Standards-in-Action 2.0

State-Based Curriculum Review

Reasoning and Communicating with Mathematics

(Part 1)

Welcome back!

Disclaimer

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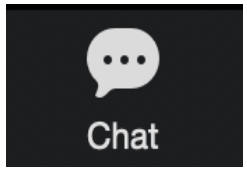
Let's Hear From You!



Type your response to this question in the group chat:

- *CHAT: In a sentence, what were your biggest takeaways or challenges related to your experience reviewing your local curriculum for Dimension 2: Mathematical Progressions and Connections?*

We'll ask everyone to hit "enter" at the same time so…

WAIT to hit "enter"!

Agenda

- Overview of Dimension 3 and its research base in mathematics
- Introduction to the content criteria for Dimension 3
- Breakout work session with your team
- Review of substantiations and ratings in the Example Workbook
- Next steps and final questions

Meeting Norms and Expectations

1. Be present and engage fully.
2. Ask questions.
3. Prepare for productive struggle.
4. Consider differing perspectives.
5. Create and maintain a safe space for professional learning.
6. Be mindful of different learning styles.

Research Base for Dimension 3

Research from NCTM (2000 and 2015), the NRC (2001), and the ACT National Curriculum Survey (2016) shows that:

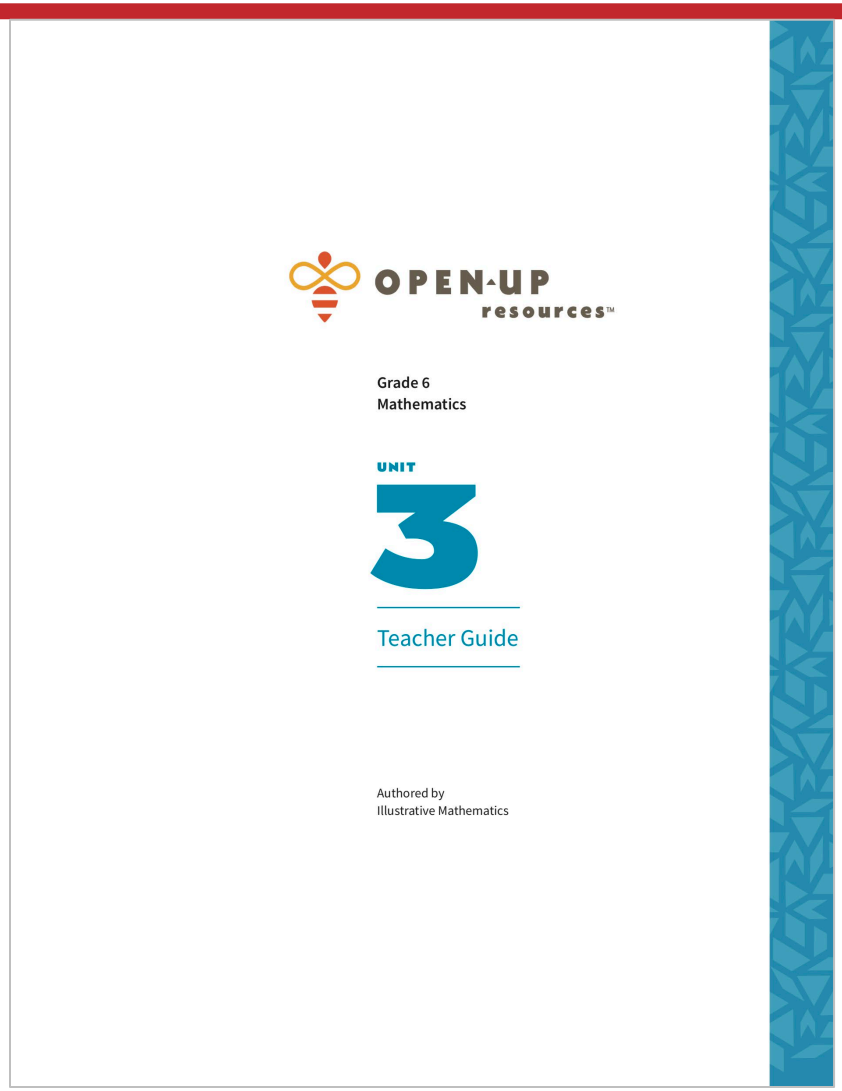
- The Standards for Mathematical Practice rest on “processes and proficiencies” with established significance in mathematics education.
- When Standards for Mathematical Practice are connected to content, deeper understanding can occur, enabling students to extend their understanding to new problem situations and contexts.

What Does This Research Mean for High-Quality Curriculum?

It means students will regularly be asked to:

- Apply the mathematics they are learning to new problems in new ways;
- Construct viable mathematical arguments and critique the reasoning of their peers; and
- Not just learn how to get the answer but also learn how to learn.

Illustrative Mathematics



All Standards for Mathematical Practice Include Reasoning

- **MP.1** Make sense of problems and persevere in solving them.
- **MP.2** Reason abstractly and quantitatively.
- **MP.3** Construct viable arguments and critique the reasoning of others.
- **MP.4** Model with mathematics.
- **MP.5** Use appropriate tools strategically.
- **MP.6** Attend to precision.
- **MP.7** Look for and make use of structure.
- **MP.8** Look for and express regularity in repeated reasoning.

MP.1 Make sense of problems and persevere in solving them

- Explain the meaning of a problem and look for entry points to its solution.
- Analyze givens, constraints, relationships, and goals.
- Plan a solution pathway rather than simply jumping into a solution attempt.
- Consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution.
- Monitor and evaluate progress and change course if necessary.

MP.2 Reason abstractly and quantitatively

- Make sense of quantities and their relationships in problem situations.
- Decontextualize and then re-contextualize.
- Create a coherent representation of the problem at hand by:
  - Considering the units involved.
  - Attending to the meaning of quantities, not just how to compute them.
  - Knowing and flexibly using different properties of operations and objects.

MP.4 Model with mathematics

- Apply known mathematics to solve problems arising in everyday life, society, and the workplace.
- Make assumptions and approximations to simplify a complicated situation.
- Identify important quantities in a practical situation and map their relationships using a variety of such tools.
- Analyze those relationships mathematically to draw conclusions.
- Interpret mathematical results in the context of the situation and reflect on whether the results make sense.
- Improve the model if it has not served its purpose.

Dimension 3: Reasoning and Communicating with Mathematics

Dimension 3
Reasoning and Communicating with Mathematics

Review Content Criteria for Dimension 3: *Note criteria with asterisks (*) for EL support.*

1 —— **Content Criterion.** Curriculum prompts students to produce mathematical arguments and to analyze the arguments of others. *
- Does the curriculum ask students to make mathematical claims and build a logical progression of statements to explore the truth of their claims?
- Are there requests in lessons, activities and assessments for students to explain, show or defend their findings?
- Are students asked to consider the merit of the mathematical reasoning of others?

Substantiation:

2 —— **Content Criterion.** Curriculum includes sufficient supports for teachers to provide opportunities for students to build their understanding of important mathematics through discussion and verbal engagement. *
- Are there suggestions in the teacher materials for strategic grouping so that students can build and share their mathematical thinking with others?
- Do the teacher materials suggest discussion questions that will elicit student interest and response?
- Are students encouraged to verbalize their thinking and given regular opportunities to practice speaking about the mathematics they are learning?

Substantiation:

3 —— **Content Criterion.** Curriculum prompts teachers and students to attend to the precision of their mathematical statements. *
- Does the curriculum encourage students to be precise when they use the content-specific language they are learning, both in speaking and in writing?
- Does the curriculum encourage teachers to repeat or rephrase students' statements to model precise mathematical language and to help students clarify their thinking?
- Does the curriculum include sufficient opportunities for students to see and experience examples of precise communication in mathematics?

Substantiation:

4 —— **Content Criterion.** Curriculum includes examples that demonstrate mathematical reasoning and a well-structured solution, without providing formulas for solving problems. *
- Do the examples from the curriculum demonstrate reasoning for a variety of problem types and problem-solving strategies?
- Do lessons lead students to a clearer understanding of the mathematics without providing step-by-step problem-solving recipes?

Substantiation:

5 —— **Content Criterion.** Curriculum promotes the strategic use of technology to support student reasoning.
- Does the curriculum encourage students to use calculators as vital tools for mathematical curiosity and conceptual understanding?
- Are students encouraged to use mental estimation to determine whether a calculator solution seems reasonable and accurate?
- Are students taught when the calculator is most useful to employ and when mental calculations can be done more simply and efficiently?

Substantiation:

Dimension 3: Rating for Content Alignment

_____ 2 Most or all components of the content criteria are present

_____ 1 Some components of the content criteria are present

_____ 0 Few or no components of the content criteria are present

Summary Comments:

Content Alignment Criteria

Dimension 3: Content Criterion 1

Curriculum prompts students to produce mathematical arguments and to analyze the arguments of others.*

Ask Yourself:

- *Does the curriculum ask students to make mathematical claims and build a logical progression of statements to explore the truth of their claims?*
- *Are there requests in lessons, activities, and assessments for students to explain, show, or defend their findings?*
- *Are students asked to consider the merit of the mathematical reasoning of others?*

Dimension 3: Content Criterion 2

Curriculum includes sufficient supports for teachers to provide opportunities for students to build their understanding of important mathematics through discussion and verbal engagement.*

Ask Yourself:

- *Are there suggestions in the teacher materials for strategic grouping so that students can build and share their mathematical thinking with others?*
- *Do the teacher materials suggest discussion questions that will elicit student interest and response?*
- *Are students encouraged to verbalize their thinking and given regular opportunities to practice speaking about the mathematics they are learning?*

Dimension 3: Content Criterion 3

Curriculum prompts teachers and students to attend to the precision of their mathematical statements.*

Ask Yourself:

- *Does the curriculum encourage students to be precise when they use the content-specific language they are learning, both in speaking and in writing?*
- *Does the curriculum encourage teachers to repeat or rephrase students' statements to model precise mathematical language and to help students clarify their thinking?*
- *Does the curriculum include sufficient opportunities for students to see and experience examples of precise communication in mathematics?*

Dimension 3: Content Criterion 4

Curriculum includes examples that demonstrate mathematical reasoning and a well-structured solution, without providing formulas for solving problems.*

Ask Yourself:

- *Do the examples from the curriculum demonstrate reasoning for a variety of problem types and problem-solving strategies?*

- *Do lessons lead students to a clearer understanding of the mathematics without providing step-by-step problem-solving recipes?*

Dimension 3: Content Criterion 5

Curriculum promotes the strategic use of technology to support student reasoning.

Ask Yourself:

- *Does the curriculum encourage the use of technology as vital for mathematical curiosity and conceptual understanding?*
- *Does the curriculum provide opportunities and encouragement for students to use appropriate tools to assist in understanding and finding a solution to a problem?*
- *Are students taught when the calculator is most useful to employ and when mental calculations can be done more simply and efficiently?*

Rating for Content Alignment

2 Points: Most or all components of the content criteria are present.

1 Point: Some components of the content criteria are present.

0 Points: Few or no components of the content criteria are present.

Breakout Time: 45 minutes

Your turn to work with your team:

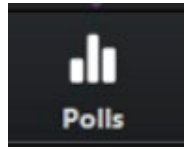
- Examine the evidence in the curriculum for each of these content criteria.
- Check the content criteria that are evident and cite in your notes where you found evidence.
- Discuss the evidence you found for all the content criteria with your team and agree upon a rating for the dimension.
- When we reconvene, we will ask you to share comparisons of your rating, criteria checks, substantiations, and commentary.

Breakout Materials

- Your copy of the Participant Workbook (p. 7)
- Curriculum: Illustrative Mathematics:
  - Grade 6 Course Guide
  - Grade 6, Unit 3 Teacher Guide
- Resource: Standards for Mathematical Practice

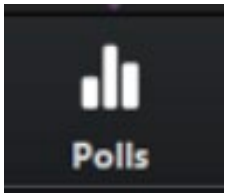
Welcome Back!

Let's Hear From You!



- POLL: What is your rating for **Dimension 3 Content Alignment**?
  - 2 points: Most or all components of the content criteria are present.
  - 1 point: Some components of the content criteria are present.
  - 0 points: Few or no components of the content criteria are present.

Let's Hear From You!

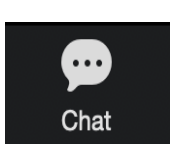


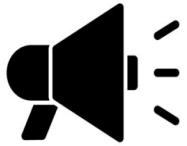
- POLL: Did you check (as present) the same criteria as in the Example Workbook?

  O Yes, I checked the same criteria as the example.

  O No, I checked one or more criteria differently than the example.

Let's Discuss!





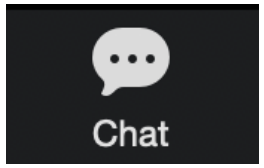
Let's take 5 minutes to review the Example Workbook that contains the substantiations for the content criteria.

Then in the group chat, share your answer to this question:

- *CHAT: How do your substantiations compare to the example?*

Then let's hear from you about the evidence you found and noted in your Summary Comments.

Let's Chat!



Type your response and comments in the group chat:

- *CHAT: What is something you have learned today (or better understand) about reasoning and communicating with mathematics?*

We'll ask everyone to hit "enter" at the same time so…

WAIT to hit "enter"!

Next Steps

- We will focus on **EL Supports** for **Dimension 3 to**:
  - Examine the sample curriculum from Illustrative Mathematics for its attention to EL supports, related to communicating with mathematics.

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Thank you!