Louisiana Believes

Common Core State Standards for Mathematics

TEACHER SELF-LEARNING SERIES

Module 5

The Standards for Mathematical Practice – Connecting the Practices to Content Standards

DEPARTMENT of EDUCATION
Louisiana Believes

COMMON CORE STATE STANDARDS for Mathematics

TEACHER LEARNING SERIES

Module 5: Standards for Mathematical Practice – Connecting Practices to Content Standards

Time Frame: Approximately 1 hour

Audience: Teachers, principals, and additional school faculty of all grade levels and all content areas (having a partner or completing this module in a small group would be beneficial)

Module Description: This module assumes that the information presented in previous modules is well known to the learner. Module 5 is the second of three modules (4, 5, and 6) designed to provide an in-depth look at the Standards of Mathematical Practice which are part of the Common Core State Standards for Mathematics. Module 5 focuses on how the practices connect to the content standards using tasks as examples. Additionally, there is a short section on the interrelatedness of the Math Practices which provides another lens through which to view the connections to the content standards. Links to descriptions to help differentiate the expected proficiencies by grade level are also included in this module.

Course Objectives: By the end of the module, the learner will be able to identify which practices are aligned to a task based on the grade level of a student.

Materials Needed to Complete Module: copy of the Common Core State Standards for Mathematics, access to the Internet, Math Practice Progressions (links provided in document), The Standards for Mathematical Practice in bulleted format posted at http://tinyurl.com/ay9n5du (optional)

Pre-Assessment: Those who can answer the questions below with confidence may want to skip this module. Because there is new material presented in the module, it is anticipated that most learners will not have encountered as much of the content as in past modules.

1) What are differences between the evidences that a fifth grade student and an eighth grade student might show to indicate that they are meeting Standard 8 of the Mathematical Practices?
2) Recognizing that a number represents a specific quantity is evidence of which Math Practice and at which grade(s)?
3) Describe similarities in the descriptions for Math Practice 8 in grade 3 and high school.

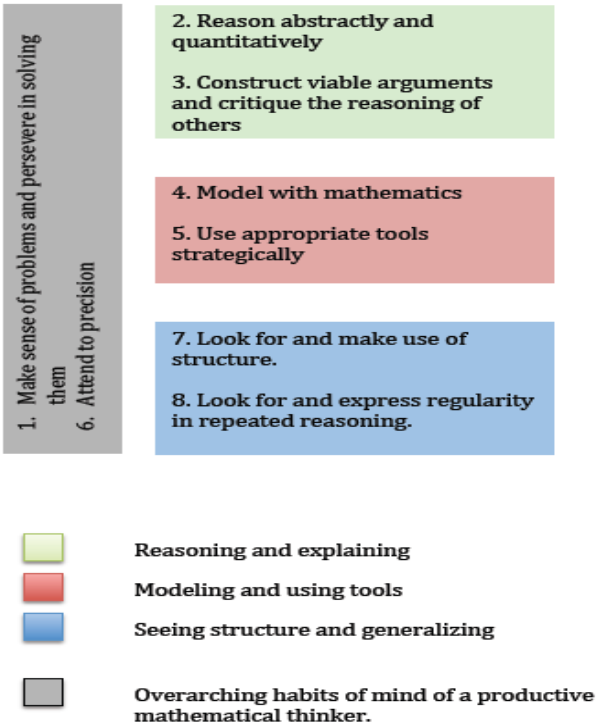
Task Resources:

- Tasks
  - The Illustrative Mathematics Project - http://illustrativemathematics.org/
  - The Mathematics Assessment Project - http://map.mathshell.org/materials/index.php
  - K-5 Math Teaching Resources - http://www.k-5mathteachingresources.com/
  - NYC Department of Education - http://tinyurl.com/72xyl78
  - National Council of Supervisors of Mathematics Great Tasks - http://tinyurl.com/a4yyjxo

Structure of the Math Practice Standards

When completing Module 4, you may have noticed that most videoed lessons and tasks were aligned to multiple Math Practices. For example, the Grade 7 video posted at http://tinyurl.com/ag4nb5m, titled *Algebraic Equations, Inequalities & Properties: Introduction (Part C)* is aligned to Math Practices 1, 3, and 6. Per Bill McCallum, author of CCSSM,

> *If you think about it long enough you can associate just about any practice standard with any content standard, but this sort of matrix thinking can lead to a dilution of the force of the practice standards—if you try to do everything all the time, you end up doing nothing. This diagram is an attempt to provide some higher order structure to the practice standards, just as the clusters and domains provide higher order structure to the content standards.*



The diagram shows that Math Practices 1 and 6 are overarching habits of mind of productive thinkers. As a result, these two practices are strongly connected to the other practices. The student characteristics and behaviors of mathematically proficient students in the remaining six practices fall into three categories:

- Reasoning and explaining
- Modeling and using tools
- Seeing structure and generalizing

The National Council of Supervisors of Mathematics (NCSM) has taken the approach of analyzing the Math Practices using the structure just described. For each of the categories (Reasoning and explaining; Modeling and using tools; and Seeing structure and generalizing), an average of four professional learning modules have been developed and posted at http://tinyurl.com/a4yyjxo. There are also modules for Problem Solving and Precision. While the modules are designed for 2-3 hour sessions, teachers can benefit from viewing the associated videos and examining the tasks and examples of student work. To examine these modules, start with a quick viewing of the *PowerPoint*© presentations. Presentations contain helpful presenter notes and most have embedded videos. A copy of the math practices, student work, a copy of the task and other materials are provided in the resource file. Videos are also posted separately on the same webpage as the presentation and the resource file for a module.

Connecting the Math Practice Standards to the Content Standards

As indicated in Module 4, verbs in the content standards are important, particularly when connecting the content to the Math Practices. Standards that begin with "understand" are good opportunities to connect the Math Practices to the content as the term is used in the CCSS to mean that students can explain the concept with mathematical reasoning, including

- justifying why a particular mathematical statement is true

- explaining where a mathematical rule comes from
- giving concrete illustrations, and
- providing mathematical representations & example applications.

The intent of the Math Practices is that the content be taught ***through*** the practices. That way, the connections are ***real*** – integrated rather than interspersed. The Standards for Mathematical Practice are what students who understand mathematics "do" with the content. Math Practices are not learned through direct teaching methods, but develop over time from opportunities that teachers provide in mathematics classrooms. These opportunities must include challenging problems or tasks, collaborative group work, lots of interactive discussion, and sufficient time to develop deep understanding.

Because students continue to grow in their mathematical understandings, the evidences that students should exhibit also change as they progress from grade to grade. The expectation for a third grader when constructing a viable argument is much different than that of a high school student. Thus, Math Practice Progression documents have been developed to provide descriptions of characteristics and behaviors that should be in evidence in each grade. Note that these are different from the Domain Progression documents which show progression of student learning. Math Practice Progression documents are available at the following links: Practices for K-2, Practices for 3-5, Practices for 6-8, Practices for high school. While these are not the only evidences that could exist, they are intended help teachers in understanding what is appropriate for the grade level.

Take a few moments to download the Math Practice Progression documents for one of the grade clusters and check to see how the proficiencies change from grade to grade.

To help students gain an understanding of what the practices mean, classroom posters for grades K-6 are available at the following links: MP Posters K-1, MP Posters 2-3, MP Posters 4-5, MP Posters 6.

Self Check: Below is a series of tasks. The source and the alignment to the content Common Core State Standards for Mathematics for each task are provided. Read each task and then determine the Math Practice(s) addressed. Since grade levels are provided as part of the content standards for each task, it may be beneficial to use the grade-cluster Math Practice Progression documents to determine which practices apply. See the self-check section on page 6 for suggested alignments.

Task 1: Books on Shelves

> Miguel has two shelves. Miguel has six books. Miguel wants to put books on the two shelves. How many different ways can Miguel put books on the two shelves? Show and tell how you know.
>
> New York City Department of Education, K.OA.3 Math Practice(s) _____

Task 2: Glasses Task

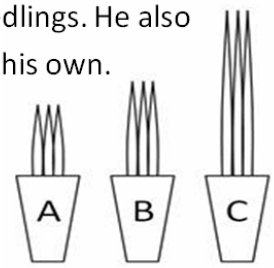
Located at http://map.mathshell.org.uk/materials/download.php?fileid=770
HSG-GMD.1, 3; 8.G cluster (review and maintenance of skills) Note: This task is part of a formative assessment lesson from the Mathematics Assessment Project.

Math Practice(s) _____

Task 3: Grass Seedlings

The students in Raul's class were growing grass seedlings in different conditions for a science project. He noticed that Pablo's seedlings were $1\frac{1}{2}$ times as tall as his own seedlings. He also saw that Celina's seedlings were $\frac{3}{4}$ as tall as his own.

Which of the seedlings shown must belong to which student? Explain your reasoning.



5.NF.5
The Illustrative Math Project, http://illustrativemath.org

Math Practice(s) _____

Task 4: The Hungry Caterpillar

http://www.k-5mathteachingresources.com/support-files/theveryhungrycaterpillar.pdf
K-5 Math Teaching Resources, 1.OA.1

Math Practice(s) _____

Task 5: Gym Membership

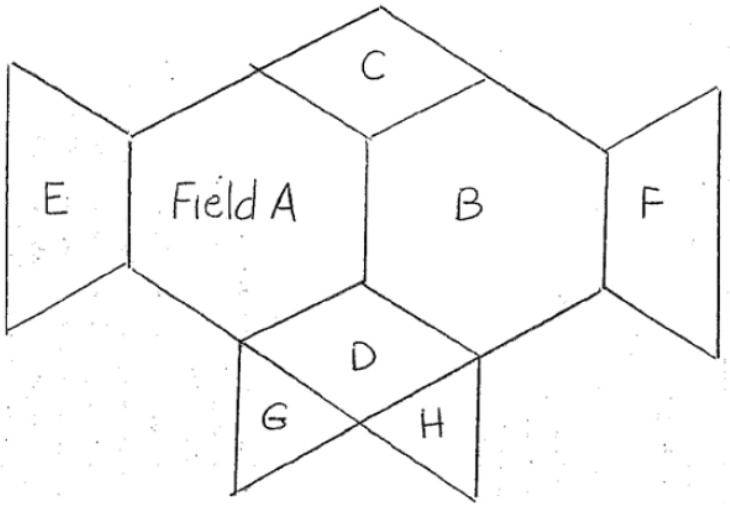
The cost to join the Keep Fit Rec Center is $240 per year, with an additional charge of $5 every time I go. If I don't want to join, I can still go whenever I want, but I have to pay $15 to get in each time. I need to lose weight and plan on going to the Rec Center 3 times per week. Which plan is the best for me? After how many visits does it make sense to join? Explain both.

6.EE; 7.EE, 8.EE; 8.F Clusters (Answers should vary based on grade level) This is an updated version of similar task found on the Inside Mathematics website.

Math Practice(s) _____

Task 6: Farmer Fred

Farmer Fred's fields are worth twelve hundred dollars total. The fields are formed with the same properties as your pattern blocks. Each field's value is based on its size. What fraction of the total value is each field worth? How much is each field worth? Show and explain all of your mathematical thinking.



NYC Department of Education, http://bit.ly/Ji2wf4, 4.NF.2, 3c, 3d and 4.G.2

Math Practice(s) _____

Task 7: Used Cars

http://sampleitems.smarterbalanced.org/itempreview/sbac/index.htm#
Item 43052, click tab that says View More Items, pick Used Cars
Smarter Balanced Sample Assessment Items, HSA-CED.1, HSA-REI.3

Math Practice(s) _____

Task 8: Circle 2

http://sampleitems.smarterbalanced.org/itempreview/sbac/index.htm#
Item 43049, click tab that says View More Items, pick Circle 2
Smarter Balanced Sample Assessment Items, 8.G.8, 8.EE.6

Math Practice(s) _____

Assignment

Return to the PreAssessment. You should now be able to answer questions with ease.

Self-Check Answers

Pages 3-5: Math Practices aligned to tasks. **Answers may vary**. MP5 may apply to some tasks, but none of the tasks appear to be designed to require students to select an appropriate tool.

Task 1 – Books on Shelves: MP1, MP2, MP3, MP6
Task 2 - Glasses: MP2, MP3, MP6, MP7
Task 3 – Grass Seedlings: MP1, MP2
Task 4 – The Hungry Caterpillar: MP1
Task 5 – Gym Membership: MP1, MP3, MP4, MP6
Task 6 – Farmer Fred: MP 1, MP3, MP6, MP7
Task 7 – Used Cars: MP2, MP4, MP8
Task 8 – Circle 2: MP3, MP6, MP8