

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

The italicized script provides direction for the presenter while the plain text script is the narrative for the presenter.

Slide 1: *Have Slide 1 on the screen as participants enter the room. Begin by introducing yourself and a bit of background on your job, role, and engagement with PA Common Core.*

This is one of five training modules designed to assist educators in understanding and transitioning to PA Common Core.

Slide 2: This is module one of five.

Slide 3: *Remind participants to sign on to SAS and complete and display their name tents.*

Slide 4: Today we are focusing on four essential questions related to unpacking the PA Common Core State Standards. *Read each question aloud.*

- What is rigor and how is it represented in mathematical assessments?
- What does engagement look like for students in mathematics and how is this captured in assessment?
- What does relevance look like in terms of assessment design?
- How can teachers design assessments that are rigorous, engaging and relevant that captures the features of the CCSS?

Slide 5: Take a look at the question on the screen. On an Index card, write your response to it individually.

Allow a 1 minute wait time for participants to create their own definition of rigor.

With a partner, think-pair-share to create a working definition of rigor.

Allow 2-3 minute wait time for participants to revise their definition of rigor with a partner.

Instruct the participants to read 4 myths about Rigor in the classroom, direct participants to the website <http://tinyurl.com/4RigorMyths> to obtain the article. After reading, instruct participants to work with their partner to revise the definition.

Allow 5-7 minute wait time for participants to read the article and revise their definition in the table groups.

Have a few volunteers report and create a shared working definition as a group.

Wrap up the activity with this question: What have we discovered about rigor?

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

Slide 6: As we look at the PACCS in terms of assessment design, the Webb's Depth of Knowledge model will be used throughout the entire assessment module. It was adapted from Norman Webb's model and used by the Council of Chief State School Officers for assessment alignment.

Optional: Background about the Webb Model:
(http://programs.ccsso.org/projects/Alignment_Analysis/Models/)

Webb Model: Provides analysis of the degree of intersection of state assessments and content standards, which combines qualitative expert judgments and quantified coding and statistical analysis. The Council worked with Norman Webb in developing the model. The model, developed by Norman Webb from the University of Wisconsin, provides a reliable set of procedures and criteria for conducting alignment analysis studies, which combine qualitative expert judgments and quantified coding and analysis of standards and assessments. The product of the analysis is a set of statistics for each standard and grade on the degree of intersection, or alignment, between the content embedded in state content standards and the content in state assessments. The Webb model has been used in alignment with more than 10 states, partly through SCASS collaborative projects managed by CCSSO. The model has been used for language arts, mathematics, science, and social studies.

Following the training process, four to six reviewers, including teachers and content specialists, individually identify the content standard objectives that match each assessment item. They first determine the 'depth of knowledge' required by each objective or benchmark of the content standards being analyzed, and code each using one of four levels of knowledge: (a) recall, (b) skill/concept, (c) strategic thinking, (d) extended thinking; operational definitions and labels vary somewhat by subject. Second, reviewers determine the objective or benchmark represented by each item or task on the state assessment being reviewed, and they rate the level of knowledge necessary for a student to successfully complete the item or task.

Norman L. Webb is a senior research scientist with the Wisconsin Center for Education Research and the National Institute for Science Education. Webb is a mathematics educator and evaluator who lead the Institute's work on strategies for evaluating reform and rethinking how we evaluate mathematics and science education, while focusing on the NSF's Mathematics and Science Partnerships. His own research has focused on assessment of students' knowledge of mathematics and the alignment of standards and assessments. Webb also directs evaluations of curriculum and professional development projects.

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

Slide 7: Why Depth of Knowledge? It ensures the intent of the standards and the level of demonstration required by the standard matches what is being assessed. It provides a framework for the highest level that students can be assessed as teachers think about test development. Further, it is intended to be designed for use with assessments, which is the focus of this module.

Slide 8: Webb's Four Depth of Knowledge Levels are:
Level 1—Recall and Reproduction
Level 2—Skills & Concepts
Level 3—Strategic Thinking
Level 4—Extended Thinking

Although there are reasons to assess at each of these levels, the Common Core and PACCS requires us to shift our assessment focus toward the higher DOK levels, which also means that we need to leverage learning activities that require strategic thinking and extended thinking.

Slide 9: DOK Level 1 only requires students to recall information, demonstrate a rote response, use a formula that requires them to follow a set procedure, or perform a clearly defined set of steps.

Slide 10: These five examples of Level 1 activities require students to perform fairly rote and computational procedures in mathematics. The procedures do not require students to move beyond a one step process.

Slide 11: The content knowledge or process involved is more complex than in Level 1. DOK 2 requires some mental processing beyond recalling or producing a response. For example, it may require the student to compare data which requires students to identify characteristics of the object and then group or order the objects. It may also ask students to organize, estimate, make observations, collect and display data, or compare data. In terms of assessment, Level 2 items may address more than one Eligible Content Item. In addition, Level 2 items imply the student uses more than one cognitive process.

Slide 12: Level 2 activities will have students organize, represent, and compare data. These five examples ask students to engage in more than one cognitive process. For example, in #5, students have to organize a set of data (knowing how to organize this data) and construct an appropriate display (knowing which display best suits the data). Each of these five examples requires students to engage in multiple cognitive processes.

Slide 13: DOK Level 3 requires students to use more demanding and abstract cognitive reasoning, such as planning and using evidence. The assessment items associated with Level 3 may have more than one possible answer. In addition,

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

they require students to justify their response. This justification of a student's response adds to the complexity of the task, assuming that the explanation provided is not a simple explanation. These skills need to be practiced regularly within a classroom culture that values and respects diverse approaches and opinions.

Optional Additional Explanation:

The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multiple step task requires students to explain their thinking at Level 3; requiring a very simple explanation or a word or two should be at Level 2.

Slide 14: The four examples ask students to use more abstract cognitive reasoning. Students are asked to explain, justify, generalize, and connect ideas using mathematical reasoning.

Slide 15: DOK Level 4 requires very high cognitive demands of students. In addition, the task is highly complex. Within the task, students are required to connect the ideas of their content or make connections among the different content areas. Students may be asked to select an approach that best solves a situation. DOK Level 4 assessment items typically require an extended period of time and are not captured by "on demand" assessment instruments; however, a task requiring extended time does not necessarily warrant a DOK Level 4. If the task is lengthy and it does not require students to apply a significant level of conceptual understanding and higher order thinking, then it is not a DOK Level 4 task.

It is possible to design assessment items requiring this type of thinking; however, these assessments will not be administered during a class period. These types of assessments may be some type of project for which students have the opportunity to apply higher order thinking and make connections as they work through this project.

In addition, it is possible to identify standards, goals, and objectives of a unit or lesson of which students will be expected to perform extended thinking. For example, "develop generalizations of the results obtained and the strategies used and apply them to new problem situations" is an example of a Grade 8 objective that would be considered Level 4.

Slide 16: Notice the complexity and higher order thinking portrayed in these examples. Students are required to demonstrate conceptual understanding as they work through these examples. The tasks are highly complex and demand that students make connections within their content area and among other content

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

areas. In addition, these examples require extended time for students to demonstrate and develop the type of understanding these tasks demand.

Take 1-2 minutes to turn and talk to your elbow partner about what you believe to be the most common DOK levels represented in math assessments.

Wait 1-2 minutes.

Conduct a quick debrief to gather feedback from participants.

Slide 17: Be aware that Depth of Knowledge levels are not exclusively determined by verbs. Notice the example here of which the verb remains the same, although the examples consist of DOK Levels 1-3. It is equally, if not more important, to focus on the context of the task and what the task is asking. You do not want to solely focus on the verb as the determinant of the Level of DOK the task is addressing.

Slide 18: Let's look at examples of different DOK level activities that address the same standard.

The standard being addressed is: Students will identify and describe properties of and apply geometric transformations within a plane to solve real-world and mathematical problems.

Students will identify a transformation within a plane.

Notice the one step recall this task requires characteristic of DOK Level 1.

Slide 19: Students will perform a compound transformation of a geometric figure within a coordinate plane.

This example requires students to apply multiple cognitive steps when performing the multiple transformations.

Slide 20: Students will perform a geometric transformation to meet specified criteria and then explain what does or does not change about the figure.

This example requires students to perform a transformation and then provide an explanation as to how the transformation or transformations affect the figure.

Slide 21: Students will abstract the transformations occurring in an Escher woodprint and then create a simplified tessellation of their own.

This example is highly complex. It requires planning, developing, and thinking. Students have to abstract the transformations occurring in Escher's work and use

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

these transformations to create their own tessellation. It requires understanding and merging the concepts of both transformation and tessellations.

Optional information:

Tessellation is the process of creating a two-dimensional plane using the repetition of a geometric shape with no overlaps and no gaps. This technique is commonly found in the work of M.C. Escher. Additional information and examples can be seen at <http://en.wikipedia.org/wiki/Tessella4on>

Slide 22: Please download and open this PDF on your laptop screen...

Ask participants to view Hess' Cognitive Rigor Matrix & Curricular Examples for Math and Science using the web address on the slide. Wait a few seconds to allow participants to download the PDF from the web. Another resource is the DOK Math Levels electronic handout which provides an overview of what students might be doing at each DOK Level.

Notice the different DOK levels and how they correspond to Bloom's. In addition, notice the examples provided for each DOK level and how these also correspond to the different levels in Bloom's. Choose at least two examples in one of these matrix categories and through DOK. Explain to a partner why each example falls in that specific DOK category.

Have participants choose at least two examples in one of these matrix categories and explain to a partner (using DOK as their rationale) why that example falls in that specific DOK category. Have participants also look to see how the activities align within that specific Bloom's category. Do a quick debrief and gather feedback from participants.

Slide 23: ***Provide participants with envelope containing the Depth of Knowledge Math Sorting Activity already cut for them. Cut from MOD 2 Activity 2 Handout. In addition, provide participants with Depth of Knowledge Cognitive Levels chart. The participants will categorize each of the tasks in their envelope under one of the DOK levels on their chart. All tasks in column 1 should represent DOK Level 1; all tasks in column 2 represent DOK Level 2, etc.***

In this activity, we will take each learning activity from the envelope and place it under the appropriate column on the Depth of Knowledge Cognitive Levels chart.

For example, the activity of measuring areas by counting unit squares (square cm, square m, square in, square n), and improvised units corresponds to the DOK level 1. The activity of finding and positioning integers and other rational numbers on a horizontal or vertical number line diagram; finding and

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

positioning pairs of integers and other rational numbers on a coordinate plane represents the DOK 2.

Begin by working individually to classify each mathematical task according to its DOK level. Then work with a partner to come to a consensus as to which DOK level each mathematical task represents.

Provide 5 minutes for individual work.

Participants should then work with a partner to come to a consensus as to which DOK level each mathematical task represents.

Provide 6 minutes for partner work.

The emphasis of the discussion as participants report should stem from WHY participants selected specific DOK levels.

Slide 24: Use the assessment that you brought with you today, or if you do not have an assessment to use, you may find an assessment online. Begin by taking 5 minutes to categorize the DOK for each activity in the assessment. Example site: <http://www.p12.nysed.gov/assessment/math/samplers/>

Then choose one level 1 or level 2 item and revise that item to reflect a higher level of DOK.

Share your revision with a partner. Partners should provide feedback to the revision process and feedback to the DOK level that the question represents.

Participants will analyze their own assessments that they brought to the workshop. If participants do not have their own assessment, then ask participants to find an online math assessment to use.

Example site: <http://www.p12.nysed.gov/assessment/math/samplers/>

Using the DOK levels, participants will analyze their own assessment to categorize each item by its DOK level.

Provide 5 minutes.

Once participants have completed this, they will choose one question at DOK Level 1 or 2 and revise that question to reflect a higher DOK level. Participants will share revisions with their shoulder partner who will provide feedback to the revision.

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

Provide 10 minutes.

Slide 25: Let's take 4 minutes to discuss these questions with the people at your table.

Participants should be given a few minutes to discuss these questions in small groups.

Provide 4 minutes.

Randomly select a few participants to share the major points of their table's discussion.

It may be helpful to have some participants report their concerns and to have a brief discussion acknowledging these concerns.

Slide 26: A parallel set of questions can be asked through the lens of learning. What concerns might classroom teachers have about preparing students for assessments created at a higher Depth of Knowledge level?

Facilitate a short discussion on what things that might present challenges to teachers preparing students for assessments that require a higher Level of DOK.

Slide 27: We will now turn our assessment focus to the engagement piece. We will be thinking about the engagement piece using the Common Core lens of the Standards for Mathematical Practice. These standards apply in all grade levels and their main focus is to describe ways in which students should ENGAGE with content, process, and proficiencies of mathematics. These standards are to be embedded in the mathematical work we do with our students, and through backward design, how we design and deliver instruction.

Slide 28: Think about how these standards apply to assessment practices. What types of assessment items capture these standards as students are being assessed?

Facilitate a couple minutes of group discussion.

Slide 29: Use the assessment that you brought with you today along with the Standards for Mathematical Practice to analyze the assessment items through the lens of the mathematical practices.

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

Direct participants to the Standards of Mathematical Practice on the SAS by clicking on standards/Common Core/PA Common Core-Math, Grades PreK-12, headings beginning on page 5, or more verbose descriptions at www.corestandards.org/the-standards/mathematics/introduction/standards-for-mathematical-practice , and the PACCS Practice Grade Progressions documents.

As a think-pair-share activity, share to your partner an assessment item that you want to revise so it better reflects one specific mathematical standard of practice.

Each participant will report to a partner an assessment item they will revise to better reflect one specific mathematical standard of practice. Participants will work with their partners to revise the assessment items to reflect the mathematical standard of practice.

Provide 10 minutes.

Ask for a few participants to share their example, their new revised example, and which mathematical standard of practice this example now reflects (10 minutes).

- Slide 30:** Did you notice the words in bold?
These words emphasize real world application: using math in a real world context, and making connections, relating ideas within the content and among content areas. These characteristics emphasize providing relevant contextual math opportunities for our students per the Common Core and PACC.
- Slide 31:** In PA Standard 2.3.7.A.1 and the corresponding PA Eligible Content item M07.C-G.2.2.2, note the emphasis on solving real-world and mathematical problems involving angle, measure, area, surface area, circumference and volume.
- Slide 32:** Here are some assessment task examples related to the previous standard that embed the idea of relevance and real world contexts.
- Slide 33:** Now let's take 10 minutes to analyze some of the assessment items that you brought with you to see how they portray real-world contexts and relevance.
- Then we will take 10 minutes for you to share your revision idea with your partner and work together to revise one item for each person.

Provide 10 minutes and then prompt participants to start working together on their revisions.

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

Provide 10 minutes and then encourage a few participants to share their newly revised assessment items with the group.

Slide 34: Revising assessment through the lens of the PA Common Core requires raising the awareness of all educators. Teachers need to understand the DOK levels and know how to address the DOK levels in learning and assessment activities. Administrators also need to understand how classroom assessments will change and be prepared to support teachers in this work. As a result, working in teams may help to build the capacity of assessment design in our schools. Through these teams, assessments may be more likely to capture the rigor, engagement, and relevance indicated in the PACC.

Slide 35: Writing DOK level 3 or 4 questions and their evaluative measures (rubrics) may be more difficult and time consuming than writing DOK levels 1 or 2 questions.

Assessment teams can help teachers to formally utilize each other as resources to design and write revised assessment items by aligning each person's areas of strength with the team's areas of need. Teams can also be leveraged to review similar assessment items to select the best items and to provide a variety of assessment tools at the desired level of DOK.

Slide 36: Now we are going to take 5 minutes to do some role playing. Let's have each table role play an assessment team discussing the questions on the screen.

Provide approximately 5-7 minutes for discussion.

Use a random reporter to have a few tables share the main points of their team's discussion.

During the group sharing, emphasize how the role of the assessment team might help to clarify these questions and provide greater consistency of assessment within schools.

Slide 37: What questions should assessment teams be asking?
Are there additional questions that teachers should be asking of their assessments?

Facilitate a short group discussion.

Slide 38: Use two 3x5 cards – one to write down two successes and the other to write down two challenges of implementing assessment teams.

Transition to PA Common Core Standards - Mathematics
Module 2: Rigor in Learning and Assessment of Learning

Then, with your partner, share the successes and challenges that you wrote on the cards and discuss strategies that could help to ensure the successes and minimize the challenges.

Provide 5 minutes.

Once each participant has completed this activity with their partner, have a few participants volunteer to share strategies (10 minutes).

Slide 39: Questions?