides 1–4: 5 minutes
	
	Critical Idea
	• It is important to set a positive tone for learning.
	
	Step-By-Step Instructions
	• Before the start of the session, use handout **M2_CL-01 Posters and Handouts Guide** to organize your preparation. It lists the posters and other materials you will need to prepare before the session as well as all the handouts needed for this module.
	• As participants come in for the day, ask them to sit in same-grade-level groups of four. This grouping will be critically important for the work at the beginning of the session. Midway through this session, they will switch to mixed-grade level groups.
	• Welcome the group to Module 2 and introduce yourself.
	• Point out the Parking Lot poster to participants. This is a place where they can leave questions throughout the day. Explain to them that periodically throughout the day, you will be answering any questions on the Parking Lot poster.
	• Take care of "housekeeping" items before beginning the day:
	  ○ Scheduled start and stop times
	  ○ Breaks
	  ○ Lunch
	  ○ Location of restrooms
	  ○ Silencing of cell phones
	  ○ Orienting participants to the handouts for the day, including the handout of the slides.
	
	Words of Wisdom
	• All timing is based on the recommended group size of 12 to 30 participants.
		M2_CL-01 Posters and Handouts Guide

 Slide 2 Time Allotted: 1 minute	***Critical Idea*** • For participants to buy in to the project, it is important to provide them with the goal and purpose. ***Step-By-Step Instructions*** • Say, "Recall from Module 1, the work in which you are engaged is part of a bigger picture. The overarching goal of the initiative is to improve the quality of instruction in math classrooms by developing deep mathematical content knowledge of teachers and connecting that content knowledge to the practical implementation of a quality curriculum." ***Words of Wisdom*** • This slide provides participants with the goal of the three-year initiative. Image Credit: Chad Baker/Jason Reed/Ryan McVay/Photodisc/Thinkstock (Item number: AA014176)	
 Slide 3 Time Allotted:	***Critical Idea*** • It is important to "begin with the end in mind" as a lens for learning. ***Step-By-Step Instructions*** • Ask participants to quietly read the learning expectations for Module 2.	

Time & Slide Thumbnail	Facilitator Notes Session 0	Materials
1 minute	• Explain that in Module 2 participants will consider the vertical articulation of standards related to multiplicative thinking in ratios and rates. Participants will engage in tasks and lesson from Tier 1 resources that illuminate the standards in the vertical trajectory. They will also explore how curricular resources can be used to reinforce modeling with mathematics. Participants will continue thinking about promoting a positive classroom culture and how mathematical modeling can be used to do so. ***Words of Wisdom*** • This slide should be brief and is about clarifying the learning expectations of Module 2.	
   Slide 4 Time Allotted: 1 minute	***Critical Idea*** • Participants must agree to honor these norms, which will help provide an environment for professional conversation. ***Step-By-Step Instructions*** • Remind participants that to meet the goal and learning expectations, we have group norms that will continue to guide our collaborative work. • Ask participants to independently read the slide. • Ask participants to choose one of the norms that they will pay particular attention to throughout the day. Participants should tell their tablemates which norm they selected as a way to encourage accountability. ***Words of Wisdom*** • This slide sets the tone for how we will go about our work for the day. Citation: These norms have been adapted from recommendations in a variety of sources, including: National Research Council. (2000). How people learn: Brain, Mind, Experience, and School. Washington, DC: The National Academies Press. The last norm ("Mistakes are expected, respected, and inspected") was shared by Jo Boaler in an early version of her online course. A current version, "How to Learn Math: For Teachers," is available here: http://scpd.stanford.edu/ppc/how-learn-math-teachers	

Math Module 2, Session 1 Overview
Session Title: Deepening Mathematical Content Knowledge for Effective Instruction
Grade Band: 6–9

Session Overview *What are the overarching goals of this session? Why are those goals important?* *How do they connect to what's come before and what will come after?*	
In Module 1 participants studied the key shifts intended by the LSSM and how these key shifts guide decisions about teaching and learning. This session builds on participants' work in Module 1 to provide time to consider the vertical articulation of standards related to multiplicative thinking in ratios and rates. Participants consider how the standards build an idea from late elementary school to early high school. Participants examine tasks to illuminate the changes in the LSSM from grade 6 to Algebra I.	
Session Key Points *What are the 2 to 4* most *important takeaways from this session?*	**Session Products** *What will participants produce during the session? Immediately following the session?*
Participants will know: • Reasoning with ratios and rates uses multiplicative thinking and is developed and used across grades 6–9. • The difference between additive and multiplicative thinking • How a set of examples illustrates the progression of multiplicative thinking with ratios and rates across grades 6-9.	**Participants will…** • Produce a poster with initial thoughts about how the big idea looks at a specific grade level. • Produce an ordered set of tasks, aligned to the LSSM, to show the progression of learning associated with multiplicative thinking in reasoning with ratios and rates.

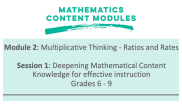
Session Objectives *What will participants know, believe, and be able to do as a result of this session?*	**Session Agenda at a Glance** *What is the overall flow of this session?*
Participants will be able to: • Give an initial description of using multiplicative thinking in reasoning with ratios and rates across grades 6-9. (CK) • Order math tasks from EngageNY and other Tier 1 resources related to the focus secondary content of multiplicative thinking with ratios and rates. (CK, CP, CS) CK: Content Knowledge CP: Content Pedagogy CS: Curriculum Skills	• Introduction • Defining the big idea • Exploring tasks at various grade levels • Connecting tasks to the standards

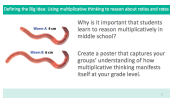
Facilitation Recommendations	
Session Length	60 minutes
Time of Year	First six weeks of the school year
Session Pairing Options	Pair with Session 2. The timing for Session 2 is very tight. If you pair Session 1 and Session 2, you may choose to move through this session more quickly so that you have extra time during Session 2.

Preparing to Facilitate *What materials and supplies are needed to facilitate this session?* *What must the facilitator do to prep for the actual session?*	
Session Materials: • Participant handouts • **M2_P-01a-d Ratio and Rate problem set** (1 set per table) • **M2_P-02 Grade 6-to-Algebra I Standards** (1 set per table) **Additional Supplies:** • Chart paper • Chart markers	**Facilitator Pre-Work and Prep** • Copy **M2 P-01a-d Ratio and Rate problem set** (1 per table, single sided) • Copy **M2_P-01_Grade 6 Algebra I standards** (1 set per table) **Note:** • Facilitators should save the big idea posters created on slides 5 and 6 for the next session (Session 2).

Participant Pre-Work *What should participants bring to this session? What should they do or prepare in advance of this session?*	
Participants must bring: • Writing utensil	**Before this session, participants should:** • Not applicable

Time & Slide Thumbnail	Facilitator Notes Session 1	Materials


 	
Slide 5
Time Allotted:
2 minutes
	Session 1: Deepening Mathematical Content Knowledge for effective instruction
	Slides 5-9: 55 minutes
	
	Critical Idea
	• Introduce Session 1.
	
	Step-By-Step Instructions
	• Say,
	  ○ "This session builds on your work in Module 1 and provides time for you to consider the vertical articulation of standards related to multiplicative thinking in ratios and rates. You will consider how the standards build this idea from late elementary school to early high school, illustrating the coherence of the standards across grade levels. Remember, the standards are designed around coherent progressions from grade to grade. You will examine tasks to illuminate this progression and the changes in the LSSM relating to ratios and rates from grade 6 to Algebra I."
	  ○ "Session 1 is designed for the purpose of deepening your own mathematical knowledge for effective instruction. The EngageNY curriculum has similar math learning activities built into its lessons, although they may be spread across several lessons and not necessarily be presented in the same way that we are about to experience. It is important to keep in mind that you may experience some ah-ha moments in this section that will not come as quickly and as easily to your students."
	
	Words of Wisdom
	• Reiterate throughout Module 2 that it is important for participants to abide by the pacing of the EngageNY curriculum, which is designed to be more developmentally appropriate for the students. The purpose of the opening math task is to get participants thinking about content related to the big idea of this module.	

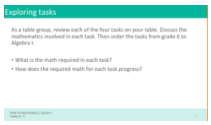
 Slide 6 Time Allotted: 17 minutes	***Critical Idea*** • Teachers may be at different places in their understanding of additive and multiplicative thinking. The purpose of this activity is to come to a consensus on the meaning of multiplicative thinking by engaging in a mathematical discussion around a problem that contrasts additive and multiplicative thinking. ***Step-By-Step Instructions*** • Show the worm image on the slide. • Say, "In this Module, you are going to consider the reasoning required when working with ratios, rates, and proportional relationships. Proportionality is a key idea of mathematics that begins in middle school. What students learn in middle school and Algebra sets the foundation for work with derivatives in calculus. As students move from elementary school to middle school, the reasoning they use to compare quantities changes. To help you start thinking about this change, think about the image of the two worms." • Say, "How might you compare the lengths of these two worms?" • Give participants 1 minute to talk with an elbow partner. • Solicit responses from participants that illustrate additive thinking, that is worm A is 2 cm longer than worm B, and responses that illustrate multiplicative thinking, that is worm A is 1.5 times as long as worm B. Note: Participants may struggle to give comparisons that illustrate multiplicative thinking. You may need to push participants to	

Time & Slide Thumbnail	Facilitator Notes Session 1	Materials

	think of other ways to compare the two worms and in particular to think about how middle school mathematics would support other ways to compare the length of the two worms.
	• Other comparisons that participants might make are:
	  ○ Worm B is 2 cm shorter than Worm A.
	  ○ Worm B is 2/3 the length of Worm A
	  ○ Worm A is 150% the length of Worm B.
	  ○ Worm B is 66 2/3% as long as Worm A.
	• Write participant responses on chart paper. Ask, "What is the difference in these comparisons?"
	• Participants may respond by pointing out the operations used in finding each answer, subtraction versus division. Participants may not use the terminology additive and multiplicative thinking. Introduce these terms and clarify what each of these ways of thinking means.
	  ○ Students who use additive thinking compare quantities by finding differences (noting that some students find differences by adding on).
	  ○ In contrast, students who use multiplicative thinking compare quantities by finding quotients.
	• Ask, "Which type of comparison is more common across the middle school grades?"
	  ○ Teachers should recognize that the multiplicative comparisons are more common because of the focus of ratios and rates across the middle school grades.
	• **Animate the slide.** Ask participants to think about the question silently for a few minutes.
	  ○ Why is it important that students learn to reason multiplicatively in middle school?
	• Ask participants to discuss their thoughts with their table. Give 2 minutes for participants to talk.
	• As participants are talking, pass out chart paper and markers to each group.
	• Popcorn out responses to the question. Some responses include:
	  ○ Thinking multiplicatively allows students to quickly scale quantities up and down, make predictions, distinguish between proportional and non-proportional relationships, and use proportional relationships to solve problems.
	• Say, "As students move from elementary school to middle school, they will need to shift from additive to multiplicative thinking to be successful with ratio reasoning and proportional relationships. This change in thinking needs to be made explicit in instruction to ensure that all students make this shift."
	• Say, "Now that you have an understanding of what multiplicative thinking is and why it is important at the middle school level, think about how students' use of multiplicative thinking manifests itself at your grade level. On the poster I put at your table, record examples of how multiplicative thinking is used at your grade. You can use words, pictures, equations, tables, or any other representation."
	• Each group should summarize their discussion on a poster illustrating their understanding of multiplicative thinking at their grade level. Make sure that participants label their poster with the grade level or course they are discussing.
	• Have participants post their posters, grouping them by grade level. If you have more than one group per grade level, give a few minutes for the groups at a given grade level to compare their posters and discuss similarities and differences.
	
	Words of Wisdom
	• The purpose of charting the big idea is to tap participants' prior knowledge. It is a starting place to acknowledge what they already know before studying the standards. It	

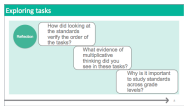
Time & Slide Thumbnail	Facilitator Notes Session 1	Materials
	helps participants make connections to what they already know and to recognize areas where more study is needed. • It would be easy to let the discussion comparing additive to multiplicative thinking overtake this session. Limit the discussion to the simple example with the worms so there is time for the other activities in this session. Image credit: bazilfoto / iStock / Thinkstock Item number: 466331588	

Slide 7
Time Allotted:
13 minutes
	Critical Idea
	• Participants review the description of the big idea at different grade levels.
	
	Step-By-Step Instructions
	• Have them do a gallery walk, analyzing the progression of ideas from grade 6 to Algebra I. Ask participants to pay attention to the following questions as they do their gallery walk.
	  ○ What do you notice about the posters from each grade level?
	  ○ Do you see any common ideas across grade levels?
	  ○ Do you see evidence of the big idea growing from grade to grade?
	  ○ Do you see any gaps between grade levels?
	• Give participants 5 to 6 minutes to do a gallery walk, reflecting on the 4 questions.
	• Take some time to have groups share out comments from their gallery walk and discuss the questions given. Let participants know that they will continue working with this big idea by studying the standards around ratios and rates. At the end of Session 2, they will have time to revisit the ideas on these posters.
	
	Words of Wisdom
	• This activity is an initial brainstorming activity for participants. Participants may have misconceptions about the big idea and the content at each grade level at this time. There may be some disagreement among participants about what is on each poster. Allow for some of this discussion, but it is not necessary to resolve these issues at this time. These discussions motivate the need for studying the standards. At the end of Session 2, participants will come back to these posters to discuss how their understanding has changed.
	• Be sure to collect these posters to use in the next session.	

 Slide 8 Time Allotted: 10 minutes	***Critical Idea*** • Participants consider four mathematical tasks and decide on how the tasks progress from grade 6 to Algebra I. ***Step-By-Step Instructions*** • Ask participants to regroup themselves so that they are sitting in mixed grade level groups. If possible there should be a teacher from each grade level at each group. • Place handout **M2_P-01_Ratio and Rate problem set** at each table, one set per table. • Have participants review each of the four tasks as a table group, discussing the mathematics involved in each task. Then have participants order the tasks in the way they think the tasks develop from grade 6 to Algebra I. • Use these guiding questions to guide group discussions. ▪ What is the math required in each task? ▪ How does the required math for each task change/develop?	**M2_P-01_Ratio and Rate problem set** **M2_P-02_ Grade 6-to-Algebra I standards**

Time & Slide Thumbnail	Facilitator Notes Session 1	Materials

	• **<u>Animate the slide</u>.** Debrief the task sorting activity by giving participants the handout **M2_P-02 Grade 6-to-Algebra I standards.** These four standards correlate to the mathematics in each of the four tasks.
	• Give participants 2 minutes to use the standards to check their order of the four tasks. They should compare the standards at each grade level to the math in the task to see if the task chosen for 6th grade addresses the standard, etc. Some participants may notice that some tasks do not address all parts of the given standard. This is okay, and Module should realize that it may take a variety of tasks, activities, and lessons to completely address a standard.
	• Quickly verify the order of the tasks as follows:
	  ○ Grade 6: Lesson 15: A Synthesis of Representations of Equivalent Ratio Collections
	  ○ Grade 7: Lesson 8, John and Amber problem
	  ○ Grade 8: Lesson 22, Water flows out of Pipe A problem
	  ○ Algebra 1: Lesson 14, Scatter plot of foal birth weight and mare's weight problem
	
	Words of Wisdom
	• In this activity, participants are making an educated guess about the order. They then compare the given standards to the tasks to verify the order.	


 	
Slide 9
Time Allotted:
13 minutes
	Critical Idea
	• This activity sets the stage for teachers to begin to see coherence in the standards and understand how ideas in one grade are built off students' understanding from previous grades and how grade level standards lead to understanding in the next grade. Teachers cannot depend on tasks or resources to define what they teach at a particular grade level; they must study the standards to have an understanding of key mathematical ideas and how they develop across grade levels.
	
	Step-By-Step Instructions
	• After participants have verified the correct order of the tasks, give them a few minutes to discuss the reflection questions on the slide at their table.
	• Debrief this activity by having several groups share out their responses to the questions. Key points that should emerge from the discussions for each question are:
	  ○ *Question 1: The mathematics called for in the standards is evident in the tasks given. The progression of the mathematics in the standards mirrors the progression of mathematics in the tasks.*
	  ○ *Question 2:*
	  ▪ *Task A (6th grade 6.RP.A.3a): Students use multiplicative thinking to make a table of equivalent ratios and plot ordered pairs from the table on the coordinate plane. Students also use ratio and rate reasoning in this task to predict values using different representations. Note, this task also relates to 6.EE.C.9 as students use variables to represent quantities in a relationship and write an equation to represent the relationship.*
	  ▪ *Task D (7th grade 7.RP.A.2a,b,c): Students are given two different relationships in different forms. Students must decide if each relationship is proportional or not (7.RP.A.2a). Then students must write an equation for each proportional relationship (7.RP.A.2c) and identify the constant of proportionality (7.RP.A.2b).*
	  ▪ *Task B (8th grade 8.EE.B.5): Students compare two proportional relationships represented in different ways.*
	  ▪ *Task C (Algebra I A1:S-ID.C.7): Students are given a linear model from data and they interpret the parameters in non-proportional linear relationships. The*	

Time & Slide Thumbnail	Facilitator Notes Session 1	Materials
	multiplicative thinking used with proportional relationships is no longer sufficient. Students find and interpret the slope as a rate, but they must also account for the initial value. ○ *Question 3. **Students** progress from creating a table of equivalent ratios to working with proportional relationships and then to interpreting parameters in non-proportional relationships. The standards clearly define the expectations of students at each grade level for this progression. It's important for teachers to understand how their instruction at their grade level is part of a larger picture.* • These four tasks may elicit a discussion between the meaning of ratio, rate, constant of proportionality, and slope. These terms represent the progression of ideas from grade 6 through Algebra I. You may choose to use the comments below to help guide discussion or answer questions that may arise in the session. Students begin to learn about ratios and rates in grade 6. ○ A *ratio* is an association between two or more quantities. The association is described using words such as "to" and "for every." While students will primarily see ratios as ordered pairs, a colon can also be used to indicate the association. ○ Using fraction notation to represent a ratio can lead to student misconceptions and confusion in that ratios can represent part-to-part relationships, not just part-to-whole relationships. Fractions represent part-to-whole relationships. ○ Because of this distinction, using fraction notation to represent ratios, especially as students are solidifying their understanding of fractions from elementary school and are being introduced to the idea of a ratio in grade 6, is problematic. F ○ or this reason, the EngageNY resources refrain from representing ratios using fraction notation; only a colon or words are used to represent ratios. ○ Every ratio of two quantities has two associated rates. The *rate* is a quantity derived from the ratio by division, and it includes units. There are two associated rates depending on the order of the division. ○ If two quantities are in a proportional relationship, then the quantities are related by a *constant factor*. The ratios between pairs of quantities in the relationship are equivalent. The value of these equivalent ratios is the constant factor and is called the *constant of proportionality*. A constant of proportionality is a numerical value that has no units. ○ In a proportional relationship, the *slope* of the line representing the relationship is the same as the constant of proportionality. But not all linear relationships are proportional. ○ In general, the slope of a line is the quotient of the change in two *y*-values on the line and the change in the two corresponding *x*-values on the line. The slope of a line indicates its steepness when graphed. It is the geometric representation of the rate of change between the quantities in the relationship. Although the slope of a line can be interpreted inside the context of a problem, the slope is a numerical value that has no units. ○ The progression of ideas from *ratio* and *rate* to *constant of proportionality* and *slope* represents students' growing understanding of how to describe relationships between two quantities. As students study rates and proportional relationships, seeing one quantity as a product of a constant and the other quantity will help students understand the power of multiplicative reasoning to scale up or down the quantities in the relationship. • Use the responses to the third question to transition to Session 2, where participants will continue studying the same big idea, but broaden their study into elementary school to build a vertical alignment of multiplicative thinking in reasoning with ratios and rates.	

Time & Slide Thumbnail	Facilitator Notes Session 1	Materials
	• Say, "In the next session, you will a deeper look at your grade-level standards related to this big idea and get a more complete picture of how this big idea builds from grades 4 through 9." ***Words of Wisdom*** • This conversation should prompt the need and value for studying standards across a grade level for a particular concept and is a good segue into the next session.	

Math Module 2, Session 2 Overview
Session Title: Exploring Coherence in the LSSM
Grade Band: 6–9

Session Overview *What are the overarching goals of this session? Why are those goals important?* *How do they connect to what's come before and what will come after?*
In Session 2 participants study how standards related to the big Idea, using multiplicative thinking to reason about ratios and rates, progress from grades 4-9. By studying this progression, participants see how students' understanding of the big idea progresses across grade levels, which is evidence of the key shift of coherence. Participants understand the specific role their grade level standards play in students' understanding and use of ratios and rates to solve problems. In Session 3, participants will experience an EngageNY lesson that directly ties to one of the standards studied in this session.

Session Key Points *What are the 2 to 4* most *important takeaways from this session?*	**Session Products** *What will participants produce during the session? Immediately following the session?*
Participants will know: • Students' use of multiplicative thinking using ratios and rates begins with an understanding of equivalent ratios in grade 6, then analyzing proportional relationships in grades 7 and 8, and finally to interpreting rates in Algebra I. This foundation begins in late elementary school when students compare quantities using multiplication and explore equivalent fractions. • Each grade builds on the prior work of the grades before and is the foundation of work to come in future grades, illustrating the coherence of the standards. • Studying the standards in a vertical team is necessary to understand how specific grade level expectations fit into the development of a big idea across grades, which has implications for grade level teaching.	**Participants will…** • Build a vertical alignment trajectory that includes standards related to the big idea, using multiplicative thinking to reason about ratios and rates.

Session Objectives *What will participants know, believe, and be able to do as a result of this session?*	**Session Agenda at a Glance** *What is the overall flow of this session?*
Participants will be able to: • Engage in a study of standards across grades 4-9 related to using multiplicative thinking to reason about rates and ratios to see how this idea develops across the grades. (CK) • Revise and refine their thinking on what the big idea means. (CK) • Reflect on their study of the standards and how their instruction may be impacted by their new knowledge. (CP) CK: Content Knowledge CP: Content Pedagogy CS: Curriculum Skills	• Introduction • Making the case: Why study the vertical alignment of standards? • Vertical Alignment process • Reflection

Facilitation Recommendations	
Session Length	60 minutes
Time of Year	First six weeks of the school year
Session Pairing Options	Pair with Session 1. The timing for this session is very tight. If you pair Session 1 and Session 2, you may choose to move through Session 1 more quickly so that you have additional time for this session.

Preparing to Facilitate

What materials and supplies are needed to facilitate this session?
What must the facilitator do to prep for the actual session?

Session Materials:

- Sets of Louisiana Math Standard Strips (1 set per table).
  - Use **M2_CL-02 Vertical Alignment Strips**.
- Handout **M2_P-03 Vertical Alignment Chart**

Additional Supplies:

- Chart paper—1 piece per group
- Chart markers
- Tape or glue sticks

Facilitator Pre-Work and Prep:

- Using **M2_CL-02 Vertical Alignment Strips**, cut sets of standards strips and put into plastic zipper bags (1 set per table).
- Copy **M2_P-03_**Vertical Alignment Chart (1 per participant)
- Study and have **M2_CL-03 Vertical Alignment Chart With Changes** ready to use to facilitate poster discussion
- Gather Big Idea poster from Session 1 and keep at hand for this session.
- Create the start of a vertical alignment chart that includes the big idea as a title, the standard strips, and standard coding for each standard listed on the strips on the left side of the chart.

Participant Pre-Work

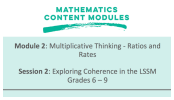
What should participants bring to this session? What should they do or prepare in advance of this session?

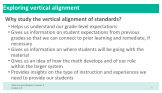
Participants must bring:

- Not applicable

Before this session, participants should:

- Not applicable

Time & Slide Thumbnail	Facilitator Notes Session 2	Materials
 Slide 10 Time Allotted: 1 minute	**Session 2: Exploring Coherence in the LSSM** **Slides 10-16: 60 minutes** ***Critical Idea*** • This slide introduces Session 2. ***Step-By-Step Instructions*** • If this session is a stand-alone, keep the *big idea* posters created in Session 1 at hand; you will pass them out at the end of this session. • Make sure participants are in mixed-grade level groups before starting this session. • Welcome participants to Session 2 of Module 2. • Say, "Remember in Session 1, you unpacked the big idea of using multiplicative thinking to reason about ratios and rates. The work you do in this session will build off that work." • Say, "You will take a more comprehensive look at standards across grades 4–9 that support the big idea from Session 1." ***Words of Wisdom*** • Participants should be sitting in mixed-grade-level groups of four.	


Slide 11
Time Allotted:
2 minutes
	Critical Idea
	• In Session 1 participants informally studied the progression of the big idea from grades 6 through 9 by looking at sample tasks that illuminated a subset of standards that addressed the big idea. In Session 2, they take a closer, more formal and complete look of how this big idea is developed, using standards from grades 4 through 9.
	
	Step-By-Step Instructions
	• Pose the question on the slide to get participants thinking about why it is important to study the vertical trajectory of standards. Ask them to think quietly about this question, then popcorn out some responses. This should be kept brief—no more than a minute.
	• **<u>Animate the slide</u>**. Build off participants' responses and use the bullets on the slide to provide the rationale for why knowing the vertical trajectory of an idea across grade levels is important.
	• Say, "This slide gives a rationale for why we want to study the vertical alignment of standards across multiple grade levels. When studying a vertical trajectory of standards, it's important that you work with mixed-grade-level teams in order to gain insights about the standards from teachers from other grade levels."
	• Give time for participants to read through the bullets on the slide.
	  ○ It helps us understand the specific expectations at our grade level.
	  ○ It gives us information on student expectations from previous grades, which will help us connect to prior learning and plan for remediation if necessary.
	  ○ It gives us information on where students are going in future grades with the ideas.
	  ○ It gives us an overview of how the mathematics develops and helps us understand our role within the larger system.
	  ○ It can provide insights on the type of instruction we need to provide our students.
	• Summarize these points by saying, "Studying the standards at your grade level and across grade levels highlights the key shifts of focus and coherence in the standards."
	• Say, "When doing a vertical alignment, you need to start with a *big idea*. A *big idea* is a mathematical topic or concept that takes time to develop across grade levels, but is narrow enough to support a focused study. You have been investigating the big idea "Using Multiplicative Thinking to Reason About Ratios and Rates" by looking at sample tasks	

Time & Slide Thumbnail	Facilitator Notes Session 2	Materials
	aligned to different grade levels and standards. Now you will study the standards to see how they support a progression of this big idea from grades 4 through 9." ***Words of Wisdom*** • Participants are building on Session 1, not repeating it. • It is important to study the vertical trajectory of standards with mixed -grade-level teams for the reasons listed in the slide. Armed with this information, teachers can make instructional decisions aligned to the standards.	

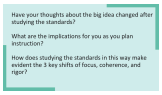
Slide 12
Time Allotted: 17 minutes
	Critical Idea
	• The power of this activity is the collaborative conversation about carefully selected standards connected to a big idea.
	
	Step-By-Step Instructions
	• Explain the vertical alignment process to the participants.
	  ○ Say, "When discussing the vertical alignment of an idea across grade levels, you need to study the standards from each grade level that are related to the big idea and discuss how the idea develops and changes. You do not necessarily need to study every standard at each grade level that relates to the big idea."
	  ○ Say, "For the purposes of the work today, the standards have been chosen for the you and cut into strips. Each group will have a set of the selected standards, with each strip containing the actual language of one or more of the standards from 4th grade to 9th grade."
	  ○ Say, "When you look at your strips, you will notice that the grade-level standard coding is not listed with the standard. For the first part of this activity, you will read each of the standard strips with you table group and determine the order of the standards, from 4th grade to 9th grade, based on you experiences and how your group thinks the big idea develops."
	• As participants read and discuss the standards statements, have them think about how the language describes how skills increase in complexity and how the language of the standards affected their group's placement of the cards.
	• Pass out the standards strips to each group. Give groups 10 minutes to work together to order their standards strips, starting with grade 4, and think about the question "How did the language of the standards affect your group's placement of the strips?"
	• As groups are working, walk around and give each group one sheet of chart paper, chart markers, and a long strip of tape, 1 - 1.5 feet in length.
	• When it looks like groups have completed the task, call participants back to the whole group.
	• Ask: "How did the language of the standards help you to place them into a progression?"
	• Have participants share a few specific examples of language from the standards that helped them to determine their placement.
	• Transition to the next slide to reveal the actual order of the standards, from grades 4 to 9.
	
	Words of Wisdom
	• Move around groups, monitoring conversations and answering questions, and prompt discussions around the mathematics in the standards.
		Sets of **M2_CL-02 Vertical Alignment Strips,** cut out and placed into bags or envelopes. One set per table.

Time & Slide Thumbnail	Facilitator Notes Session 2	Materials

Slides 13 and 14
Time Allotted: 5 minutes
	Critical Idea
	• The power of this activity is the collaborative conversation about carefully selected standards connected to a big idea.
	
	Step-By-Step Instructions
	• Pass out **M2_P-03_Vertical Alignment Chart**, and have groups compare their order of the standards to the actual order of the standards.
	• Give groups 2 to 3 minutes to check their order and to reorder if necessary.
	• Debrief questions to ask:
	  ○ *Were there any standards that you thought were intended for one grade level but then had to move?*
	  ○ *What language in that standard do you think makes it fit with its intended grade level?*
	
	Words of Wisdom
	• Not applicable
		M2_P-03_ Vertical Alignment Chart

Slide 15
Time Allotted: 25 minutes
	Critical Idea
	• The power of the vertical alignment process is the collaborative conversation. It is not about just placing the standards in order or filling out the chart. The process is intended to capture the conversations and common understandings.
	
	Step-By-Step Instructions
	• At this point, explain the remainder of the vertical alignment process.
	  ○ Show the sample vertical alignment chart created ahead of time to clarify for participants how they should organize and attach the standards strips (that they have sorted at their tables) on the chart paper.
	  ○ Explain to participants that they will tape their strips to their chart paper, beginning with grade 4 at the bottom, being sure to include the title of the big idea at the top and the standard coding for each strip.
	  ○ When participants discuss the changes that occur from grade to grade, starting with grade 4, they will chart their conversation on the right-hand side of the paper.
	  ○ Participants should use the guiding questions on this slide to discuss the changes that occur from one grade to the next, determine where concepts are introduced, developed and finalized; and describe where and how ideas get more complex.
	• Give 20 minutes for groups to create their charts and to document the changes from grade to grade, using the questions on the slide as a guide. The initial taping of the strips and titling of the poster should take fewer than 3 minutes. Most of the time should be reserved for discussing the standards and the questions on the slide. Tell participants up front that the poster creation should be fast.
	▪ If you find that groups are struggling with documenting the changes, you may choose to model the changes from grades 4 to 5 with the whole group, using as a guide **M2_CL-03_Vertical Alignment Chart With Changes**.
	• Circulate around the room as groups are working, encouraging them to use the guiding questions to guide their conversations. Use **M2_CL-03_Vertical Alignment Chart With Changes** to help you facilitate conversations with different groups.
	• When groups finish their work, have each group hang their poster.
	• Allow time for table groups to share a few of their findings with the whole group. If needed, ask:
	  ○ What are some of the important findings your group made?
	  ○ Was there anything that surprised you about the standards?
	  ○ Was there anything that was an ah-ha for you or your group?
		M2_CL-03 Vertical Alignment Chart With Changes
		
		Chart paper (at least 1 sheet per group of 4 mixed-grade-level groups)
		
		Markers
		
		Tape

Time & Slide Thumbnail	Facilitator Notes Session 2	Materials
	Words of Wisdom • The focus of this work is the conversation and seeing the coherence of the big idea across grade levels. The purpose of the Vertical Alignment is to capture conversations and ideas. It is not about completing the chart. • It may help to set a timer for participants to build the initial chart with the strips and the title. This should take less than 3 minutes.	


Slide 16
Time Allotted:
10 minutes
	Critical Idea
	• The focus of this work is the conversation and seeing the coherence of the big idea across grade levels.
	
	Step-By-Step Instructions
	• To debrief this activity, have participants regroup into grade-level groups from Session 1. Participants do not have to sit for this conversation. They can just regroup into different corners of the room.
	• As participants regroup, hand each grade-level group their big idea poster from Session 1.
	• Have the participants discuss the following questions in their grade level groups:
	  ○ Have your thoughts about the big idea changed after studying the standards?
	  ○ What are the implications for you as you plan instruction?
	  ○ How does studying the standards in this way make evident the 3 key shifts of focus, coherence, and rigor?
	• Give participants 2 minutes to reflect on these questions, then invite them to share out.
	• Some important ideas that should surface during the whole group share out are:
	  ○ Question 1: Teachers' thoughts about this question will depend on their original thinking about the big idea from Session 1.
	  ○ Question 2: Teachers are a part of the larger system, are responsible to that system, and fulfill that responsibility by studying and teaching all parts of the standards so as not to cause instructional gaps. It is important that grade-level/department teams spend collaborative time studying the standards to ensure horizontal and vertical alignment. In addition, studying the standards can be used as a structure that supports differentiation and as a way to identify potential gaps in student learning. Teachers should think about how they can address gaps in student understanding while still teaching the necessary grade level content.
	  ○ Question 3: The standards focus teachers on specific content at each grade level and explicitly describe the components of rigor at each grade level. The vertical alignment discussion gives teachers an understanding of the coherence of the standards; that is that ideas build from grade to grade.
	• Say, "What happens if a teacher decides not to teach the standards?"
	• Go up to one of the charts hanging in the room and remove a standard strip from the chart. Popcorn some responses.
	• Say, "We all need to work hard to implement with fidelity for the good of our students."
	
	Words of Wisdom
	• The purpose of the vertical alignment process is to capture conversations and ideas. It is not about completing the chart.
	• Watch the time carefully. You will probably not have time for participants to revise their Big Idea posters – just allow for the discussion to take place.	

Math Module 2, Session 3 Overview
Session Title: Key Shifts in Action Through an EngageNY Lesson
Grade Band: 6–9

Session Overview *What are the overarching goals of this session? Why are those goals important?* *How do they connect to what's come before and what will come after?*
Participants experience an EngageNY lesson that directly ties to the ratio and rate standards studied in earlier sessions. After experiencing the lesson as students, participants reflect on their experience and discuss how the lesson directly supports the LSSM and the three key shifts in the standards. Participants unpack the structure of the EngageNY lesson connected to the mathematics learning experience, with a focus on the content standards and teacher moves that promoted student engagement in the key shifts. By analyzing the components of the EngageNY lesson and considering intentional instructional strategies that were used in the facilitation of the lesson, participants identify implications for their own planning. A major goal of this session is to build teacher proficiency in using the EngageNY lessons for planning and instruction to better meet the intent of the standards. More specifically, participants use their knowledge from Session 1 and 2 to tie this lesson to specific LSSM studied in the vertical alignment session of this module.

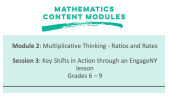
Session Key Points *What are the 2 to 4* most *important takeaways from this session?*	**Session Products** *What will participants produce during the session? Immediately following the session?*
Participants will know: • The EngageNY teacher materials provide information about standards, including focus standards, foundational standards, and standards for mathematical practice. • How the key shifts in the standards of focus, coherence, and rigor are evident in an EngageNY lesson and how the key shifts are supported by the content and practice standards.	**Participants will…** • Produce posters showing the relationship between two quantities and justifications of whether or not the quantities are in a proportional relationship.

Session Objectives *What will participants know, believe, and be able to do as a result of this session?*	**Session Agenda at a Glance** *What is the overall flow of this session?*
Participants will be able to: • Connect the EngageNY lesson to specific standards from previous sessions. (CK, CP, CS) • Use the EngageNY Module Teacher Materials and the teacher version of the lesson to make connections between the lesson and the LSSM content and practice standards. (CP, CS) • Provide evidence of focus, coherence, and rigor in a model lesson by leveraging the content and practice standards. (CP, CK) CK: Content Knowledge CP: Content Pedagogy CS: Curriculum Skills	• Review of content previously learned • Model lesson • Reflection

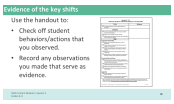
Facilitation Recommendations	
Session Length	90 minutes
Time of Year	First six weeks of the school year
Session Pairing Options	

Preparing to Facilitate *What materials and supplies are needed to facilitate this session?* *What must the facilitator do to prep for the actual session?*	
Session Materials: • Handout **M2_P-03** Vertical Alignment Chart: Using multiplicative thinking to reason about ratios and rates • Handout **M2_P-04** EngageNY Module 1 Teacher Materials • Handout **M2_P-05** Looking for Evidence of Student Engagement in the Key Shifts • Handout **M2_P-06** EngageNY Math7, M1, TA, L6 Student: Lesson 6: Identifying Proportional and Non-Proportional Relationships in Graphs • Handout **M2_P-07** Diamond Reflection: Unpacking the EngageNY lesson • Handout **M2_P-08** EngageNY Math7, M1, TA, L6 Teacher: Lesson 6: Identifying Proportional and Non-Proportional Relationships in Graphs • Envelopes containing ratio situation cards – 1 envelope per group. Use **M2_CL-05 EngageNY Ratio Cards** **Additional Supplies:** • Chart paper • Chart markers • Sticky notes Facilitator should bring the Big Idea posters created on slides 5 and 6 in Session 1. Participants will revisit these posters in Session 2.	**Facilitator Pre-Work and Prep** • Prepare to deliver the EngageNY Lesson—Grade 7, Module 1, Topic A, Lesson 6 • Copy the ratio situation cards from the EngageNY lesson, cut up, and place into envelopes. Use **M2_CL-05 EngageNY Ratio Cards: Ratios for Exploratory Challenge.** • **M2_CL-04** ENY Math7, M1, TA, L6 Teacher: Lesson 6: Identifying Proportional and Non-Proportional Relationships in Graphs

Participant Pre-Work *What should participants bring to this session? What should they do or prepare in advance of this session?*	
Participants must bring: • Writing utensil	**Before this session, participants should:** • Not applicable

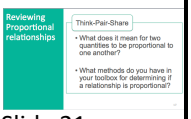
Time & Slide Thumbnail	Facilitator Notes Session 3	Materials
 Slide 17 Time Allotted: 1 minute	**Session 3: Key Shifts in Action through an EngageNY lesson** **Slides: 17–27: 90 minutes** ***Critical Idea*** • This slide is an introductory slide for Session 3. ***Step-By-Step Instructions*** • Say, "We will now transition into Session 3. As mentioned at the beginning of Module 2, this session is designed for the purpose of deepening your own mathematical knowledge for effective instruction. It is important to keep in mind that you may experience some ah-ha moments in this section that will not come as quickly and as easily to your students so it is important to abide by the pacing of the EngageNY curriculum designed lead students to the same ah-ha moment over the course of multiple lessons, not a single lesson." ***Words of Wisdom*** • Direct participants to sit in mixed-grade level groups of no more than four. • Reiterate throughout the session that it is important for participants to abide by the pacing of the EngageNY curriculum which is designed to be more developmentally appropriate for the students.	
 Slide 18 Time Allotted: 5 minutes	***Critical Idea*** • The EngageNY module overview document contains important information to orient teachers to the flow of lessons across the module. It also gives teachers focus standards, foundational standards from prior grades, and links to standard for mathematical practice. ***Step-By-Step Instructions*** • Pass out the handout **M2_P-04 EngageNY Module 1 Teacher Materials** (note: this handout is just the first 5 pages of the Module 1 Teacher Materials document. There is more to this document than what is provided for the participants). • Say, "Each module in EngageNY has a Module Teacher Material document that provides you with important information as you prepare to teach a module. Take a minute to glance through the handout and see the components of the Module 1 Teacher Materials document, which are listed on this slide. There are more components to EngageNY Module 1 than what is listed here, and some of these other components are specific to Module 1 only." • Say, "Today's lesson is the culmination of five lessons about proportional relationships in Topic A of this module in grade 7. Read the Module Overview to help you situate the lesson you will experience in the flow of the entire module." • After participants read the Overview, have them look at the focus content standards and the foundational content standards in Module 1 of EngageNY (pages 3–5 of the Teacher Material document). After the lesson, they will refer back to this to come to consensus on which standard the model lesson addresses. • It is important to note that in some cases, the focus standards and foundational standards given in the EngageNY materials differ from the standards references in the Eureka guides. In this lesson, that is not the case; however, participants should be aware that this might be true in a future lesson. In future modules, participants will look at the Louisiana Eureka guides in more detail. • Point out the connection to the work participants have been doing in Module 1 and earlier in this module. Notice that the overview helps them focus on key content standards. It also gives participants a look at foundational standards from prior grades.	**M2_P-04 EngageNY Module 1 Teacher Materials**

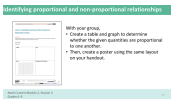
Time & Slide Thumbnail	Facilitator Notes Session 3	Materials
	• Point out that some of these standards are on the vertical alignment study they did in Session 2. ***Words of Wisdom*** • Stay focused on the connection to standards in the Module Overview. Encourage participants to explore the rest of the Module Overview on their own time.	


Slide 19
Time Allotted:
2 minutes
	Critical Idea
	• The key shifts are what make the LSSM different from previous standards. These key shifts should guide decisions about teaching and learning.
	
	Step-By-Step Instructions
	• Ask participants to locate handout **M2_P-05 Looking for Evidence of Student Engagement in the Key Shifts**.
	• Ask them to read the directions on the slide.
	• Then orient participants to the handout.
	• Say,
	  ○ "Before you experience a mathematics lesson from EngageNY, we want to remind you of the tool used in Module 1 to observe how the key shifts come to life in the classroom."
	  ○ "The left-hand column contains descriptors of the key shifts. Next to each descriptor is a box that can be used to check off any of the student actions that you observe in the lesson."
	  ○ "The right-hand column should be used to document observations of any specific actions that can be used as evidence for the descriptors that have been checked off in the left-hand column."
	• Give participants time to look over the information on the handout and ask questions if they need further clarification.
	• Say, "As you experience today's lesson, please use this tool to capture your observations and experiences. We will discuss your takeaways after the lesson."
	• Ask participants if they have any questions. Transition to the next slide.
	
	Words of Wisdom
	• This should be kept brief.
		M2_P-05 Looking for Evidence of Student Engagement in the Key Shifts

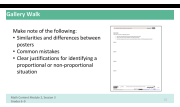
Slide 20
Time allotted:
1 minute
	Critical Idea
	• Participants take on the student perspective to experience an EngageNY lesson related to the big idea studied in Session 1.
	
	Step-By-Step Instructions
	• Review the learning expectations for the day listed on the slide.
	  ○ Examine situations carefully to decide whether two quantities are proportional to one another.
	  ○ Compare and contrast proportional and non-proportional relationships.
	  ○ Use examples and counterexamples to communicate thinking using appropriate vocabulary, symbols, and/or units.
	
	Words of Wisdom
	• Participants may want to discuss the lesson or talk about changes they would like to make. Do not allow that to happen during the lesson; make sure to stay in your role as the "teacher" and encourage the teachers to stay in their role as the "students."	

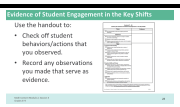
Time & Slide Thumbnail	Facilitator Notes Session 3	Materials


Slide 21
Time Allotted:
6 minutes
	Critical Idea
	• The purpose of the think-pair-share is to get teachers thinking about what they already know about proportional relationships and then transitioning to the role of "student."
	
	Step-By-Step Instructions
	• Say,
	  ○ "In this session, you will be experiencing an EngageNY lesson that directly ties to the standards you have been exploring in the vertical alignment from Sessions 1 and 2."
	  ○ "This session is about experiencing the lesson as a student, and you will have a chance to unpack the teacher materials and make connections to the standards later."
	  ○ "The lesson for today comes from a 7th-grade lesson on proportionality."
	  ○ "In this session, I as the facilitator will be the 'teacher,' and you as participants will be the 'students.'"
	  ○ "You may want to discuss the lesson or talk about changes you would like to make. You will have time to discuss the lesson afterwards. For now, please stay in your role of 'student.'"
	  ○ "We are going to do a think-pair-share about what you already know concerning proportional relationships. Think individually and quietly for a minute or two about the two questions on the slide."
	  ▪ What does it mean for two quantities to be proportional to one another?
	  ▪ What methods do you have in your toolbox for determining if a relationship is proportional?
	• Use a timer to give 1 to 2 minutes of quiet think time and ask participants to jot down their responses on a sticky note.
	• After participants have had a chance to respond, ask them to get up and find a partner not at their table. Give participants 2 minutes to discuss the prompts with their partners. Set a timer for this discussion.
	• As pairs are talking, walk around and listen for responses. If you hear a response that you'd like to highlight for the whole class, give the pair(s) warning that you will be asking them to share their response (to either the first or second prompt).
	• After 2 minutes of discussion, have participants return to their seats and ask those pairs that you identified earlier to share their responses.
	
	Words of Wisdom
	• Don't linger too long on these discussions. Keep the review short and sweet and moving along.
	• When possible, use a timer during different sections of the lesson to model for participants how a timer can be used to keep a lesson moving along.	

 Slide 22 Time Allotted: 25 minutes	***Critical Idea*** • Participants experience an EngageNY lesson related to the big idea studied in Sessions 1 and 2. ***Step-By-Step Instructions*** • Say, "Today's lesson will bring together all of your work with proportional relationships up to this point." • Pass out the student version of the EngageNY lesson. This is handout **M2_ P-06 EngageNY Math7, M1, TA, L6 Student.** • Teach the EngageNY lesson to the participants, as students, using the Teacher Version of the lesson, **M2_CL-04 ENY Math7, M1, TA, L6 Teacher.**	**M2_CL-04 ENY Math7, M1, TA, L6 Teacher** **M2_CL-05 EngageNY Ratio Cards: Ratios for Exploratory Challenge (**cut up cards and placed into

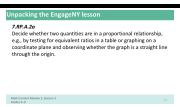
Time & Slide Thumbnail	Facilitator Notes Session 3	Materials
	Words of Wisdom • Be sure the participants remain in the 'student' role during the duration of the lesson. • When possible, use a timer during different sections of the lesson to model for participants how a timer can be used to keep a lesson moving along.	bags – 1 per group) **M2_P-06 EngageNY Math7, M1, TA, L6 Student**


Slide 23
Time Allotted: 20 minutes
	Critical Idea
	• Participants experience an EngageNY lesson related to the big idea studied in Sessions 1 and 2.
	
	Step-By-Step Instructions
	• Once all groups have hung their posters on the wall, direct participants to locate handout **M2_P-06 EngageNY Math7, M1, TA, L6 Student.**
	• Direct participants to complete a gallery walk using page 2 and 3 of handout **M2_P-06 EngageNY Math7, M1, TA, L6 Student.** Say,
	  ○ "You will have 8 minutes to complete a gallery walk. As you examine each poster, make notes on page 2 and 3 of your handout. You should specifically look for similarities and differences between each poster, common mistakes, and posters that include clear justifications for identifying whether the situation represents a proportional or non-proportional relationship."
	• After participants complete the gallery walk, debrief the lesson with a whole-group discussion. Ask several participants to share observations from the gallery walk. Possible responses may include:
	  ○ Each group had a matching poster including: Group 1 and 8, Group 2 and 7, Group 3 and 6, and Group 4 and 5.
	  ○ Posters that identified proportional relationships included a point at the origin.
	  ○ Posters that identified non-proportional relationships included quantities that did not have the same unit rate.
	  ○ Although group 1 and 8 was increasing at a constant rate, it is not a proportional relationship since it did not include a point at the origin.
	  ○ The graphs provide a representation of each situation. The points can be connected to represent the relationship between quantities for that scenario.
	• Summarize the lesson. Say, "One way to determine if a relationship is proportional is by analyzing the table or graph of a given situation. If the plotted points form a line that passes through the origin, we can conclude the relationship is proportional."
	• Close the lesson. Say, "If this were a middle school class, students would complete an exit ticket to find out what they have learned about identifying proportional relationships. Because of the nature of the session, we will now close the activity."
	
	Words of Wisdom
	• Be sure the participants remain in the 'student' role during the duration of the lesson.
	• When possible, use a timer during different sections of the lesson to model for participants how a timer can be used to keep a lesson moving along.	

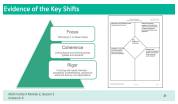
 Slide 24 Time Allotted: 7 minutes	***Critical Idea*** • Intentional teacher moves support focus, coherence, and rigor around the mathematics content. ***Step-By-Step Instructions***	**M2_P-05 Looking for Evidence of Student Engagement in the Key Shifts**

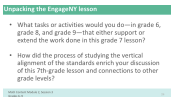
Time & Slide Thumbnail	Facilitator Notes Session 3	Materials

	• Say, "It is essential that we take a deliberate pause in our work to reflect on this experience. During the lesson, you were asked to use handout **M2_P-05 Looking for Evidence of Student Engagement in the Key Shifts** to check off student behaviors/actions observed in the lesson. Please take 3 minutes of independent think time to record specific evidence of the descriptors in the right-hand column of the page."
	• Once participants are done, say,
	• "Please look over the evidence you just recorded on handout **M2_P-05** and share your observations with a partner."
	• Direct the participants to find someone in the room they have not worked with in this session and share their responses.
	• After all pairs have the opportunity to share, call on 2 or 3 participants to summarize their discussions. If it has not surfaced yet, reiterate the following points:
	  ○ Each of the components of rigor is equally important to student mastery.
	  ○ Rigorous teaching in mathematics does not simply mean increasing the difficulty or complexity of practice problems.
	  ○ Incorporating rigor into classroom instruction and learning means exploring at a greater depth the standards and the ideas with which students are grappling.
	  ○ For instruction to be rigorous, teachers must have a clear understanding of the components of rigor and make connections to these components in the Tier 1 resources.
	  ○ The element of rigor assigned to each standard is intended to help teachers understand how to facilitate the learning. For example, if the standard explicitly calls for conceptual understanding, then the focus of the instruction will be on building student understanding of how the math works with visual models. For example, if the standard explicitly calls for procedural skills and fluency, then the instruction may continue to make use of those visual models but should be pushing for students to transition into more efficient strategies.
	• Summarize the learning experience. Say,
	  ○ "Now that you have experienced an EngageNY lesson from start to finish and made connections between the student learning experience and the key shifts of the LSSM, we will unpack the structure of the EngageNY lesson and discuss implications for planning and instruction. "
	
	Words of Wisdom
	• Participants need time to think about, reflect on, and share their observations of what they observed in the lesson.	


Slide 25
Time Allotted:
1 minute
	Critical Idea
	• A strong understanding of the LSSM is critical for teachers to implement the Tier 1 resources with fidelity and integrity. Teachers must be able to use the language of the standards to guide high-quality, standards-aligned teaching and learning.
	
	Step-By-Step Instructions
	• **<u>Animate the slide.</u>** Display the content standard addressed by this lesson.
	• Say,
	  ○ "When planning with any resource, it is important that we consider how the lesson, task, or activity aligns with the standards."
	  ○ "Only when we truly understand how the standards manifest in the lesson can we ensure that our instruction will align with the full intent of the standards."
	  ○ "On the slide, you will find the standard this lesson was intended to address."
	  ○ Give participants 1 minute to read the standard on the slide. Say,	

Time & Slide Thumbnail	Facilitator Notes Session 3	Materials
	▪ "It is important to use the language of the standards to guide high-quality teaching and learning. Notice that the standard on the slide specifically indicates that students should decide whether two quantities are in a proportional relationship by testing for equivalent ratios in a table or graphing on a coordinate plane." ▪ "Although students have been exposed to many strategies for working with proportional relationships, it is important to also make note of what is not stated. The standard does not state for students to decide whether two quantities are in a proportional relationship by using a proportion or through cross multiplication." ***Words of Wisdom*** • Keep this slide brief. Participants will have the opportunity to look at how the standards manifest as they debrief the lesson further.	


 	
Slide 26
Time Allotted:
15 minutes
	Critical Idea
	• Rigorous mathematics teaching and learning is achieved when teachers intentionally integrate the standards for mathematical practice with the standards for mathematical content. This requires that teachers have deep knowledge of the standards so that they can make good use of their instructional resources.
	
	Step-By-Step Instructions
	• **<u>Animate the slide</u>**. Pass out **M2_P-07 Diamond Reflection: Unpacking the EngageNY lesson** and **M2_P-08 EngageNY Math7, M1, TA, L6 Teacher** handout.
	• Participants will jigsaw these reflection questions at their table. They can use the teacher version of the lesson when thinking about the reflection questions.
	• Have participants at each table choose one of the 4 questions to reflect on, making sure that no questions are left out. They can use **M2_P-05_Looking for Evidence of Student Engagement in the Key Shifts** to help them reflect on these questions:
	  ○ FOCUS: How are the mathematics content standards evident in the lesson?
	  ○ RIGOR: How did students' engagement in the mathematics reinforce the components of rigor (conceptual understanding, procedural skill and fluency, and application)?
	  ○ COHERENCE: How does this lesson fit into students' larger understanding of proportional relationships?
	  ○ PLANNING: What instructional strategies and facilitator moves brought out the content and practice standards?
	• Give them 3 minutes to silently reflect on their question. They can look at other questions if they have time.
	• Give 4 to 5 minutes for them to share their responses with their table (~1 minute per person). They can use handout **M2_P-07 Diamond Reflection** to record their conversations.
	• Debrief this conversation by asking, "Do you see ways to strengthen the connection to the content and/or practice standards?"
	• Ask for a few groups to share out.
	• Transition to the next slide by saying, "Recall from our discussion in Module 1, not all lessons address every aspect of a standard. Often, we will find that a lesson covers only a piece of the standard. This is why it is important to consider not only the individual lesson, but also how that lesson fits into the full scope and sequence. Only then can we tell if a standard is covered to its full intent."
		M2_P-05 Looking for Evidence of the Key Shifts
		
		M2_P-07 Diamond Reflection: Unpacking the EngageNY lesson
		
		M2_P-08 EngageNY Math7, M1, TA, L6 Teacher

Time & Slide Thumbnail	Facilitator Notes Session 3	Materials
	Words of Wisdom • The standard addressed in the model lesson is *7.RP.A.2a*. • It is important to emphasize the last statement from both a teaching perspective AND learning perspective. The Tier 1 curriculum is built so that kids develop understanding of the content over several lessons and experiences. In many instances, it will take more than one lesson for students to reach intended learning goals.	
 Slide 27 Time Allotted: 7 minutes	***Critical Idea*** • This activity connects back to the vertical alignment discussion participants had in Sessions 1 and 2. ***Step-By-Step Instructions*** • Now ask participants to think back to their grade-level standards, using **M2_P-03 Vertical Alignment Chart.** • Ask them to consider—as a vertical group—the following question: ○ What tasks or activities would you do in grade 6, grade 8, and grade 9 that either supports or extends the work done in this grade 7 lesson? • To debrief, ask: "How did the process of studying the vertical alignment of the standards enrich your discussion of this 7th grade lesson and connections to other grade levels?" ***Words of Wisdom*** • Participants should see the value in studying the standards across multiple grade levels to enrich their understanding of their own instruction at their grade level.	**M2_P-03 Vertical Alignment Chart**

Math Module 2, Session 4 Overview
Session Title: Instructional Strategies to Improve Curriculum Implementation
Grade Band: 6–9

Session Overview *What are the overarching goals of this module? Why are those goals important?* *How do they connect to what's come before and what will come after?*
The overarching goal of Session 4 is for participants to gain understanding about the Standards for Mathematical Practice and explore the important features of Modeling with Mathematics (SMP 4). Participants apply this information to their instruction by determining strategic opportunities for students to model with mathematics, recognizing when EngageNY and other Tier 1 resources provide an appropriate context that could be solved using a modeling approach. Session four plays a critical role in Module 2 and future modules by providing participants with a deeper understanding of what modeling with mathematics is and addresses misconceptions about modeling with mathematics. Most importantly, participants use this knowledge to promote rigor in the classroom, leveraging student engagement in modeling with mathematics to develop conceptual understanding, procedural skill and fluency, and application skills with students.

Session Key Points *What are the 2 to 4* most *important takeaways from this session?*	**Session Products** *What will participants produce during the session? Immediately following the session?*
Participants will know: ● Modeling with mathematics is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, understand the situations better, and improve precision and processes for decision-making. ● The value of technology when making mathematical models and its role in exploring consequences, varying assumptions and comparing predictions with data. ● Appropriate problem-solving contexts within the EngageNY resources for students to model with mathematics. ● How to foster conceptual understanding, procedural skill and fluency, and application through student engagement in modeling with mathematics.	**During the session:** • Record initial thoughts on the meaning of the Standards for Mathematical Practice and will add notes as they deepen their understanding • Chalk talk - pre-assessment of modeling with mathematics knowledge

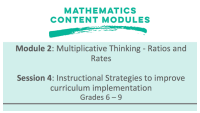
Session Objectives *What will participants know, believe, and be able to do as a result of this session?*	**Session Agenda at a Glance** *What is the overall flow of this session?*
Participants will be able to: ● Closely examine modeling with mathematics and recognize its critical role in the development of students' mathematical thinking. (CK, CP) ● Apply knowledge to planning and instruction by determining strategic opportunities for students to model with mathematics. (CK, CP) ● Promote rigor in the classroom through student engagement in Modeling with Mathematics. (CP) ● Recognize appropriate contexts within EngageNY and other Tier 1 resources for students to model with mathematics. (CS) CK: Content Knowledge CP: Content Pedagogy CS: Curriculum Skills	• Chalk talk - What is and is not modeling? • Explore the LSSM – compare/contrast SMP 4 for 6-8 and the modeling conceptual category in high school • Super Stairs 3-Act modeling lesson • Link to EngageNY Lessons from Session 1: Recognizing Modeling • Session 4 Reflection

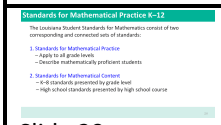
Facilitation Recommendations *At what time of year should this session be delivered? To what size audience? Should it ideally be done in conjunction with another session?*
Time of Year: This should be done within the first six weeks of the school year. This session is designed to be facilitated in 90 minutes. If you must break it into two sessions, it is suggested that you facilitate slides 1-5 in the first session (the bulk of the reading and analyzing), then facilitate the remaining slides in the second session (actively participating in a modeling lesson).

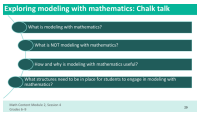
Materials	

Session Materials:
• **M2 P-10** LSSM_SMP 4: K-12 Louisiana Student Standards for Mathematics: Standards for Mathematical Practice: 4 Model with mathematics.
• **M2 P-11** High School Modeling Conceptual Category: Louisiana Student Standards: Companion Document for Teachers Algebra I: Modeling Standards
 	
Additional Supplies:
• Markers
• Chart paper
• Sticky notes in 3 different colors
• Projector
• Paper, pencils
• Optional: Document camera
	Facilitator Pre-work and Prep:
	• Create Blank Posters with the following questions at the top of each and hang the posters before the session:
	  ○ What is modeling with mathematics?
	  ○ What is not modeling with mathematics?
	  ○ How and why is modeling useful with mathematics?
	  ○ What structures need to be in place for students to engage in modeling with mathematics?
	• Print copies of participant handouts
	• Read through handouts **M2 CL-07** and **M2 P-10 and M2_P-11** to prepare for facilitation
	• Review Super Stairs Modeling task from slides 33-35
	• Download Super Stairs video link 1 and link 2 or ensure a computer with internet access is available for slides 33 and 35

Participant Pre-Work *What should participants bring to this session? What should they do or prepare in advance of this session?*	
Participants must bring: • Writing utensil • Handouts from Session 1: **M2 P-01** Ratio and Rate problem set	**Before this session, participants should:** • Not applicable

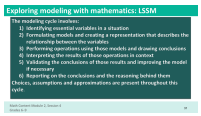
Time & Slide Thumbnail	Facilitator Notes Session 4	Materials
 Slide 28 Time Allotted: <1 minute	**Session 4: Instructional Strategies to Improve Curriculum Implementation** **Slides 28-39: 90 minutes** ***Critical Idea*** • This slide introduces Session 4. ***Step-By-Step Instructions*** • Say, "We will now begin Session 4." ***Words of Wisdom*** • Organize participants in new mixed-grade-level groups. This is important to get different perspectives in a conversation when participants compare SMP 4 Model with Mathematics and the high school conceptual category.	

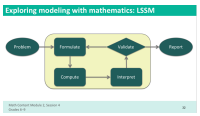

Slide 29
Time Allotted:
2 minutes
	Critical Idea
	• The Standards are comprised of two equally important sets of corresponding and connected standards - content and practice standards.
	
	Step-By-Step Instructions
	• Say,
	  ○ "The Louisiana Standards for Mathematics should be understood as **a set** of corresponding and connected standards."
	  ○ "The Standards for Mathematical Practice describe how the Content Standards for Mathematics should be approached."
	  ○ "The Standards for Mathematical Practice are about **student** actions—how students engage in the mathematics—and how they act as mathematicians in the classroom. The Standards for Mathematics Content, on the other hand, define what students should understand and be able to do."
	  ○ "Although the content standards change grade by grade, the Standards for Mathematical Practice are written the same for grades K–12."
	• **<u>Animate the slide.</u>**
	• Say, "This is a list of the 8 Standards for Mathematical Practice. You can find the full text of each of these practice standards in your LSSM standards document."
	
	Words of Wisdom
	  • Keep this slide simple and brief.	

 Slide 30 Time Allotted: 10 minutes	***Critical Idea*** • Develop an initial understanding of the purpose for modeling with mathematics in the classroom. • The LSSM for both middle school and high school identifies SMP 4 as modeling with mathematics. In addition, the high school standards identify modeling standards within each course (indicated with a star). ***Step-By-Step Instructions*** • Say, "In the last session, you experienced a model lesson. You saw how engaging in the mathematics can develop conceptual understanding and procedural skill and fluency. Now, we will take a closer look at one of the SMPs, SMP 4 Model with Mathematics." • Ensure all participants have a marker. Each person is expected to add responses to the questions during the chalk talk activity. • Say,	4 sheets of chart paper and markers for all participants. Facilitator will want to have **M2_CL-06 Modeling Chalk Talk–Possible Responses** available throughout this session

Time & Slide Thumbnail	Facilitator Notes Session 4	Materials
	○ "We will begin our study of SMP 4 with an activity called a Chalk Talk. The purpose of this activity is to share our current knowledge and perspectives on what modeling with mathematics is and what it looks like in the classroom." ○ "For this activity, you will have time to respond to each of the four questions listed on the posters hanging around the room. Each of the questions is related to modeling with mathematics. This is a silent activity. No one may talk at all. Anyone may add to the chalk talk as they please. You can comment on other people's ideas simply by drawing a connecting line to the comment. Write as you feel moved." • Set the timer for 6 minutes. Direct participants to move independently around the room from poster to poster. Participants should write their individual thoughts in response to each question on the posters. • Circle or highlight some of the interesting ideas shared and invite comments to broaden the discussion, or pose questions about a participant's comment. (**NOTE:** The ideas listed on handout **M2_CL-06 Modeling Chalk Talk—Possible Responses** may not surface in this initial conversation. It is not necessary for these ideas to surface now. When you return to these posters after the reflection piece at the end of this session, share some of these ideas with participants if they have not yet been highlighted in conversation). ***Words of Wisdom*** • It might be tempting to connect modeling with the application component of rigor. It's not necessarily true that these two are synonymous, although they are related. In this session, we will dig into the connections between the two and clarify the differences.	
 Slide 31 Time Allotted: 15 minutes	***Critical Idea*** • Develop an initial understanding of the purpose for modeling with mathematics in the classroom. To grasp the full meaning and intent of SMP 4, multiple conversations and collaborative study are needed. ***Step-By-Step Instructions*** • Say, "We will further explore the four ("Chalk Talk") questions and come to a shared understanding of how modeling with mathematics manifests with both students and teachers in the classroom." • Direct middle school participants to find **M2_P-09 LSSM_SMP 4** and high school participants to find **M2_P-10 High School Modeling Conceptual Category.** • Say, ○ "Initially, you will only be reading the document that pertains to your grade band." ○ "As you read the document for your grade band, you should take notes and highlight important text in the document." ○ "Your goal is to come to a detailed understanding of modeling with mathematics for your grade band." • Give participants 3 to 5 minutes to read their grade band document and take notes. • After quiet reading and study time, direct participants to form groups of 2 to 4 so that each group consists of teachers who read the same document. • Say, ○ "In your groups, discuss what each member recorded as he/she studied. As you hear important pieces of the conversation, you should add to your own notes." • Indicate meeting areas for each of the middle school and high school groups. • Give participants 1 minute to get into groups and 5 minutes to have their discussion. • Circulate around the room looking for interesting beliefs to bring to the forefront in the	**M2_P-09 LSSM_SMP 4: K-12 Louisiana Student Standards for Mathematics**: Standards for Mathematical Practice: 4 Model with mathematics **M2_P-10 High School Modeling Conceptual Category:** Louisiana Student Standards: Companion Document for Teachers Algebra I: Modeling Standards

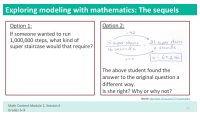
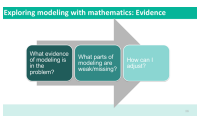
Time & Slide Thumbnail	Facilitator Notes Session 4	Materials
	whole group share out. • Reconfigure participants into new groups. This time, combine a middle school group with a high school group. Allow each grade band 2 minutes to summarize their reading first. • Once they have finished sharing their readings, focus the groups on finding similarities and differences between the 2 documents. (See below for sample responses) • After the mixed grade-level groups have finished their table discussion, debrief the conversation as a whole group. Ask 3-4 participants to share the similarities and differences between SMP 4 and the high school conceptual category. **Sample responses:** *6-8 SMP 4*: Students are able to: • Reflect on the reasonableness of results and whether it makes sense for the context. • Make initial assumptions about the problem situation based on prior knowledge, understanding that these assumptions may need revision later. • Identify important quantities and map relationships using multiple representations such as diagrams, tables, graphs, flowcharts and formulas. • Analyze relationships to draw conclusions. • Improve models to help with intended purpose. *High School Modeling*: • Modeling involves a different way of thinking about a problem and requires a cyclical process. • Modeling provides students with experience in approaching problems that do not necessarily have a single "correct" answer. • Modeling can have differing goals depending on the situation (quantitative prediction for weather; qualitative aspect to understand a system such as predator–prey populations). • Critical variables must be identified, including essential features of the situation. • Interpreted situation must be represented by diagrams, graphs, equations, or tables. • Moving from interpretation to the representation involves reasoning (algebraic, proportional, quantitative, geometric, or statistical). • Quantitative information must be analyzed or synthesized to make or evaluate assumptions based upon the original situation. ***Words of Wisdom*** • Be sure to revisit what modeling IS as well as what it is NOT to clarify that modeling with mathematics goes beyond showing different representations of a problem.	


Slide 32
Time Allotted
5 minutes
	Critical Idea
	• Although these six student actions are specifically called out in the high school standards, middle school teachers should be able to make connections to similar student actions with modeling with mathematics at the middle school level.
	
	Step-By-Step Instructions
	• Review the six actions students take over the course of a complete modeling task as stated in the high school LSSM and noted in the high school **conceptual** category handout, **M2_P-10 High School Modeling Conceptual Category**: Louisiana Student Standards: Companion Document for Teachers Algebra I: Modeling Standards
	• Highlight connections between these actions and those in middle school:
	  ○ Making assumptions that may need revisions
	  ○ Identifying important quantities	

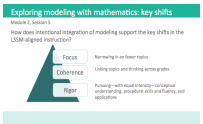
Time & Slide Thumbnail	Facilitator Notes Session 4	Materials
	○ Representing relationships (tables, graphs, formulas, flowcharts) ○ Analyzing relationships to draw conclusions ○ Improving models to help with intended purpose ***Words of Wisdom*** • This slide is a "tell" to help participants connect the different documents they have been studying and make connections between modeling in middle school and in high school.	
 Slide 33 Time Allotted 13 minutes	***Critical Idea*** • It is important for teachers to provide opportunities for students to engage in these six modeling actions and to implement tasks that require all six in conjunction. ***Step-By-Step Instructions*** • Say, "This diagram is the representation of the six actions that students take over the course of a complete modeling task from the standards." (Also located in **M2_P-10 High School Modeling Conceptual Category: Louisiana Student Standards: Companion Document for Teachers Algebra I: Modeling Standards)** • **Animate the slide**: A box will appear around the middle part. • Ask, "Why is this highlighted portion so important? ○ Answer should clarify this cyclical portion shows how often students will need to rework their initial hypothesis and try again based on what was learned the first time they engaged in the modeling cycle. • Direct participants to complete a think, pair, share with a partner. • Say, ○ "As a teacher, what is your role in each stage of this cycle?" • Give participants 2 minutes to use the diagram on handout **P-00 Module 2 presentation slides** to insert teacher moves, probing questions, etc. • After the 2 minutes, direct participants to turn to their elbow partner and share. Participants should continue to add to their notes as they discuss with their partner. • Finally, engage the group in a large discussion. Important points to surface: ○ Selecting a task (or developing one): consider whether the task requires students to make decisions about how to approach the problem mathematically. ○ Determine assumptions students might have. ○ Uncover common misconceptions or errors that might occur and monitor during the cycle. ○ Analyze what strategies could be used to intervene without taking over and use the strategies while the students work through the cycle. ○ Monitor work (take notes on strategies used, assumptions made and math opportunities). ○ Encourage analysis of their solutions to make sense of their solutions in context. ○ Summarize mathematical ideas that the students have. ***Words of Wisdom*** • More important than memorizing the steps in the cycle is for both teachers and students to understand the iterative nature of the modeling cycle. Just as in the real world, modeling real life situations is not cut and dried. There are many ways to solve problems, many stumbling blocks involved, and students must be supported to understand that stumbling blocks require time to reflect and revise their thinking.	**M2_P-00 Module 2 presentation slides** **M2_P-10 HS Modeling Conceptual Category**

Time & Slide Thumbnail	Facilitator Notes Session 4	Materials

Slide 34
Time Allotted: 25 minutes **<u>for slides 34-36</u>**
	Critical Idea
	• This part of the activity enables participants to engage in components of a modeling task as defined by the LSSM.
	
	Step-By-Step Instructions
	• Introduce the video to participants. Say,
	  ○ "Now that you have a deeper understanding of SMP 4 Modeling with Mathematics, and the high school conceptual category of modeling, you will experience a modeling activity. We are going to watch a video clip. Do not take notes—just observe what is happening in the video."
	• Play the video clip.
	• Ask, "Do you have any questions?" Select two or three participants to share out their questions.
	• Acknowledge the questions and then pose the following (if it hasn't been stated already): "How many steps will he run on the super stairs? How long will it take him to run them?"
	• Direct participants to get out a piece of blank paper**.**
	• Say, "I want you to make an educated guess on your paper in response to the question. Before you do, I will give you one more look at the video clip so you can begin to gather any information that may inform your prediction. You should not spend too much time making your prediction. I will ask for you to share your prediction at your table within 1 minute after I play the clip, so be prepared to share."
	• Play the video clip once more. Give participants 1 minute after to make their predictions and share it with their table. Then take a poll. Find the highest prediction in the room; find the lowest prediction in the room.
	• Next, ask participants, "What information is important here?"
	  ○ Note: The language is very important. Participants might use the words *steps* and *stairs* interchangeably. To minimize confusion, clarify that *stairs* are physical and concrete, while *steps* are actions the person took.
	• Write everything down that participants share out on a piece of chart paper.
	  ○ If participants ask how many stairs there are, ask them to write down and share a guess. Then, tell them that there are 21 stairs.
	  ○ For questions about speed, rate or times, tell participants to pull out a watch or a cellphone timer. Then play the "Act One" video for the group as many times as they need.
	  ○ Some participants will want to time the "turnarounds." Some will get different rates for going up the stairs and down the stairs. Some will time the regular stairs. Some will time the super stairs.
	• Feel free to tell them at some point, "We will all have different answers and we will all be wrong. That's the nature of modeling. We're making assumptions. The question is whose assumptions were best."
	  ○ If some participants are struggling with information to collect, encourage them to create a table and track "stairs" and "steps on that trip" and "total steps after those trips." Their goal will be to find a number rule that turns "stairs" into "total steps." (stairs)*(stairs+1).
	
	Words of Wisdom
	• This activity enables participants to experience the task from a learner perspective and begins to set the stage for incorporating modeling tasks in the classroom. In order for the participants to truly understand the roles of teachers and students, they must experience the activity from a learner perspective.
		Super Stairs Act 1 video can be found at: <u>https://youtu.be/1Hoqt1ttFck</u>
		
		Blank chart paper to record participant predictions
		
		Markers
		Blank paper
		
		Super Stairs citation: Dan Meyer. (2013 December and subsequent posts). Super Stairs, part of 101 Questions. Available at http://www.101qs.com/2714-super-stairs

Time & Slide Thumbnail	Facilitator Notes Session 4	Materials
	• Consider mentioning the Box and Draper quote, “All models are wrong, but some are useful” in discussion to show the real-world connection to the nature of modeling with mathematics.	
  Slide 35 Time Allotted: 25 minutes **for slides 34-36**	***Critical Idea*** • This part of the activity allows participants to engage in components of a modeling task as defined by the LSSM. ***Step-By-Step Instructions*** • Direct participants to revisit their guess. • Play the video clip. • Ask, “Were your predictions correct? Explain to your elbow partner why or why not.” • Elicit a few responses for the whole group to hear. • Ask, “Is there anything that you would’ve done differently? How would this have changed your guess? If you changed your process, would it have produced a more accurate prediction?” • Say, “Turn to your neighbor and discuss changes you’d make and how it would have affected the outcome – or if it would have at all.” • Ask a few participants to share before moving on. ***Words of Wisdom*** • This activity allows participants to experience the task from a learner perspective and begins to set the stage for incorporating modeling tasks in the classroom. In order for the participants to truly understand the roles of teachers and students, they must experience the activity from a learner perspective. **Super Stairs citation:** Dan Meyer. (2013 December and subsequent posts). Super Stairs, part of 101 Questions. Available at http://www.101qs.com/2714-super-stairs	Super Stairs Act 3: https://youtu.be/FOByTUT8g2w
 Slide 36 Time Allotted: 25 minutes **for slides 34-36**	***Critical Idea*** • This activity allows participants to extend their thinking and reasoning about a modeling task as defined by the LSSM. ***Step-By-Step Instructions*** • If time permits, allow participants to choose and solve one of the “sequel” options displayed on the screen. • If time is limited, explain to participants that the options are two examples of extension activities to the Super Stairs task. ***Words of Wisdom*** • Not applicable	
 Slide 37 Time Allotted:	***Critical Idea*** • By experiencing the modeling cycle in context, teachers can use the experience to inform critical decisions when planning with LSSM and EngageNY materials. ***Step-By-Step Instructions*** • Direct participants to locate the math tasks completed in Session 1: **M2_P-01 Ratio and Rate Problem set .**	**M2_P-01_Ratio and Rate problem set**

Time & Slide Thumbnail	Facilitator Notes Session 4	Materials
10 minutes	• Say, “These tasks were chosen from EngageNY because in each task modeling is specifically mentioned on the teacher page or in the standard itself. “ • Say, “With a partner from your grade-band who did the same task as you did, look at the 3 questions on the screen. Find specific evidence in the problem (if present) of using modeling, determine weaknesses in the cycle and determine appropriate adjustments to ensure students have opportunities to engage in the modeling cycle. “ • Give the participants 7 minutes to work together before transitioning to the next slide . ***Words of Wisdom*** • Not applicable	
  Slide 38 Time Allotted: 7 minutes	***Critical Idea*** • By experiencing the modeling cycle in context, teachers can use the experience to inform critical decisions when planning with LSSM and EngageNY materials. ***Step-By-Step Instructions*** • Give participants 2 minutes to gather their thoughts and form a statement using the sentence stem on the slide. • During the remaining 5 minutes, allow each table to read their completed sentence. • Use a document camera (if available) so others can see the evidence in the lesson. ***Words of Wisdom*** • Not applicable Credit: drogatnev / iStock / Thinkstock	If available, document camera to share teacher responses to the sentence stem.


 	
Slide 39
Time Allotted:
3 minutes
	Critical Idea
	• The key shifts are what makes this set of standards different from previous standards and should guide decisions about teaching and learning.
	
	Step-By-Step Instructions
	• To bring focus to the learning, ask participants to reflect on the key shifts (Focus, Coherence, and Rigor) and to cite evidence of the shifts that surfaced during the Modeling section.
	• Record their responses on separate Post-It notes to be placed on three separate sheets of chart paper:
	  ○ Focus
	  ○ Coherence
	  ○ Rigor
	• If time permits, ask participants to share with an elbow partner.
	
	Words of Wisdom
	• N/A
		Sticky notes
		Chart paper
		Markers

Math Module 2, Session 5 Overview
Session Title: The Role of a Productive Classroom Culture in the EngageNY Curriculum
Grade Band: 6–9

Overview *What are the overarching goals of this session? Why are those goals important?* *How do they connect to what's come before and what will come after?*
Session 5 seeks to explore the question, "How do we encourage students to value struggle, failure and perseverance in our classrooms?" The session is grounded by the Agile Mind article, *Persistence and effective effort,* to allow participants to reflect on their own experiences with struggle and connect these experiences to support students in productive ways. Participants reflect on the Super Stairs activity from Session 4 using the Agile Mind resource, *Thinking about Thinking Self-Reflection tool.* The reflection tool provides a strategy that students can use to examine their thinking and their work, and most importantly, provides teachers with a clear example of how students can direct effort in effective ways. Participants connect the research to the curriculum by examining an EngageNY lesson for their grade level and identifying places in the lesson that support students in persistence and effective effort. Additionally, participants will identify ways to increase opportunities for students to persist in the EngageNY lesson. Participants walk away from Session 5 with key ideas from research and clear action steps to foster persistence and effective effort in the classroom.

Session Key Points *What are the 2 to 4* most *important takeaways from this session?*	**Products/Deliverables** *What will participants produce during the session? Immediately following the session?*
Participants will know: • Adults play a significant role in helping students develop persistence and apply effective effort. • Incorporating strategies that promote students' persistence and effective effort can impact the overall culture of learning in classrooms. • Strategic opportunities for students to apply persistence and effective effort strategies in the EngageNY lessons. • Key ideas from research and action steps to foster persistence and effective effort in the classroom.	**Participants will:** • Complete a text protocol for the Agile Minds article, "Persistence and Effective Effort." • Complete the Agile Minds resource, *Thinking about Thinking: Self-Reflection tool.*

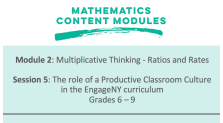
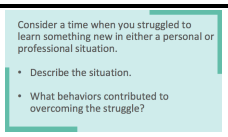
Session Objectives *What will participants know, believe, and be able to do as a result of this session?*	**Agenda at a Glance** *What is the overall flow of this session?*
Participants will be able to: • Promote students' persistence and effective effort in the classroom. (CP) • Identify appropriate places in the EngageNY curriculum for students to apply persistence and effective effort strategies. (CS).	• Personal reflection – When have you experienced struggle? • Text protocol with the article, *Persistence and effective effort.* • Reflect on Super Stairs activity using *Thinking about Thinking: Self-Reflection Tool* • Identify key findings from research and educator action steps • Examine EngageNY lesson to identify opportunities in the curriculum for students to apply persistence and effective effort strategies • Session reflection – What, So What, Now What? Module 2 closing slides: • Session evaluation survey

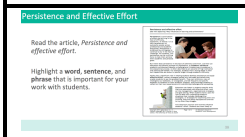
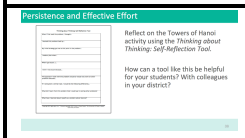
Facilitation Recommendations

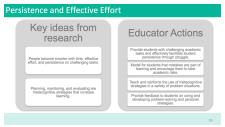
At what time of year should this session be delivered? To what size audience? Should it ideally be done in conjunction with another session?
Suggestion: This should be done within the first six weeks of the school year.

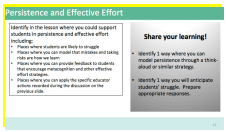
Preparing to Facilitate	
Session Materials: • Handout **M2_P-00 Module 2 presentation slides** • Handout **M2_P-11 Persistence and effective effort** • Handout **M2_P-12 Thinking about thinking: self-reflection tool** Bring from Session 3: • **M2_P-08** EngageNY Math7, M1, TA, L6 Teacher: Lesson 6: Identifying Proportional and Non-Proportional Relationships in Graphs **Additional Supplies:** • 1 index card per participant • Markers • Chart paper	**Facilitator Pre-work and Prep:** • Print participant handouts • Read the article **M2_P-11 Persistence and effective effort** • Review **M2_CL-07 Text Rendering Experience**

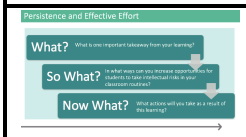
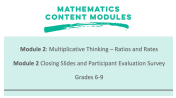
Participant Pre-Work	
Participants must bring: • Laptop or mobile device with internet access • Handout **M2_P-08 ENY Math7, M1, TA, L6 Teacher** from Session 3	**Participants:** • Not applicable

Time & Slide Thumbnail	Facilitator Notes Session 5	Materials
 Slide 40 Time Allotted: <1 minute	**Session 5: The Role of a Productive Classroom Culture** **Slides 40–46: 60 minutes** ***Critical Idea*** • This slide introduces Session 5. ***Step-By-Step Instructions*** • Say, "We will now begin Session 5." ***Words of Wisdom*** • For Session 5, the facilitator may want to organize participants in new mixed-grade-level groups to encourage conversation between different teachers.	
 Slide 41 Time Allotted: 7 minutes	***Critical Idea*** • The purpose of this activity is to surface each person's ability to overcome struggle successfully and acknowledge that challenging and worthwhile learning is meaningful. • A growth mindset is necessary for learners to have, but it is not sufficient. Students also need critical academic skills – their effort needs to be effective. ***Step-By-Step Instructions*** • Begin this section by connecting to Session 5 in Module 1 on growth mindsets. • Say, "Recall from Module 1 the discussion about growth mindsets. In that session, we highlighted the importance of praising students' effort rather than simply their products. A key takeaway from Module 1 is that a growth mindset is necessary for learners to have, but it is not sufficient. Students also need critical academic skills – their effort needs to be effective." • Direct participants to think of a situation when they struggled to learn something new in either a personal or professional situation. • Tell participants to individually answer the questions on the slide using **handout M2_P-00 Module 2 presentation slides**. Allow 1 minute of independent think time. • Set the timer for 5 minutes. Direct each person to share his/her example of overcoming struggle at the table. Circulate as participants talk, and listen for commonalities in the behaviors described. • Say, "Now, we will surface the common thoughts or behaviors you discussed and think about which might be important for successful change with students." • Highlight 2 to 3 common thoughts or behaviors heard from circulating around the room. • Connect the behaviors discussed at each table to the research about academic youth development. • Say, "Research emerging over the past decade tells us that students' attitudes, beliefs, and behaviors can dramatically affect their learning and their success in school. As educators, we strive to build the capabilities and desire of middle and high school students to **engage**, to **succeed**, and to **persist** in school. An important component of this work, and the focus of this session, is empowering you with research findings about how students learn and achieve, and with strategies to translate that research into daily practice." • Say,	**M2_P-00 Module 2 Presentation Slides**

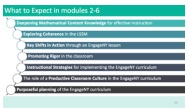
Time & Slide Thumbnail	Facilitator Notes Session 5	Materials
	○ "In this session, you will learn about key ideas that, when effectively and consistently applied, have the power to dramatically reshape outcomes of teaching, learning, and instructional systems." ○ "As you investigate these ideas, you will consider strategies that enable you to **apply** findings from research in the classroom and **enact** changes in the culture of your school systems." ***Words of Wisdom*** • Allow enough time for each person in the group to share.	
 Slide 42 Time Allotted: 15 minutes	***Critical Idea*** • Adults play a significant role in helping students develop persistence and apply **effective effort**—proven strategies paired with attitudes and beliefs that enable students to see the greatest benefit. • The growth mindset is not just about effort. Getting smarter is about effective effort that leads to learning. ***Step-By-Step Instructions*** • Direct participants to handout **M2_P-11_Persistence and effective effort.** Set a timer for 5 minutes. Direct participants to silently read the article and highlight a word, sentence, and phrase that is particularly important for their work with students. • Once participants are done reading, set the timer for 8 minutes. Direct participants to follow the **M2_CL-07 Text Rendering Experience** in groups of four. Groups should choose a reporter to be prepared to share one important piece of the discussion. When time is up, call on the reporter for each group to share. ***Words of Wisdom*** • If participants finish the reading text analysis before the 5 minutes has passed, encourage them to connect what they read to the previous discussion about their own experience with struggling to learn something. **Citation:** Used with permission of Agile Mind, Inc., the article "Persistence and effective effort," which appears in An Educator's Course in Academic Youth Development, by the Charles A. Dana Center and Agile Mind, Inc., available to users of Dana Center/Agile Mind programs in mathematics and science. To learn more about the Academic Youth Development family of programs, see http://www.agilemind.com/programs/academic-youth-development.	**Timer** **M2_CL-07 Text Rendering Experience** **M2_P-11_Persistence and effective effort**
 Slide 43 Time Allotted: 5 minutes	***Critical Idea*** • Metacognitive strategies provide students with ways to examine their thinking and their work and can help them direct effort in effective ways. ***Step-By-Step Instructions*** • Direct participants to handout **M2_P-12_Thinking about Thinking: Self-Reflection Tool.** • Say, "Proven strategies help redirect effort in productive ways and support future success. Use handout **M2_P-12_Thinking about Thinking: Self-Reflection Tool** to summarize your individual experience with the Super Stairs task in Session 4. Then discuss these questions with your colleagues:" ○ "How can a tool like this be helpful for your students?" ○ "How can a tool like this be helpful with colleagues in your district?"	**M2_P-12 Thinking about Thinking: Self-Reflection Tool**

Time & Slide Thumbnail	Facilitator Notes Session 5	Materials
	• It is important to clarify that it is not suggested to use all of the questions on the Thinking about thinking tool. • Say, ○ "The Self-Reflection Tool is used after challenging tasks. It is suggested that you select 2 or 3 questions for students to write about or discuss, or students can select a few questions to consider based on a particular problem-solving experience." ***Words of Wisdom*** • A self-reflection tool can help uncover insights into learning. **Citation:** Used with permission of Agile Mind, Inc., "Thinking About Thinking: Self-Reflection Tool," which appears in Summer-Start Academic Youth Development, School-Year Academic Youth Development, and An Educator's Course in Academic Youth Development, by the Charles A. Dana Center and Agile Mind, Inc., available to users of Dana Center/Agile Mind programs in mathematics and science. To learn more about the Academic Youth Development family of programs, see http://www.agilemind.com/programs/academic-youth-development.	
 Slide 44 Time Allotted: 8 minutes	***Critical Idea*** • Incorporating strategies that promote students' persistence and effective effort can change the overall culture of learning in classrooms. ***Step-By-Step Instructions*** • Say, "This slide reflects the ideas and strategies you have explored related to persistence and effective effort. As you and your colleagues work toward changing students' attitudes, beliefs, and behaviors, and the culture of learning in your classrooms, schools, and school systems, you will add your own practices to this list." • Give participants 3 minutes to discuss, share, and record their own practices. • **<u>Animate the slide</u>.** Ask participants to respond to the question on the slide. • If you were to adopt new strategies that promote students' persistence and effective effort, how might those actions change the overall culture of learning in your classrooms? Your schools? ***Words of Wisdom*** • It is important for participants to record their own practices before animating the educator actions on the slide.	


 	
Slide 45
Time Allotted:
20 minutes
	Critical Idea
	• Incorporating opportunities in the curriculum that promote students' persistence and effective effort can change the overall culture of learning in classrooms.
	
	Step-By-Step Instructions
	• Say, "Now we will connect the research to your EngageNY curriculum."
	• Direct participants to handout **M2_P-08 EngageNY Math7, M1, TA, L6 Teacher** from Session 3.
	• Say, "Revisit the EngageNY lesson and identify the places that support students in persistence and effective effort. As you look through the lesson, look for the following:"
	  ○ "Places where students are likely to struggle"
	  ○ "Places where they can model that mistakes and taking risks are how we learn"
		M2 P-08
		EngageNY Math7, M1, TA, L6 Teacher: Lesson 6: Identifying Proportional and Non-Proportional Relationships in Graphs (from Session 3)
		3

Time & Slide Thumbnail	Facilitator Notes Session 5	Materials
	○ "Places where they can provide feedback to students that encourage metacognition and other effective effort strategies." ○ "Places where they can apply the specific educator actions they recorded during the discussion on the previous slide." • **<u>Animate the slide.</u>** • Say, "In addition, be prepared to share your learning. Identify at least 2 ways to increase opportunities for students to persist in the lesson. More specifically, identify a place where you might model persistence through a think-aloud or similar strategy, and another way you might anticipate students' struggle and prepare appropriate responses." • Set the timer for 7 minutes. Circulate around the room while participants are analyzing the lesson. • Once time is up, direct participants to find a partner they have not worked with in this session. Participants should share the 2 ways they will support persistence and effective effort in the EngageNY lesson. ***Words of Wisdom*** • The last activity of the slide is very powerful. Participants are able to share strategies of how to use an EngageNY lesson to support growth mindsets and effective effort with students.	
 Slide 46 Time Allotted: 5 minutes	***Critical Idea*** • Reflecting on our learning is important to solidifying understanding and making progress toward accomplishing the goals of the initiative. ***Step-By-Step Instructions*** • Say, "This slide reflects the ideas you have explored related to persistence and effective effort. As you and your colleagues work toward changing students' attitudes, beliefs, and behaviors, and the culture of learning in your classrooms, schools, and school systems, you will add your own practices to this list." • **<u>Animate the slide</u>**. Ask participants to respond to the three questions. ***Words of Wisdom*** • It is important to acknowledge where faculty might struggle in providing opportunities for students to persist.	
 Slide 47 Time Allotted: < 1 minute	**Module 2 Closing and Participant Evaluation Survey** **Slides 47-50 Time Allotted: 15 minutes** ***Critical Idea*** • Slides 41–45 serve as closing slides for Module 2. ***Step-By-Step Instructions*** • Say, "We will now conclude Module 2." ***Words of Wisdom*** • N/A	Sticky notes Markers
 Slide 48	***Critical Idea*** • This slide provides references for Module 2. ***Step-By-Step Instructions*** • Say, "These are the references for Module 2."	

Time & Slide Thumbnail	Facilitator Notes Session 5	Materials
Time Allotted: 1 minute	***Words of Wisdom*** This slide should be brief.	


Slide 49
Time Allotted:
1 minutes
	Critical Idea
	• This slide provides participants with an overview of the content in Modules 3 through 6.
	
	Step-By-Step Instructions
	• Say, "Before we conclude Module2, we will remind you of the content and structure of modules 4–6. Just as in Module1, the learning sessions in future modules will include mathematics tasks and discussions designed to strengthen your understanding of the LSSM to support students' learning of mathematics content through the high-quality curriculum."
	• **Animate the slide one bullet at a time.** As each bullet animates, say,
	• "In each module, we will continue to:"
	  ○ "Analyze the major work of grades 6–9 to **Deepen Mathematical Content Knowledge** for effective instruction."
	  ○ "**Explore Coherence** between and within the grade-level standards in the LSSM."
	  ○ "See the **Key Shifts in Action** through an EngageNY lesson related to the major work of grades 6–9."
	  ○ "Study the Standards for Mathematical Practice to **Promote Rigor** in the classroom."
	  ○ "Identify the role of a **Productive Classroom Culture** in the EngageNY curriculum."
	  ○ "Apply knowledge of the LSSM to guide **Purposeful Planning** of the EngageNY curriculum."
	• Summarize the slide.
	• Say, "Please keep at the forefront of your mind that the work in which you are engaged is part of a bigger picture, and this second module serves as the foundation for learning in the remaining modules."
	• Thank the participants for their time and effort in Module 2.
	
	Words of Wisdom
	This slide should be brief and is about clarifying the learning expectations for Modules 3 through 6.	

 Slide 50 Time Alotted: 12 minutes	***Critical Idea*** • Participant feedback is highly valued and is critical in informing future learning sessions. ***Step-By-Step Instructions*** • Say, "In order to gather feedback of your learning experience, you will take a module evaluation survey. Your responses are very important, so you will use the next 10 minutes to complete the survey." ***Words of Wisdom*** Participants should complete the evaluation survey during the session.	http://www.utdanacenter.org/ldoe/surveys