Welcome!

- The webinar will begin at 9 am.
- Please use the chat if you need to communicate with the SED team regarding any technical issues.
- If your site has a question regarding the briefs, please use the Q&A feature.
- The SED team can be reached via email to P12StandardsInstruction@nysed.gov or by calling 518-474-5922.

An Overview of the NYSED Numeracy Briefs with Dr. Deborah Loewenberg-Ball

Tuesday, May 13, 2025

Outcomes

- Review Briefs Roadmap: Evidence-Based Practices for Teaching Mathematics
- Read and understand the eight numeracy briefs.
- Reflect on how the numeracy briefs relate to your current role in education.
- Commit to one leadership move you can make to enhance numeracy in your school, district, or BOCES.

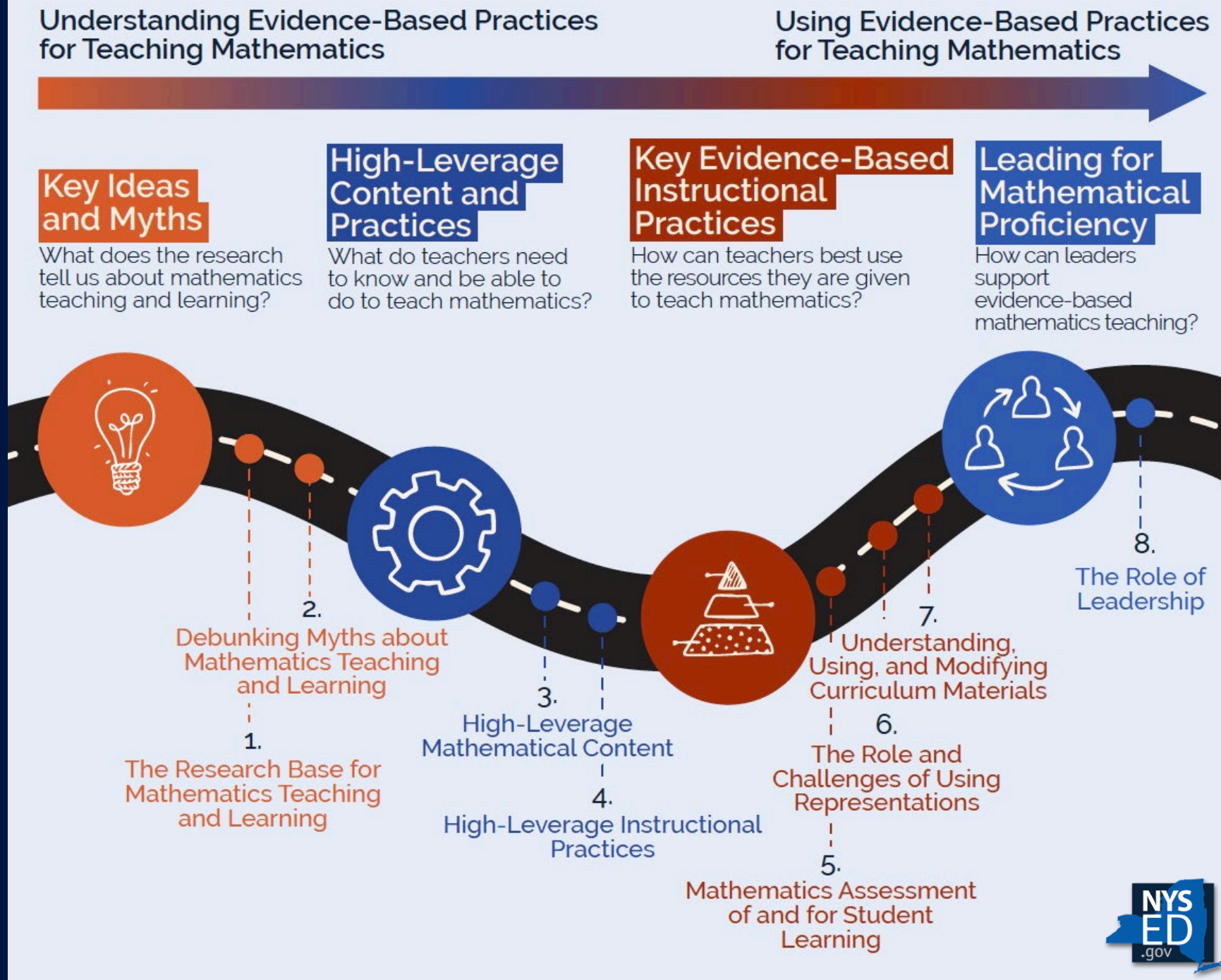
#MATHNY

Deborah Loewenberg Ball

Nicole Garcia

Overview of Briefs & Roadmap

Evidence-Based Practices for Teaching Mathematics



Research Base for and Debunking Myths about Mathematics Teaching and Learning

Overview of NYSED Numeracy Briefs 1 and 2

Brief 1:

The Research Base for Mathematics Teaching and Learning

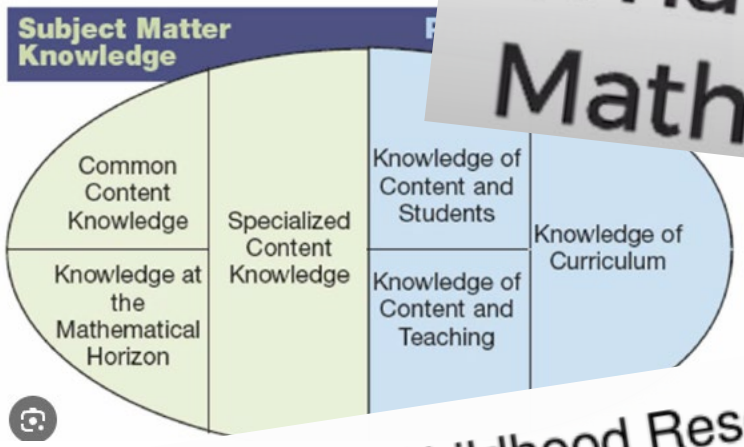
Supporting Evidence-Based P–12 Mathematics Teaching Practice

The Research Base

1. Skillful mathematics teaching makes use of instructional practices that develop all **strands of mathematical proficiency**.
2. Research-based **learning trajectories** provide teachers with information about students' progress toward fluency and conceptual understanding.
3. Research on mathematics teaching and learning highlights the importance of **culturally responsive and sustaining learning environments**.
4. Research on mathematics teaching and learning shows that **teachers' own relationship to and understanding of mathematics** is crucial for supporting positive student development.

Research by Ed School psychologist reinforces case for stressing multiple problem-solving paths over memorization

What Works Best in the Mathematics Classroom

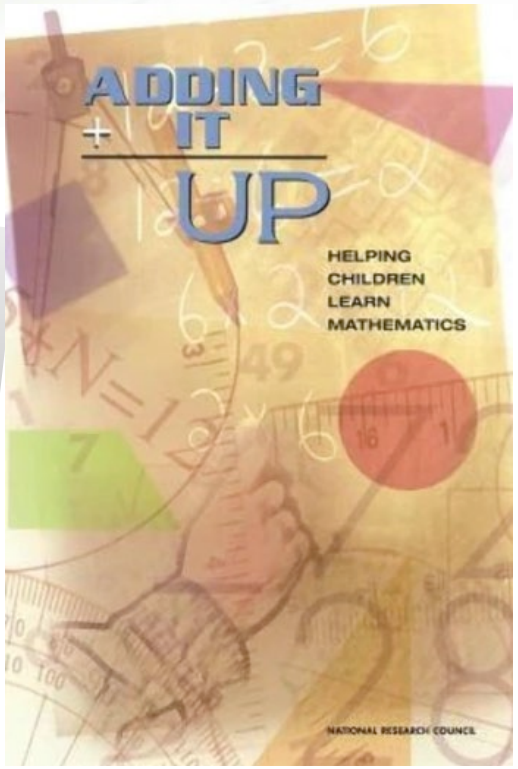


RESEARCH BRIEF

REL | WestEd

Opening a Gateway to College Access

Algebra at the Right Time



Journal of Early Childhood Research

http://ecr.sagepub.com/

The development of early numeracy skills in kindergarten in low-, average- and high-performance groups

ERIC

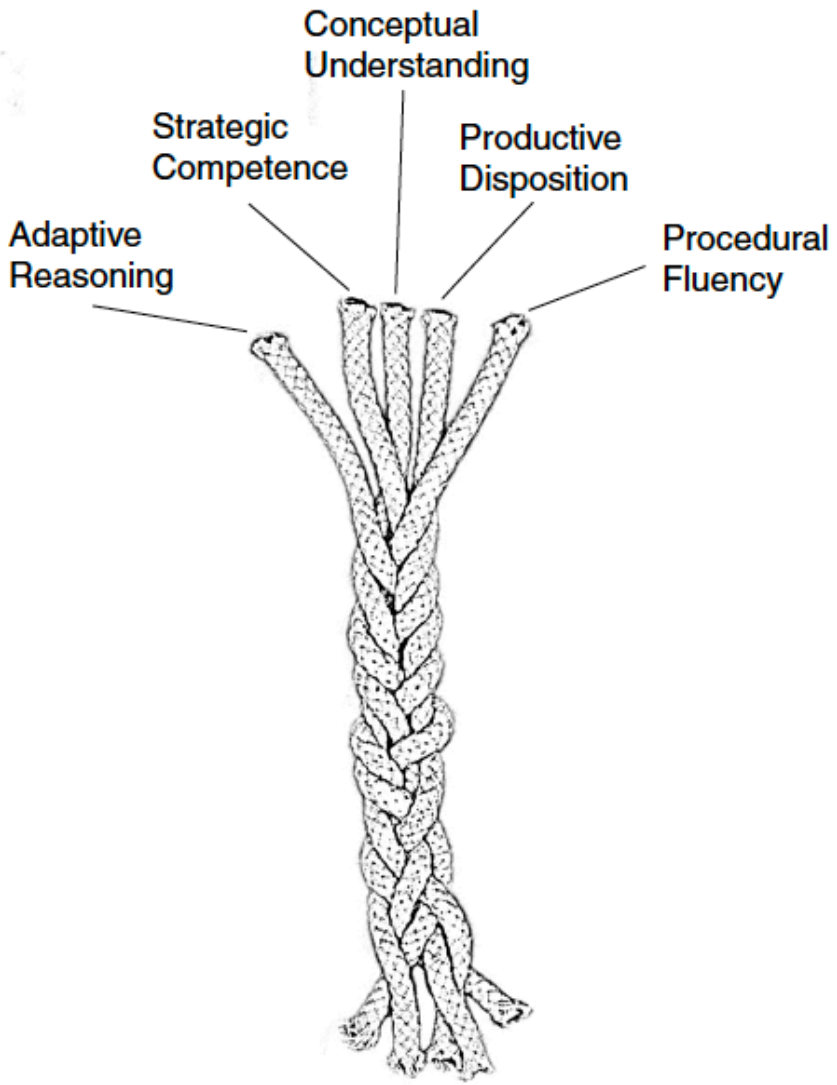
Collection | Thesaurus

Search education resources | Search | Advanced Search

Peer reviewed only | Full text available on ERIC

EDThoughts: What We Know about Mathematics Teaching and Learning.

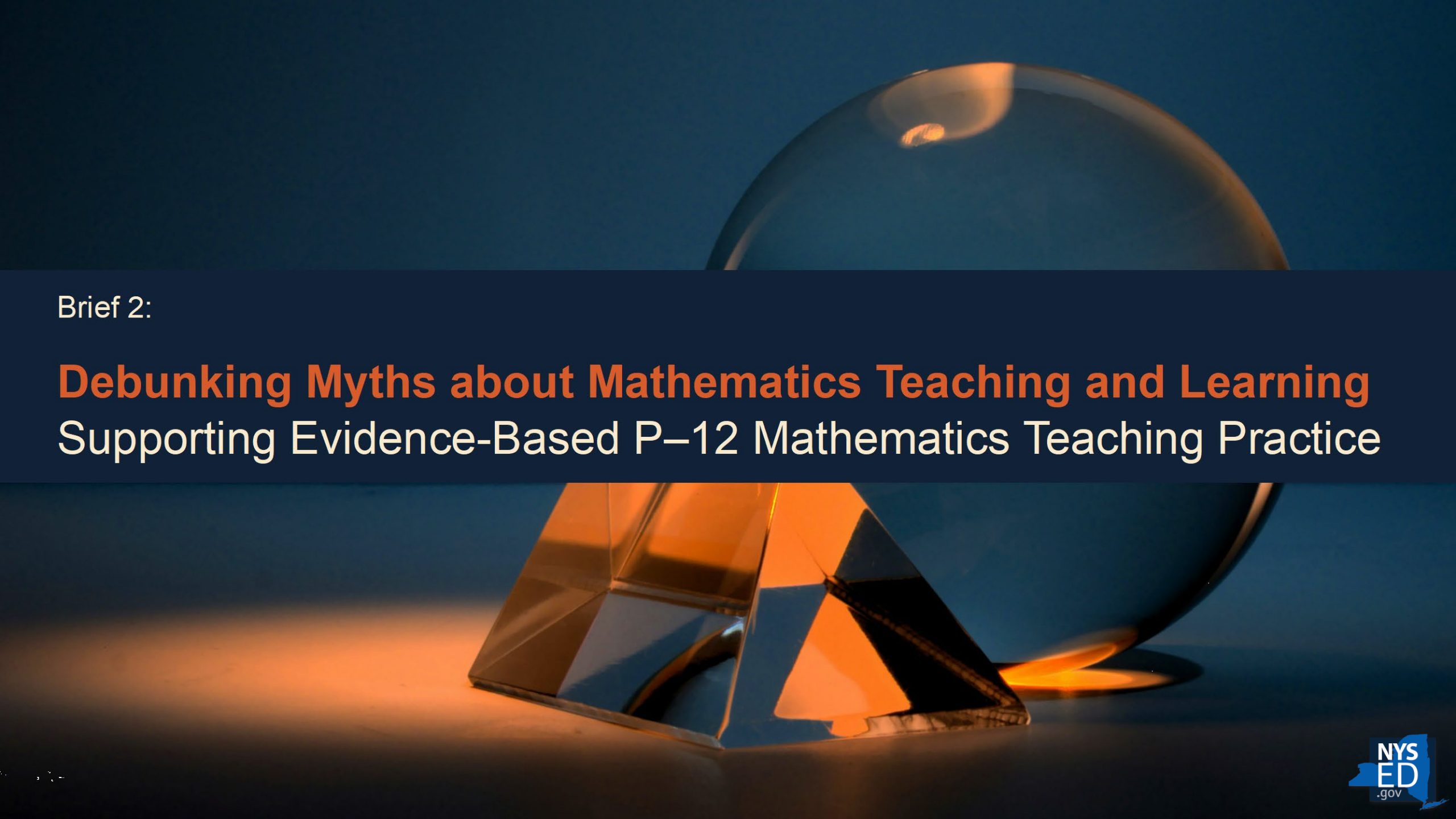
NYS ED .gov



From *Adding It Up: Helping Children Learn Mathematics*, by the National Research Council, 2001, p. 117.

The Strands of Mathematical Proficiency

- **Adaptive Reasoning:** Capacity for logical thought, reflection, explanation, and justification.
- **Strategic Competence:** Ability to formulate, represent, and solve mathematical problems.
- **Conceptual Understanding:** Comprehension of mathematical concepts, operations, and relations.
- **Productive Disposition:** Habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.
- **Procedural Fluency:** Skill in carrying out procedures flexibly, accurately, efficiently, and appropriately



Brief 2:

Debunking Myths about Mathematics Teaching and Learning

Supporting Evidence-Based P–12 Mathematics Teaching Practice

Myths

Myth #1: "Ability" grouping improves success.

Myth #2: Most students struggle in mathematics.

Myth #3: Mathematical competence means being efficient and accurate.

Myth #4: Developing competence requires isolated repetition and drills.

Myth #5: The most effective teaching method is providing step-by-step procedures for solving problems.

Myth #6: "Inquiry" approaches leave students to learn on their own instead of teaching them mathematics.

Myth #7: Success in calculus is the ultimate goal of school mathematics.

What is a Myth? The Importance of Nuance

Myth #1: "Ability" grouping improves success.

Myth #2: Most students struggle in mathematics.

Myth #3: Mathematical competence means being efficient and accurate.

Myth #4: Developing competence requires isolated repetition and drills.

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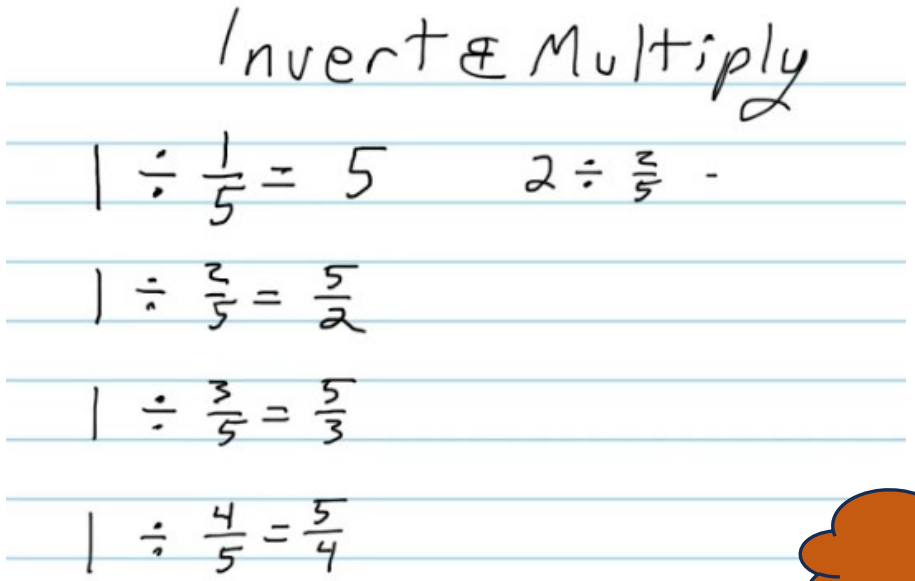
Myth #7: Success in calculus is the ultimate goal of school mathematics.



Write a story problem for $2 \div \frac{2}{5} = 5$.

Myths

Myth #1: "Ability" grouping improves success.

Myth #2: Most students struggle in mathematics.

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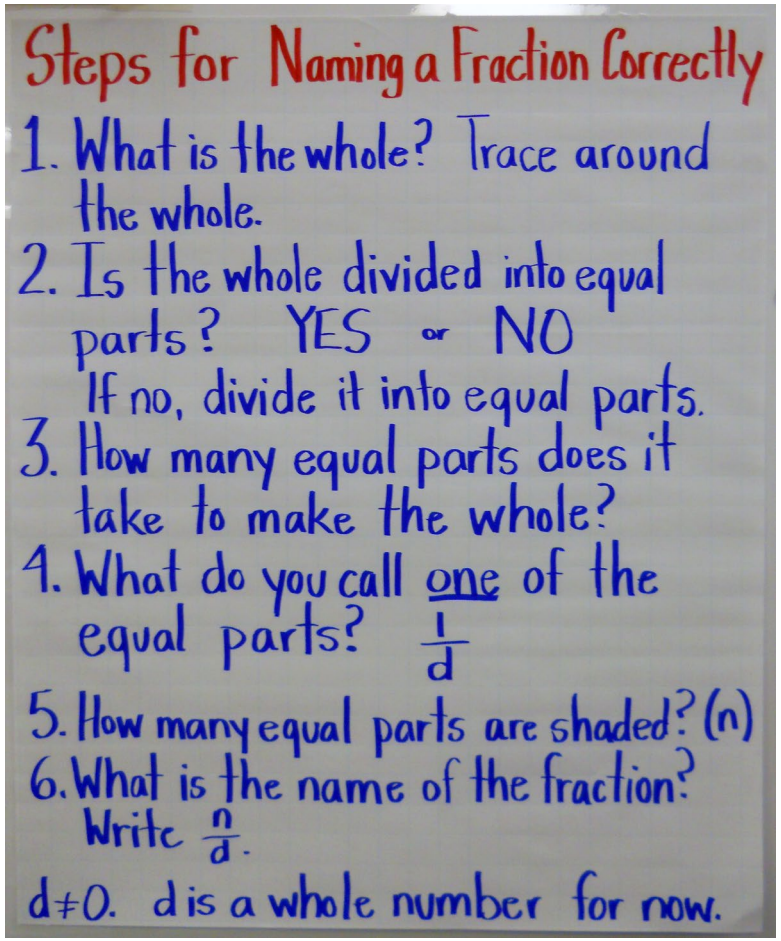
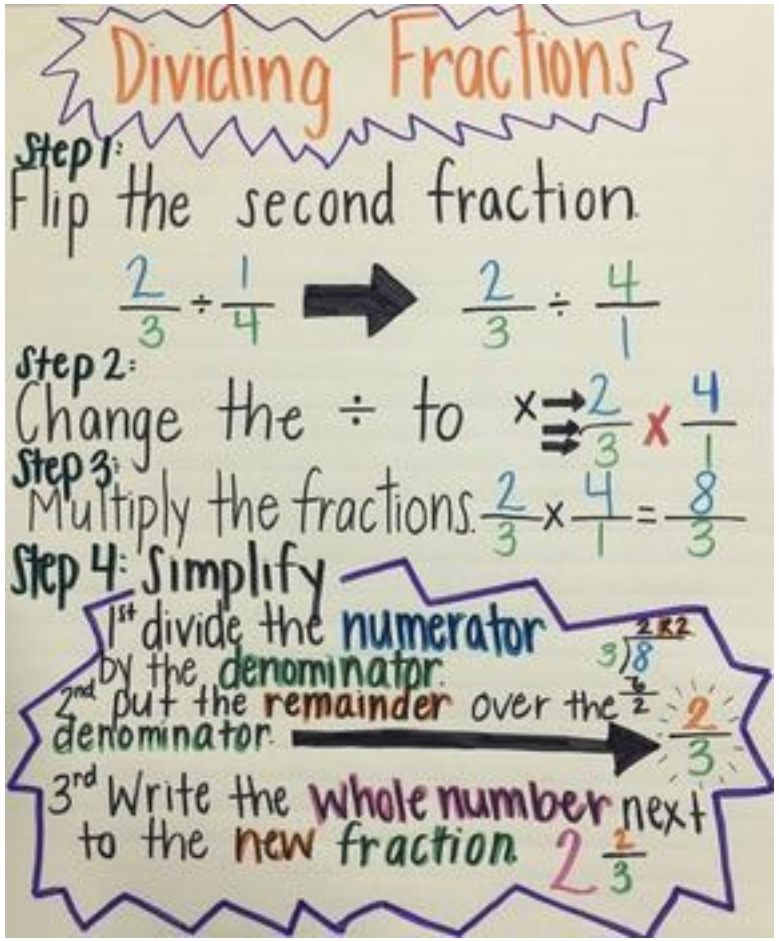
Myth #7: Success in calculus is the ultimate goal of school mathematics.

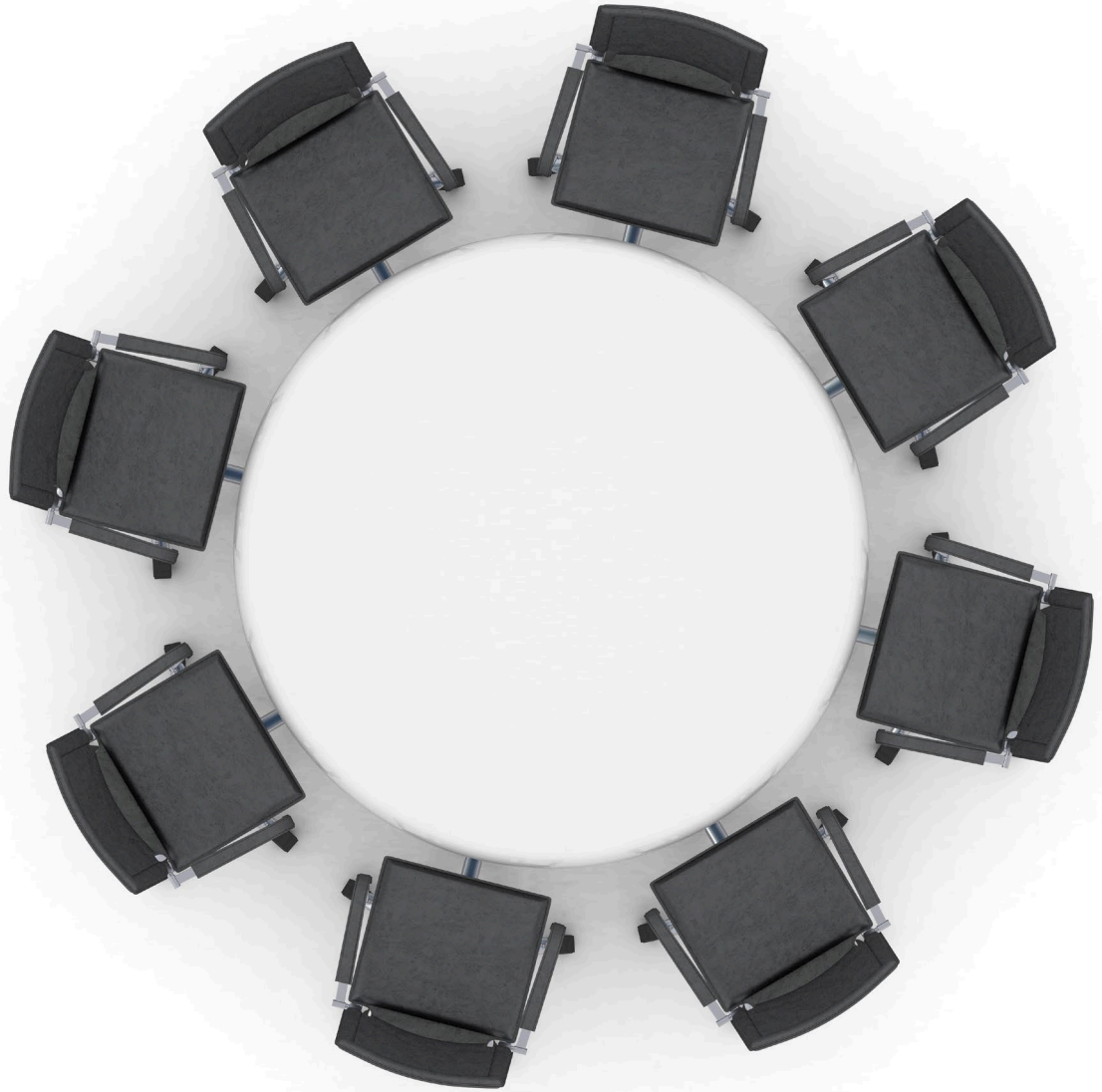
Step By Step Procedures or Inquiry?





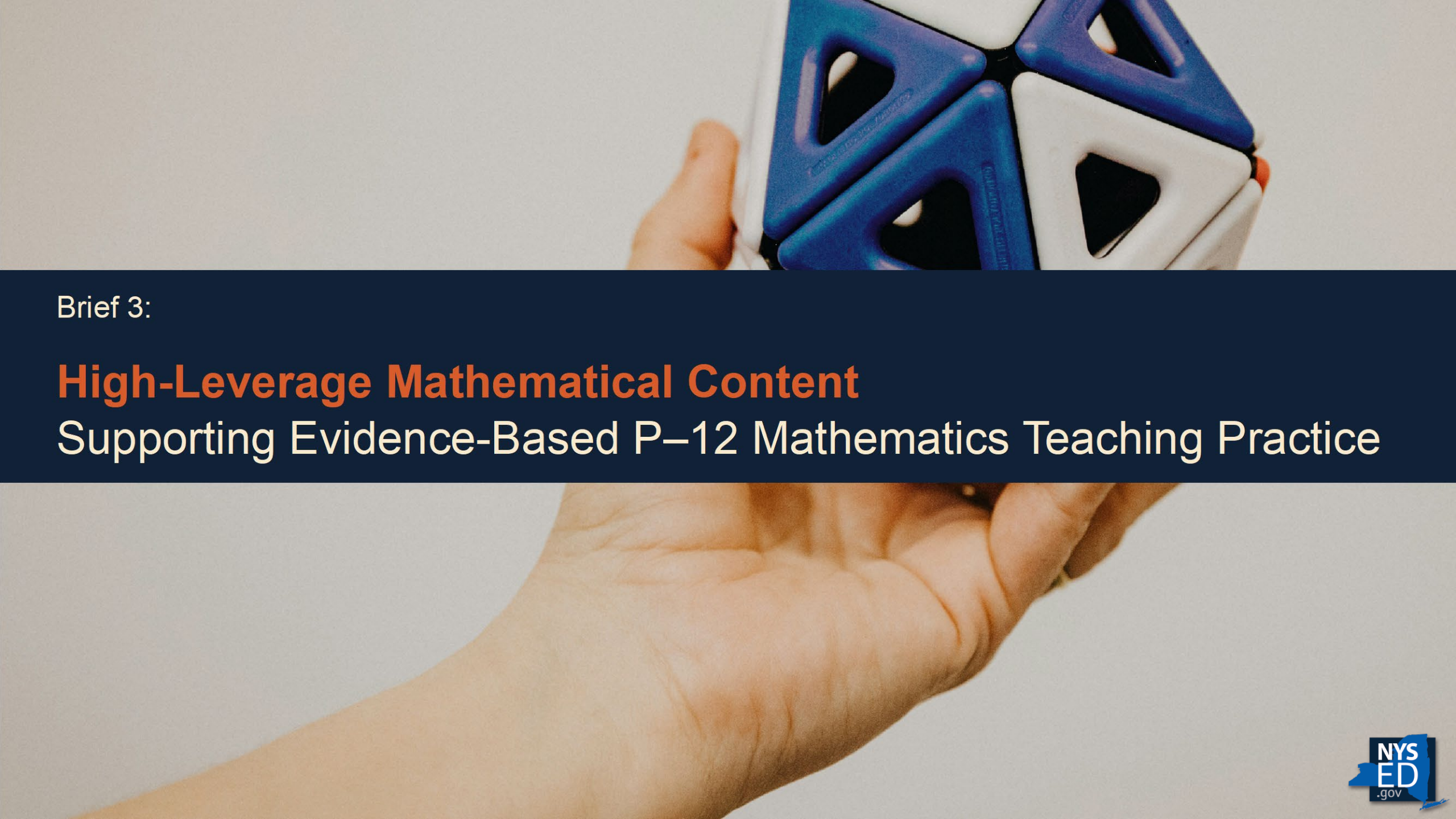
Local Discussion

Briefs 1 & 2



High-Leverage Mathematical Content and Instructional Practices

Overview of NYSED Numeracy Briefs 3 and 4



Brief 3:

High-Leverage Mathematical Content

Supporting Evidence-Based P–12 Mathematics Teaching Practice

What Makes Mathematical Content "High-Leverage?"

High-leverage mathematical content is:

- Inclusive of concepts, procedures, skills, language, and practices.
- Fundamental across the early grades and through high school.
- Foundational to mathematical reasoning and thinking.
- Crucial for accessing and mastering more advanced knowledge and skills in mathematics

The idea of high-leverage mathematical content is **centered on students**, and what they need to learn so that they can use the tools and practices of mathematics and see themselves as capable to do so.

Examples of High-Leverage Content

Base-ten system of place value and numeration

Number line

Fractions

Solving equations

Core practices from the New York State Next Generation Mathematics Learning Standards

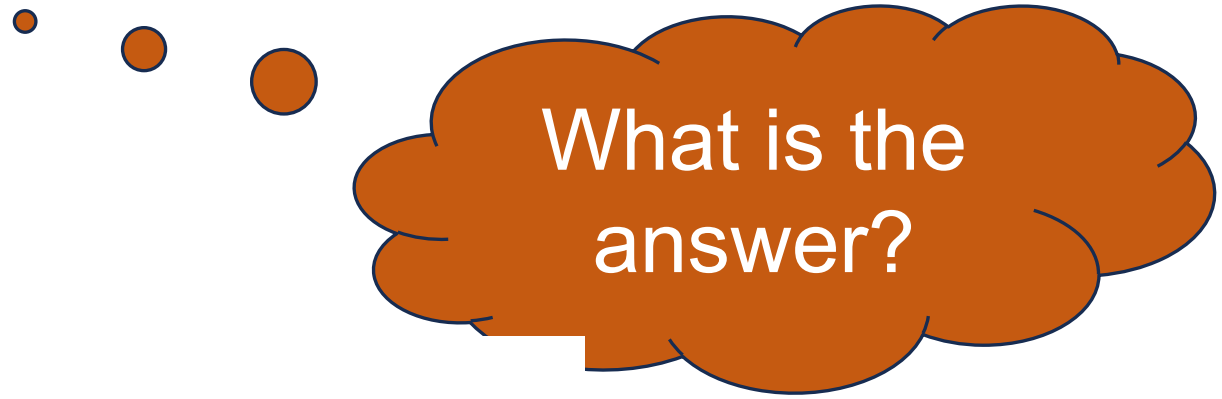
Mathematical Knowledge For Teaching (MKT)

Understanding the content that students are learning is **necessary but insufficient** for teachers.

Teachers need to:

- understand the content from students' perspectives;
- be aware of what might make a particular procedure or skill confusing; and
- be able to represent it in ways that make sense to students.

This is important for teaching all students but is particularly **important for advancing equity** in mathematics learning.



$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline \end{array}$$

Understanding the content that students are learning is **necessary but insufficient** for teaching.

What mathematical steps led to these answers?

(a)

$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline 405 \\ 108 \\ \hline 1485 \end{array}$$

(b)

$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline 225 \\ 100 \\ \hline 325 \end{array}$$

(c)

$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline 1250 \\ 25 \\ \hline 1275 \end{array}$$

Brief 4:

High-Leverage Instructional Practices

Supporting Evidence-Based P–12 Mathematics Teaching Practice

What Are "High-Leverage Instructional Practices?"

TeachingWorks High-Leverage Practices

SCAN ME

High-leverage instructional practices are:

- Essential to the work of teaching.
- Key to supporting students' learning and thriving.
- Grounded in research on teaching and learning mathematics.
- Crucial in promoting equity and inclusion in the classroom.

High-leverage instructional practices:

- Support students' mathematics learning and development.
- Help students learn important mathematical content and practices.
- Enable teachers to support students' social and emotional development.

Examples of High-Leverage Instructional Practices

Eliciting and interpreting individual students' thinking

Explaining and modeling content

Leading a group discussion

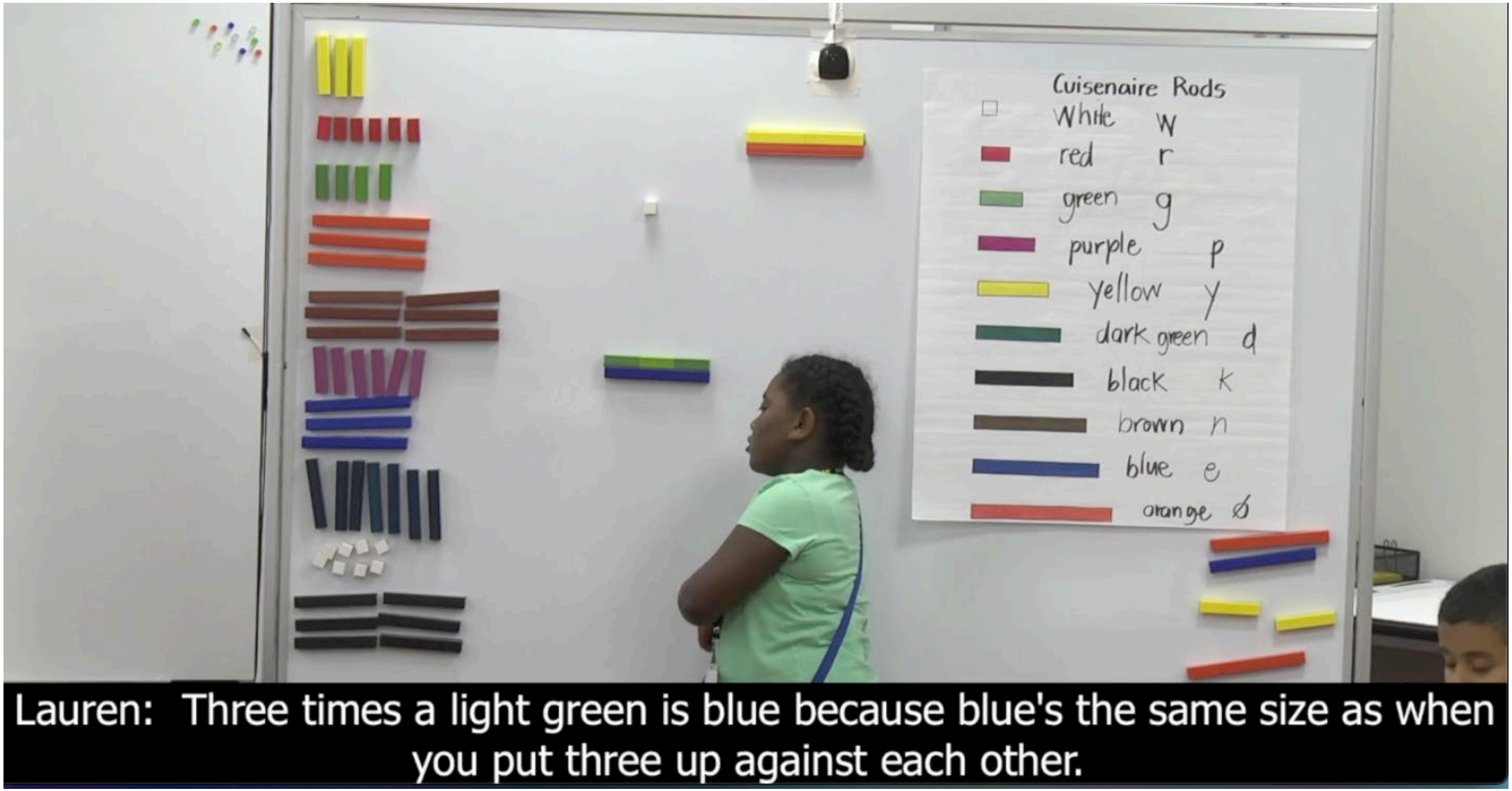
Setting up and managing small group work

Establishing and maintaining community expectations

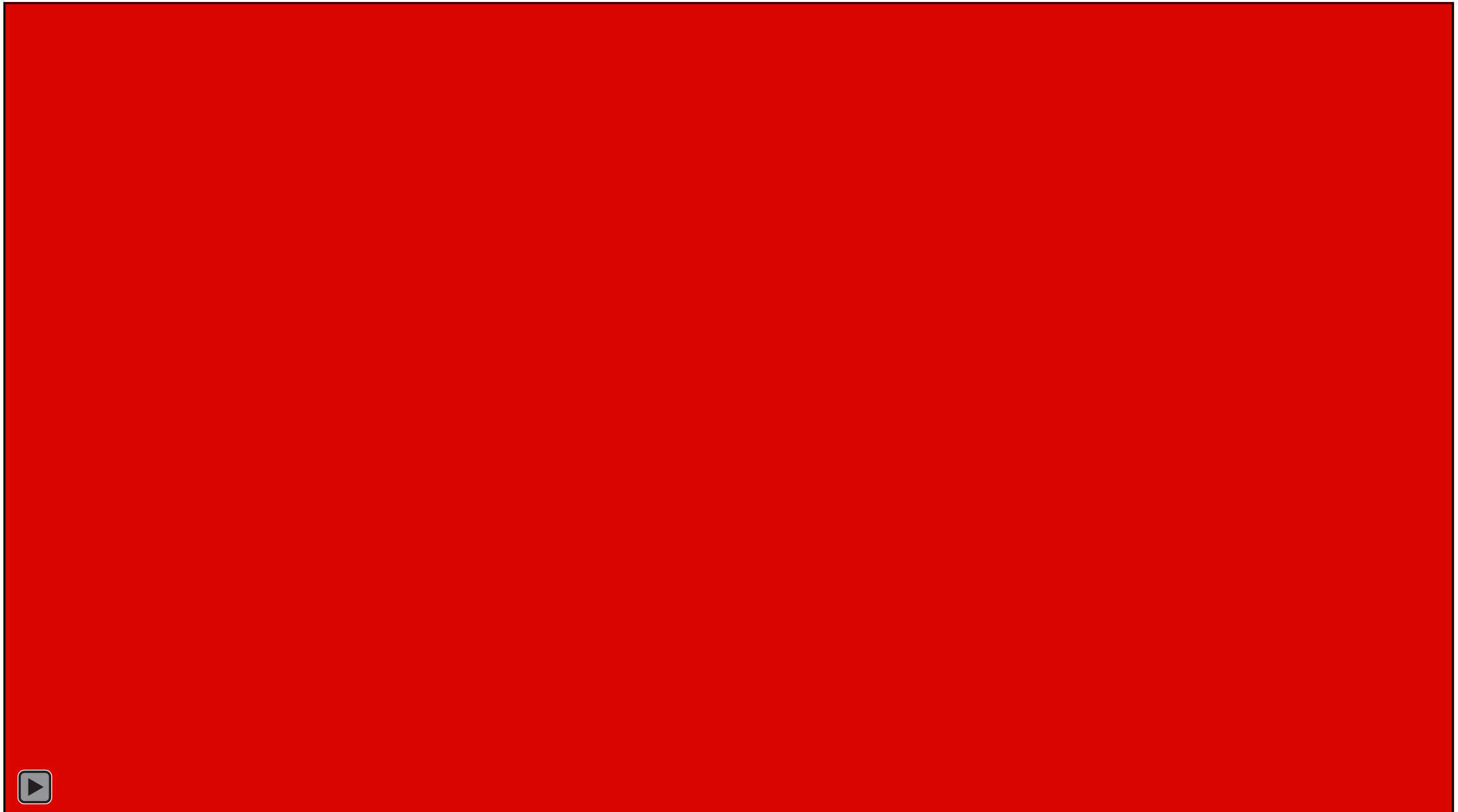
For more information on high-leverage practices, check out the TeachingWorks website.

Which rod is three times a light green?

Lauren: “Three times a light green is blue.”

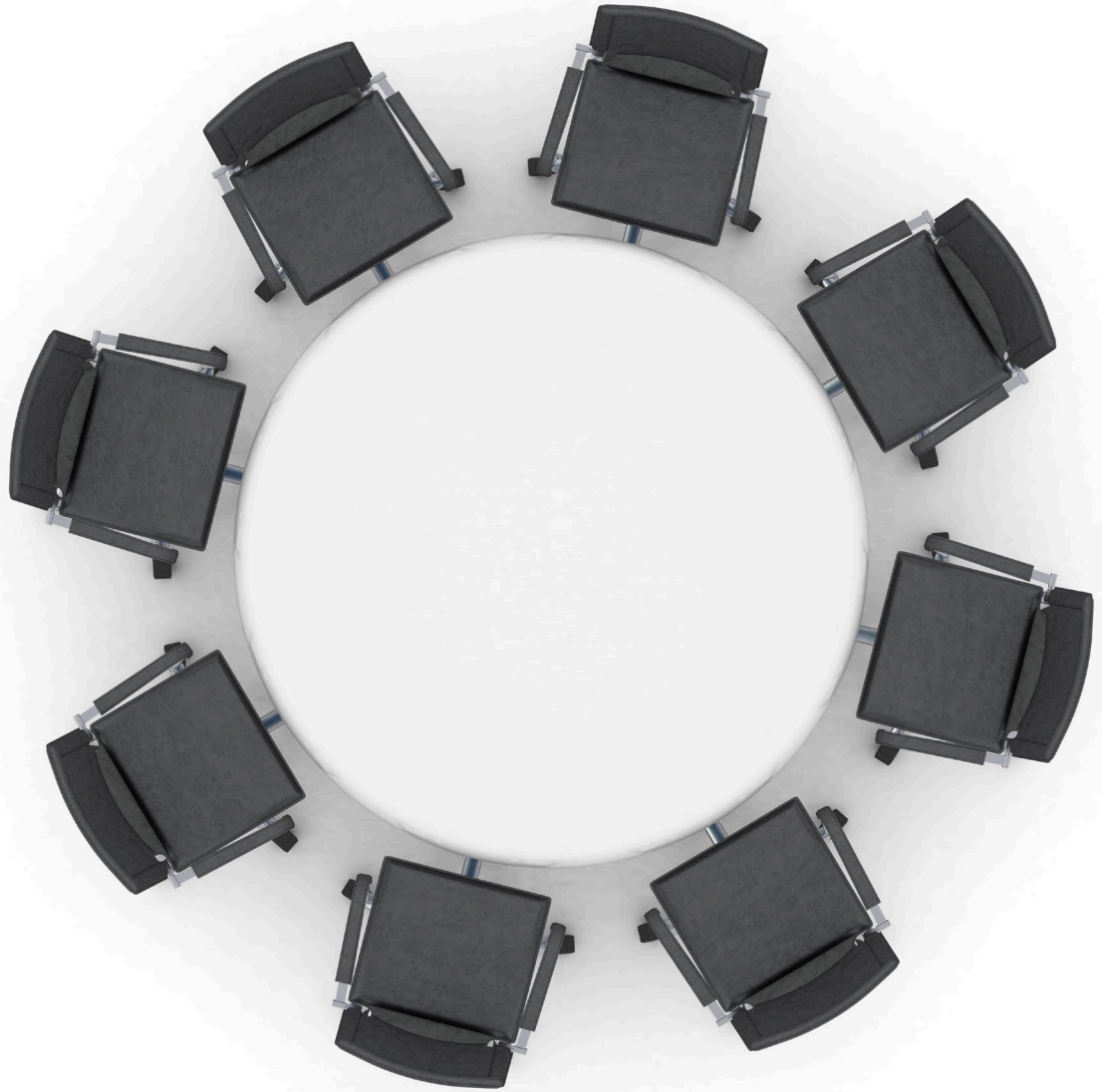


La’rayne: “I think it’s three whites.”



Local Discussion

Briefs 3 and 4




Enjoy your lunch!

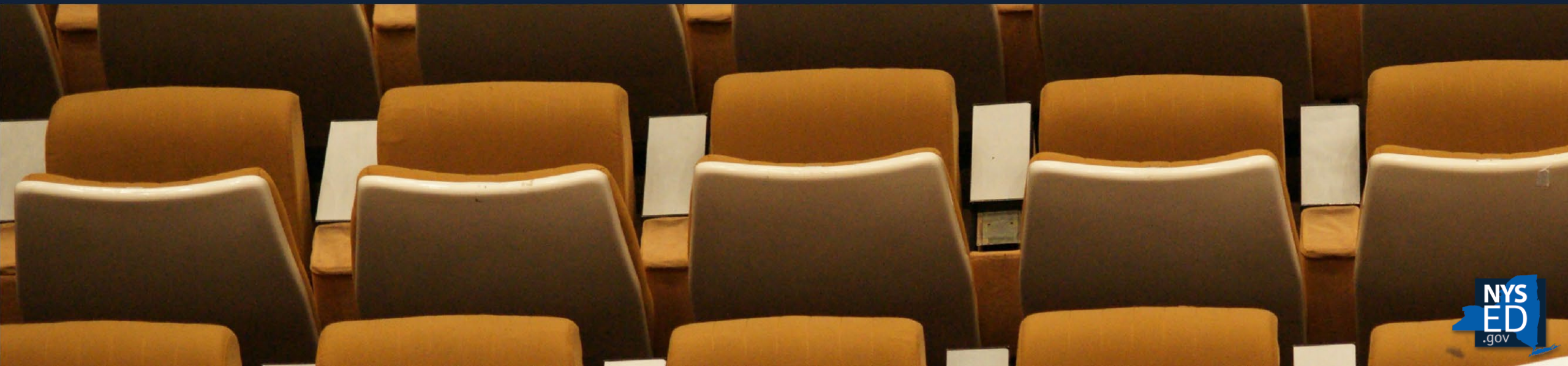
Mathematics Assessment, Role and Challenges of Using Representations, and Understanding, Using, and Modifying Curriculum Materials

Overview of NYSED Numeracy Briefs 5, 6 and 7

Brief 5:

Mathematics Assessment of and for Student Learning

Supporting Evidence-Based P–12 Mathematics Teaching Practice



Purposes of Assessments

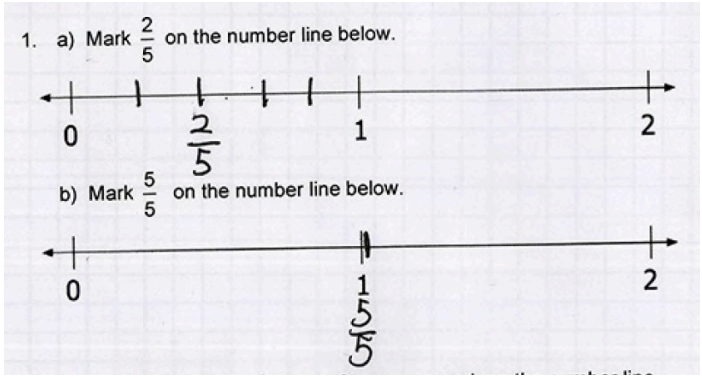
- **Teacher-led formative assessment:** Checking in up close on how students are making sense of instruction.
- **Self-appraisal:** Supporting students to appraise their own learning.
- **Assessment of mathematical identity:** Learning how students see themselves as mathematical thinkers and knowers, focused on the development of their mathematical identity.
- **Summative assessment:** Documenting what students have learned after completing a specific unit of instruction, what they may need further support with, and what they can extend beyond the scope of what was taught.
- **Standardized assessment:** Using common rigorously developed assessment items that enable analyses at scale.

Examples of Assessments *for* Learning

- **Teacher-led formative assessment:** These include exit tickets, short quizzes, journal writing, tasks matched to what was done in class, or tasks that slightly extend what was done in class.
- **Self-appraisal:** These include exit tickets, questions as part of homework assignments, short surveys.
- **Assessment of mathematical identity:** These include short questionnaires, drawings, journal entry prompts.
- **Task-based assessments:** These include tasks that require students to demonstrate skills in problem-solving, explanation, justification, representation, and/or selection of mathematical tools in order to solve them.

Learning from Formative Assessments

An exit ticket focused on placing fractions on the number line:



Learning from Formative Assessments

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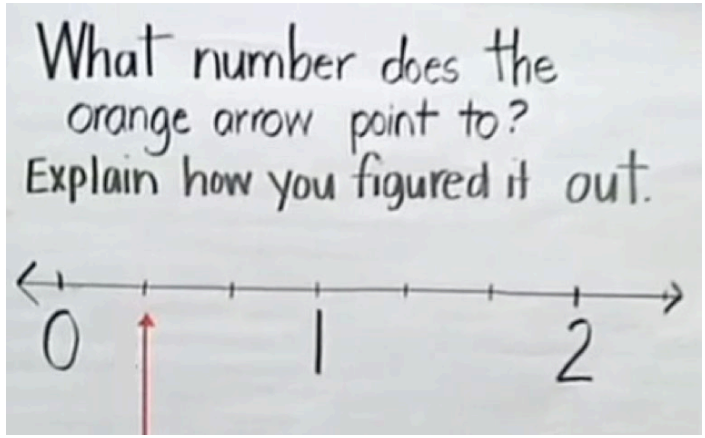
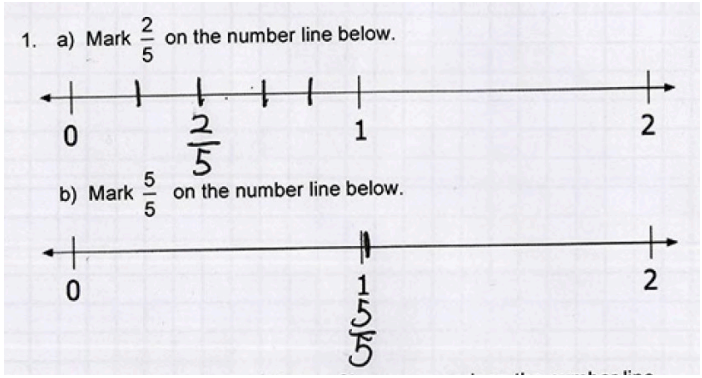
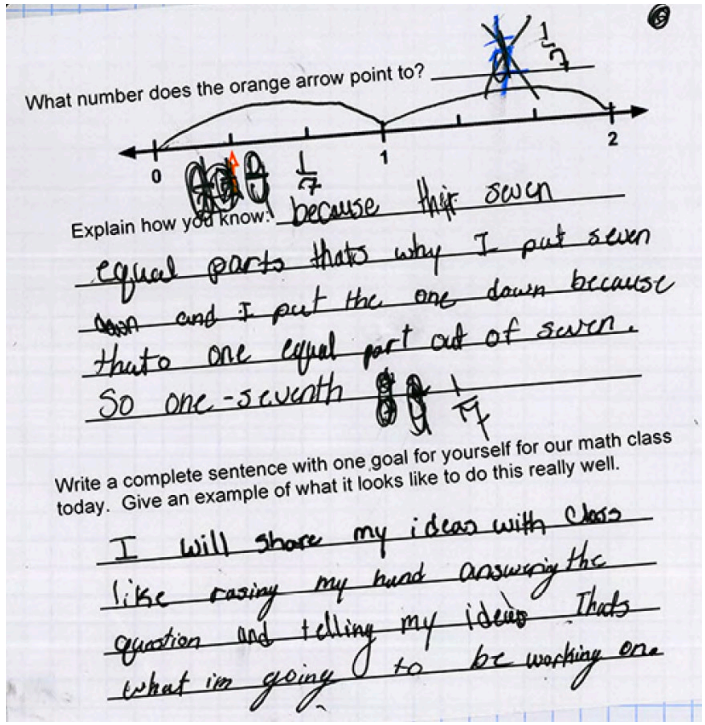
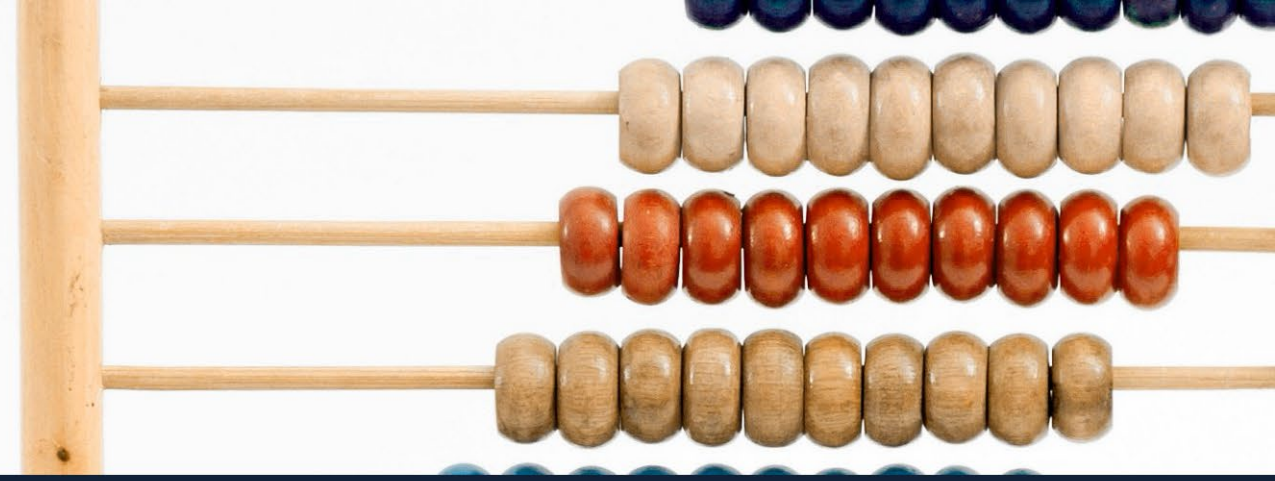




A warm up focused on naming points on the number line the next day

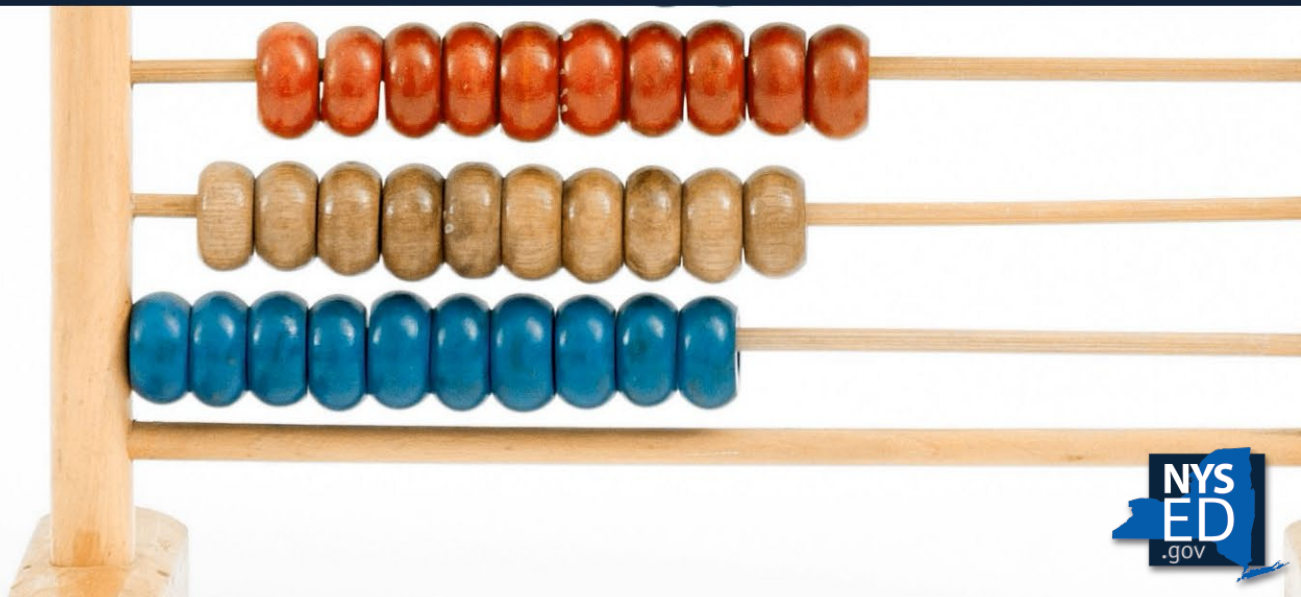




Brief 6:

The Role and Challenges of Using Representations

Supporting Evidence-Based P–12 Mathematics Teaching Practice



Types of Representations

- **Physical:** manipulative materials such as Unifix cubes, base ten blocks, algebra tiles
- **Visual:** diagrams, drawings, graphs
- **Symbolic:** numbers, expressions, equations
- **Verbal:** explanations and discussions
- **Contextual:** real-world situations and problem-based contexts

Using Representations

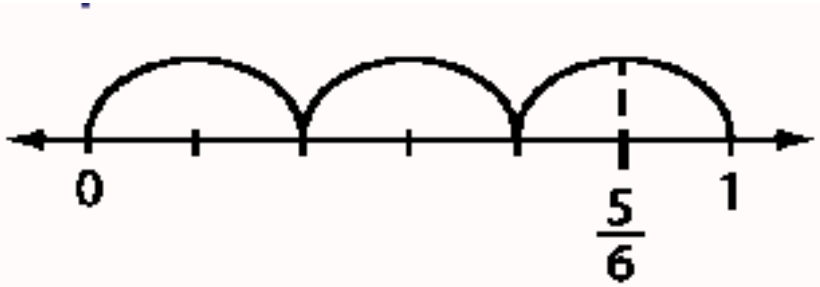
Preparing for Instruction

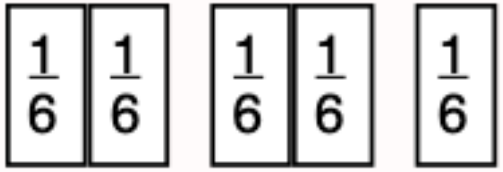
- Weigh the strengths and limitations of different representations based on the mathematics they make available.
- Use what you know about your students' previous experiences and the challenges students are likely to encounter.
- Consider task demands as you make decisions about when to adapt tasks and how to implement them with your students and mathematical purposes in mind.

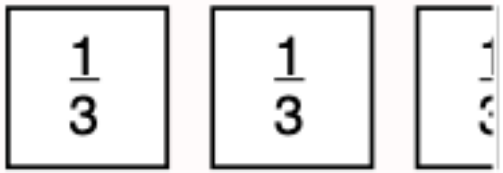
During Instruction

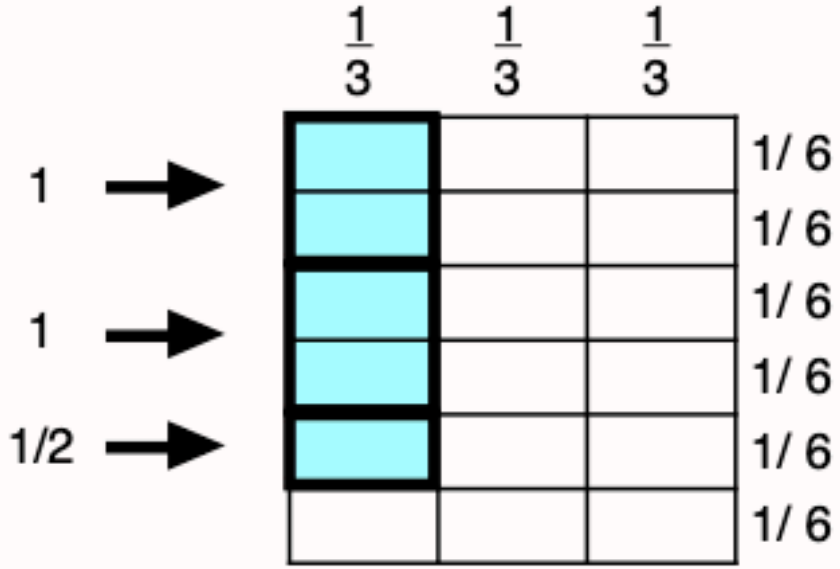
- Encourage sense-making by providing time for students to explore and experiment with representations as they solve problems, offering support when needed.
- Teach students how to use particular manipulatives and set up the language and routines for their productive use.
- Make connections across representations.

Which of these can be used to represent $\frac{5}{6} \div \frac{1}{3}$?









Brief 7:

Understanding, Using, and Modifying Curriculum Materials

Supporting Evidence-Based P–12 Mathematics Teaching Practice

Questions to Ask When Analyzing Curricular Materials

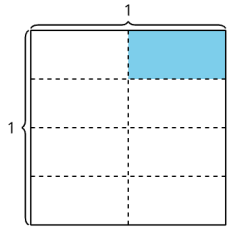
- How is **mathematics** represented in the curriculum materials?
- How are **evidence-based practices** represented in the curriculum materials?
- **Who** is represented in the curriculum materials and how are they shown?
- How does the curriculum support a **welcoming and affirming environment**?
- What supports are integrated into materials for **multilingual learners and students with disabilities**?

Considering Curricular Materials

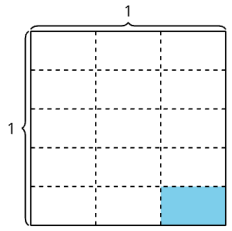
- How are **evidence-based practices** represented in the curriculum materials?
- What supports are integrated into materials for **multilingual learners and students with disabilities**?

---

1. Write a multiplication equation to represent the area of the shaded piece.



2. How does the diagram represent the equation $\frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$? Explain or show your reasoning.



3. Find the value that makes each equation true. Use a diagram if it is helpful.
   a. $\frac{1}{2} \times \frac{1}{6} = ?$
   b. $\frac{1}{4} \times \frac{1}{6} = ?$

Activity Synthesis

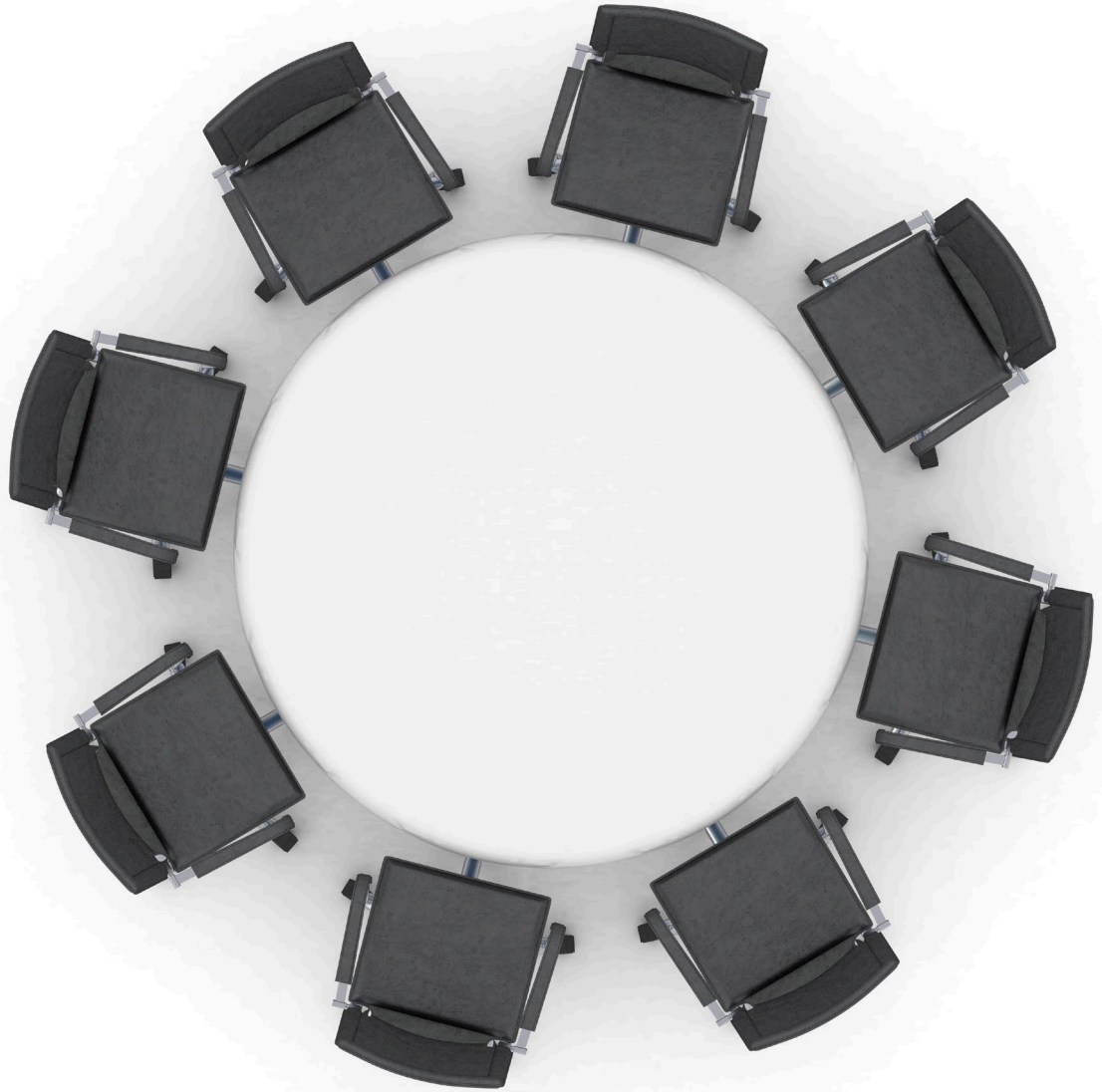
- Display: $\frac{1}{2} \times \frac{1}{4} = \frac{1}{(2 \times 4)} = \frac{1}{8}$ and the corresponding diagram.
- "How does this equation represent the diagram?" (One fourth of one half is shaded which is the same as 1 piece of the whole square that is divided into 2 columns and 4 rows. So, one eighth of the whole square is shaded.)

MLR1 Stronger and Clearer Each Time

- "Share your explanation about how the last diagram represents $\frac{1}{5} \times \frac{1}{3} = \frac{1}{15}$ with your partner. Take turns being the speaker and the listener. If you are the speaker, share your ideas and writing so far. If you are the listener, ask questions and give feedback to help your partner improve their work."
- 3–5 minutes: structured partner discussion
- Repeat with 2–3 different partners.
- If needed, display question starters and prompts for feedback.
  - "Can you give an example to help show . . . ?"
  - "Can you use the word _____ in your explanation?"
  - "The part that I understood best was . . . ."
- "Revise your initial draft based on the feedback you got from your partners."
- 2–3 minutes: independent work time.

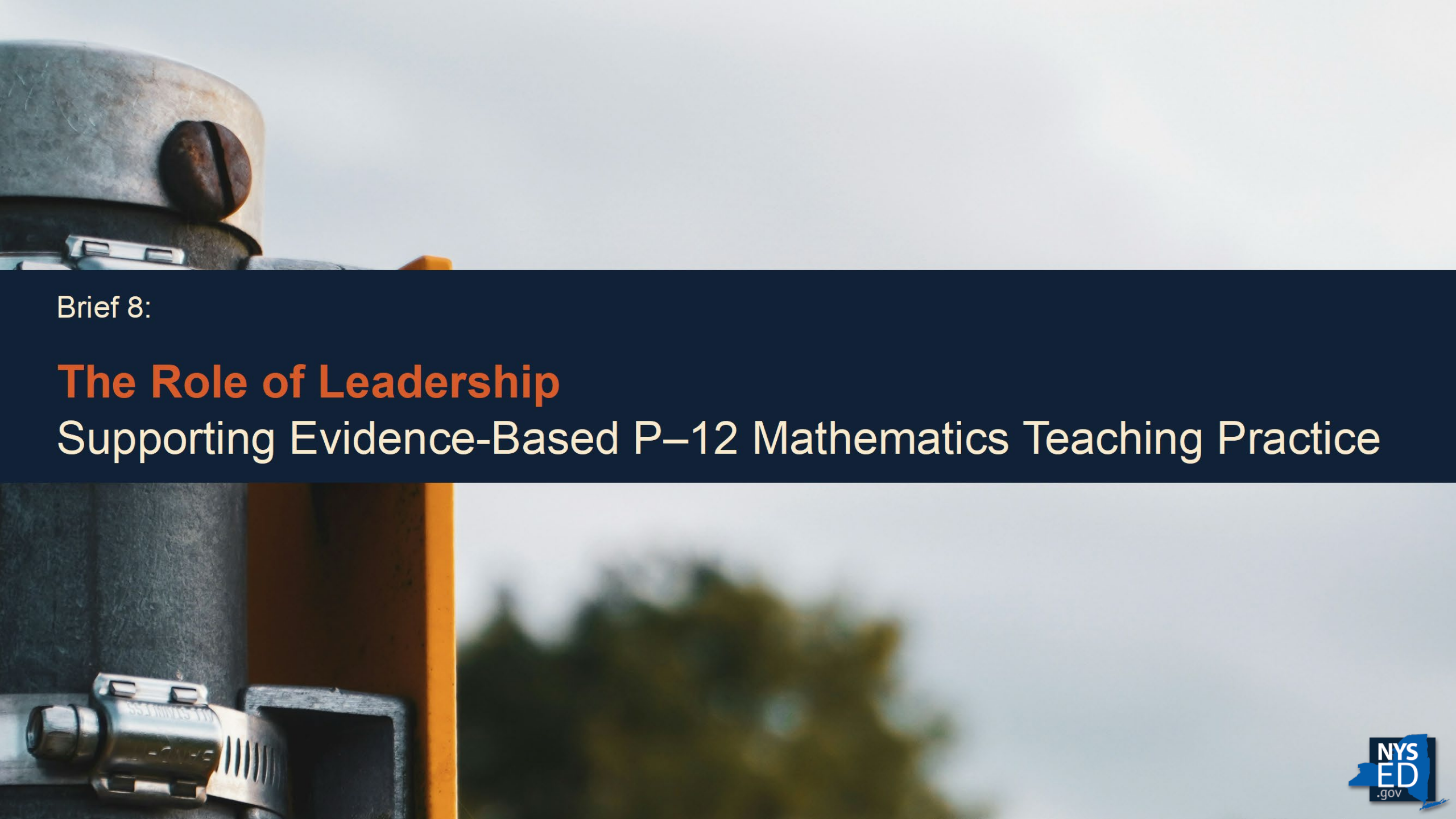
Local Discussion

Briefs 5, 6, and 7



The Role of Leadership

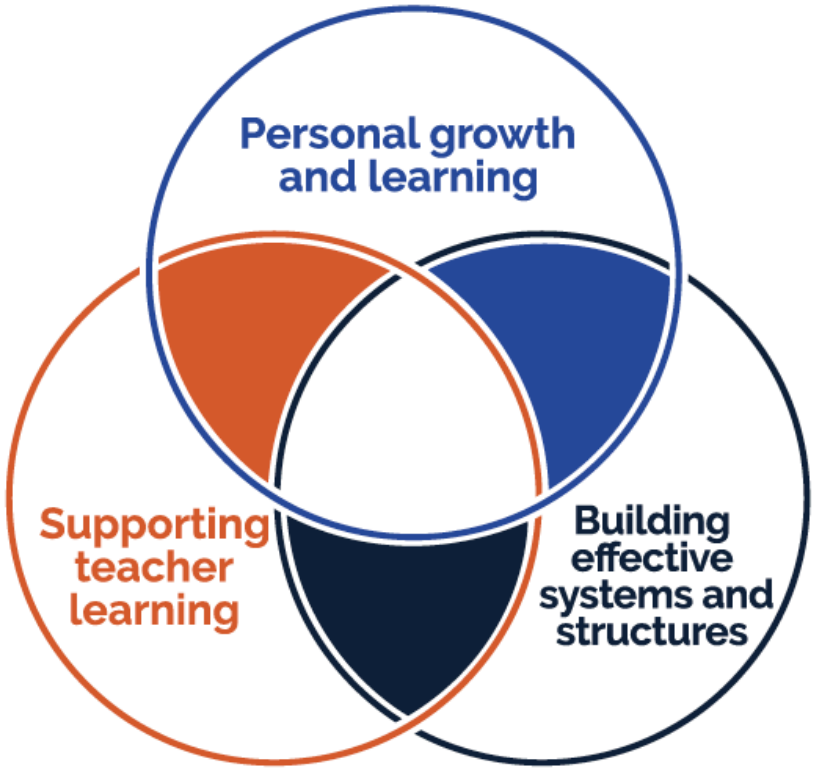
Overview of NYSED Numeracy Brief 8



Brief 8:

The Role of Leadership

Supporting Evidence-Based P–12 Mathematics Teaching Practice



Leadership Areas

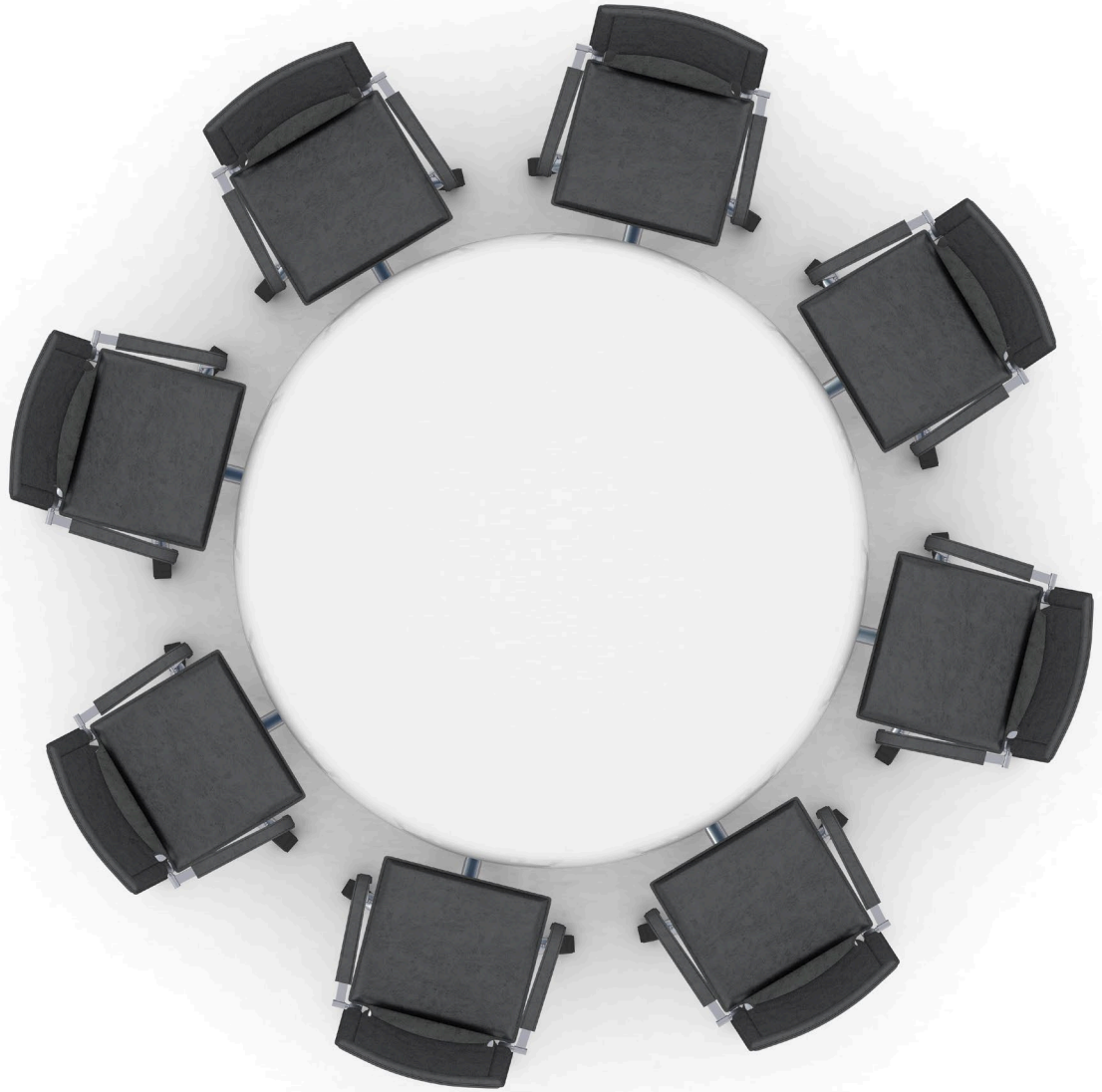
1. **Personal Growth and Learning**
   - Understand effective mathematics teaching and learning
   - Understand tensions
   - Investigate how communication style and messaging impact teachers' work and support connections

2. **Supporting Teacher Learning**
   - Ensure subject-specific learning opportunities for teachers and leaders
   - Ensure curriculum-specific learning opportunities for teachers and leaders
   - Provide space and structures for practice-focused reflection and feedback
   - Support connections between frameworks and initiatives

3. **Building Effective Systems and Structures**
   - Build systems and schedules that support teacher learning
   - Use assessments and assessment data wisely
   - Make use of building resources

Local Discussion

Brief 8



Numeracy Leadership Moves

As a numeracy leader, what action can you take to enhance numeracy in your community?

https://forms.office.com/r/G9s41bQPLA

Next Steps and Closing Remarks

Thank You!