Module 1
Facilitator Guide

Focus on Practice Standards

Connecticut Core Standards for Mathematics

Grades 6–12

Systems of Professional Learning

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Module Overview

In Module 1, grades 6-12 Common Core Coaches will explore the Standards for Mathematical Practice to gain a deeper understanding of the instructional shifts needed to implement the Connecticut Core Standards for Mathematics (CCS-Math). The module will introduce all eight practices after which participants will focus on effective teaching strategies associated with Practice 1: *Make sense of problems and persevere in solving them* and Practice 6: *Attend to precision*. Coaches will also plan how they will share information with teachers at their school and provide teachers with the support necessary to make changes to their instructional practice.

Target Audience	Grades 6–12 Common Core Coaches
Prerequisite	None
Duration	Full day
Outcomes	**By the end of the session, participants will have** • Gained an initial understanding of the CCS-Math and the embedded changes and instructional shifts. • Explored all eight of the Standards for Mathematical Practice and identified how they are related. • Explored how practices can be clustered and examine the reasons why Practice 1: *Make sense of problems and persevere in solving them* and Practice 6: *Attend to precision* are considered the two "umbrella" standards that describe the habits of mind of successful mathematical thinkers. • Identified evidence of the practices in tasks. • Discussed and created grade-level descriptors for all eight practices. • Explored how specific instructional strategies can help students meet major learning goals. • Identified relevant resources for implementing the CCS-Math and created a peer support network. • Identified ways in which you will share information with and provide support for teachers as they make changes to their instructional practice.

Resources Required

- Chart paper, markers, pens, highlighters, nametags, post-it notes
- Participant Guide for each participant
- EQuIP Rubric (separate handout for each participant)
- Materials for "Kite Activity"

Session Preparation

Tables should be arranged so participants can work in groups.

Key Messages

- Successful transition to the Connecticut Core Standards (CCS) requires change–change at all parts of the educational system for students and the educators who work with them.
- The CCS-Math embody a core shift in teaching and learning.
- The CCS-Math are designed to bring focus, coherence, and rigor through two areas of concentration: 1.) what students learn (mathematical content); and 2.) how they learn it (mathematical practices).
- The Standards for Mathematical Practice present a vision for how students should think about and work with mathematical content at all grade levels.
- Practice 1: *Make sense of problems and persevere in solving them* and Practice 6: *Attend to precision* are considered the "overarching habits of mind of productive mathematical thinkers" and can be found in all of the Standards for Mathematical Practice.
- Implementation of the CCS-Math will be an ongoing process requiring collaboration, time, and professional engagement.
- The EQuIP Rubric for Lessons and Units: Mathematics is aligned with the key shifts and expectations set forth in the Connecticut Core Standards.

Session at-a-Glance

Introduction (10 minutes)

The facilitator will review project goals and activities, module outcomes, and the agenda for the session. Participants will complete a Pre-Assessment.

Supporting Documents:

- Pre-Assessment

PowerPoint Slides:

- 1–5

Section 1: Understanding the Foundations of the Connecticut Core Standards (55 minutes)

The facilitator will engage the group in a discussion on what participants currently know about the CCS. Participants will first discuss the question in small groups and then will share out their answers during a large

group discussion. As participants share, the facilitator will chart their responses. The facilitator will wrap up the discussion by posing the question 'How is what they know about the CCS different from what they know about past instruction in mathematics?'. The facilitator will use participant responses to transition into a brief period of direct instruction on the three shifts of focus, coherence, and rigor.

After presenting on the shifts of the CCS, the facilitator will lead the participants in an examination of the EQuIP Rubric to begin the discussion on the impact of the shifts at the classroom level. From there, participants will use a method, similar to two-column note taking, to document their personal questions around the shifts and the CCS, leaving space to record answers to their questions that will be generated as the session continues.

Participants will then view segments of the Phil Daro video, *Against Answer Getting* in order to begin to answer the question 'Why do we need a change in mathematics teaching and learning?'.

The facilitator will wrap up Section 1 by debriefing the video with participants in a large group and using the broader topic of change to transition to the next section on supporting teachers in the process of changing instructional practice.

Supporting Documents:

- What Do We Know
- The Impact of the Shifts
- The Personal Journey of the CCS
- EQuIP Rubric (separate handout)

Materials:

- Chart paper and markers

Video:

- Phil Daro - *Against Answer Getting:* http://www.youtube.com/watch?v=B6UQcwzyE1U

PowerPoint Slides:

- 6–16

Section 2: Supporting Change (20 minutes)

Participants will first be introduced to the stages of change and will discuss the implications of working with teachers through these stages. A focus will be placed on creating a professional learning environment in which teachers feel comfortable in expressing their ideas, strengths, and challenges on their personal implementations of the CCS. Participants will then go through the process of setting norms for working within their professional groups in this session as a way to model the types of considerations that will need to be made back at their school. As they engage in this process, participants will work in their group to answer questions such as: *In a*

conversation, what is something that encourages you to speak your mind? What is something that deters you from expressing your ideas? Responses will be recorded on chart paper. Later, in Activity 4, when perseverance is addressed, these norms will be referenced as a way to look at creating a classroom environment in which the Standards for Mathematical Practice can be developed.

Supporting Documents:

- Stages of Change
- Creating an Environment for Personal Change

Materials:

- Chart paper and markers

PowerPoint Slides:

- 17–19

Section 3: Understanding the Standards for Mathematical Practice: Developing Mathematical Expertise (90 minutes)

Section 3 begins with participants solving problems that are each aligned to one of the Standards for Mathematical Practice. The facilitator then provides information on each of the eight practices, including information about the standard, what the standard means, instructional supports for helping students to develop the practice, and sample "I Can" statements. Throughout the presentation, participants will answer questions and work in groups to determine which of the problems was an example of the practice, and to create grade level "I Can" statements for each of the practices based on their new understanding of each practice.

The section wraps up with teachers discussing how they would pair the practices based on their attributes and then viewing Bill McCallum's Mathematical Practices Grouping Chart.

Supporting Documents:

- Problem Set: Practice Standards Alignment
- Understanding the Mathematical Practices

Materials:

- Chart paper and markers

PowerPoint Slides:

- 21–65

Section 4: Supporting Students to "Make sense of problems and persevere in solving them" (35 minutes)

Participants will begin by working through the *Kites Activity*. Participants will debrief the task as a large group and talk about the experience from a personal standpoint. Participants will then work together to discuss what would be needed to help students make sense of this problem and to persevere in solving it. Using this information and the experience of the *Kites Activity*, participants will create a description of a classroom environment that is set up to help students "*Make sense of problems and persevere in solving them."*

Supporting Documents:

- Kites Activity

Materials

- Chart paper and markers
- Kite Activity:
  - Strips of cardstock
  - Metal brad – 1 per participant
  - Graph paper – 1 cm squares – 2 sheets per participant
  - Rulers – 1 per table
  - Protractors – 1 per table

PowerPoint Slides:

- 67–69

Section 5: Attending to Precision in Every Lesson (20 minutes)

Participants will watch a classroom lesson in which the teacher helps students attend to precision. In groups, they will then discuss how this teacher gets students to attend to both the precision of the mathematical language and the calculations needed to complete the work. The facilitator will wrap up Section 5 by charting the instructional strategies identified by the participants and using that list of strategies to transition to Section 6.

Supporting Documents:

- Video Observation Sheet

Materials:

- Chart paper and markers

Video:

- Cathy Humphreys: http://www.insidemathematics.org/index.php/standard-6 (view the 4th video in the grade 9-10 series).

PowerPoint Slides:

- 70–71

Section 6: Teaching with the Standards for Mathematical Practice (95 minutes)

Participants are first engaged in an exploration of the instructional strategies of asking effective questions, engaging students in mathematical discourse, and teaching and learning mathematics through multiple representations. Through their exploration, participants will engage in a discussion around how these strategies can be used to help students develop the mathematical practices. Participants will then use this information to assist in an examination of a sample lesson plan through the lens of the EQuIP Rubric. During the lesson examination, participants will focus only on sections of the rubric that specifically discuss the Standards for Mathematical Practice. Participants will build off of this experience and work within a small group to plan a set of instructional suggestions around a given mathematics task that teachers could use with students and that will meet the expectations set forth in the EQuIP. The facilitator will wrap up Section 6 by having participants discuss their experience and identify possible teacher questions and challenges that they may encounter back at their school.

Supporting Documents:

- Asking Effective Questions
- Multiple Representations
- Steps to Getting Students Talking
- Sample Lesson Plans
- Section 6 Problem Set
  - Middle School – The Average Price of Jeans
  - Algebra – Phone Plans
  - Algebra – The Warehouse Problem
  - Geometry – Exploration: Angles and Polygons

Materials:

- Chart paper and markers

PowerPoint Slides:

- 73–79

Section 7: Supporting Change (20 minutes)

Common Core Coaches will work in grade-band groups to reflect on the module activities and discuss how big ideas from each will be shared with teachers back at their school. Facilitator will review module outcomes.

Supporting Documents:

- Supporting Change

PowerPoint Slides:

- 80–83

Closing Activities (10 minutes)

Participants will complete a Post-Assessment and a Session Evaluation**.**

Supporting Documents:

- Post-Assessment
- Session Evaluation (online)

PowerPoint Slides:

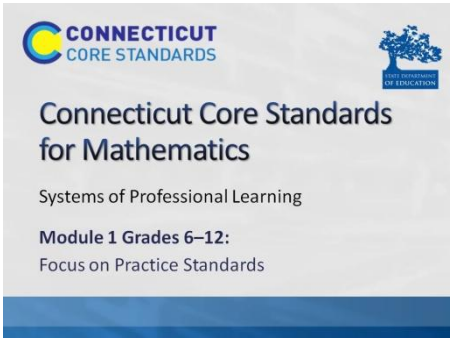
- 84–85

Timeline

This module is designed to be six hours in length. However, each activity within the module may be used as an individual session within an ongoing Connecticut Core Standards professional development plan. Each activity can be used with a group of grade level teachers or with the entire faculty.

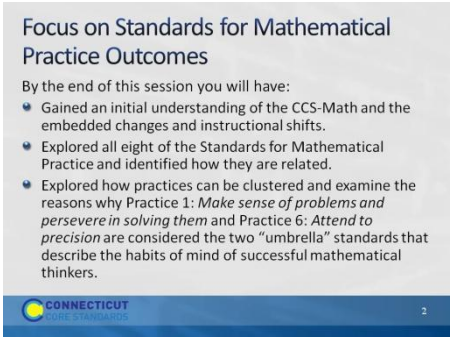
Session Implementation

Introduction



Title Slide

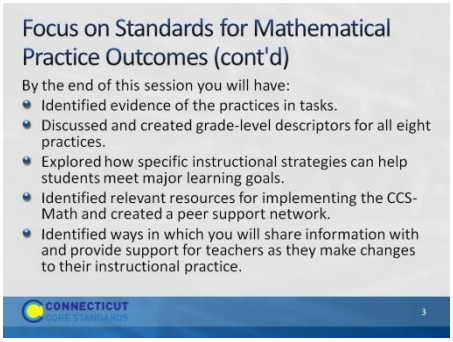
(Slides 1-5, including the pre-assessment, will take about 10 minutes total.)



Slide 2

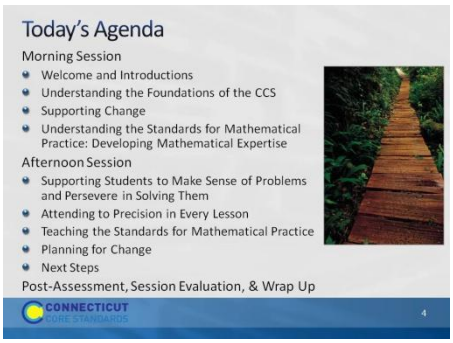
Review the outcomes for the day, sharing what you hope to accomplish throughout the full day session.

These are the outcomes for this session. These are presented to the participants over two slides. Explain that the session will include an in-depth look at all eight Standards for Mathematical Practice but will provide specific insight and depth into Practices 1 and 6.



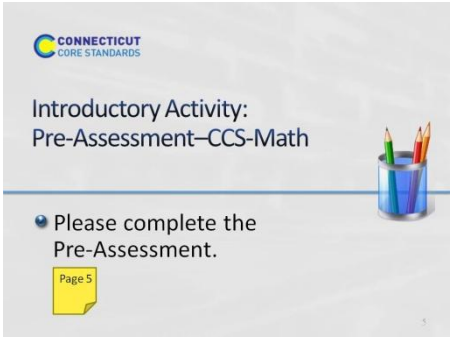
Slide 3

These are the outcomes for this session. These are presented to the participants over two slides.



Slide 4

Review the agenda, letting participants know that this is the pathway they will travel in order accomplish the seven outcomes discussed earlier. Note that in addition to the break for lunch there will also be a morning and afternoon break. Emphasis the importance of coming back from breaks on time to ensure enough time to complete all the work of the day.

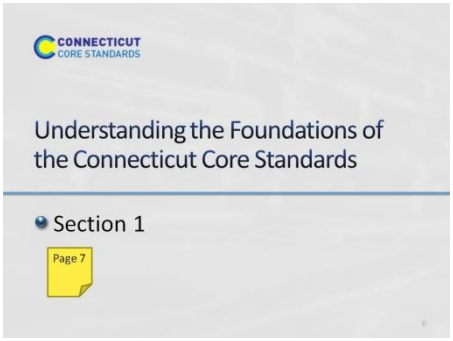


Slide 5

This will be a short self-assessment, which will be found in the participants' guide on page 5. It will assess where the coaches are now with understanding and implementing the Standards for Mathematical Practice. The

participants will complete the same assessment at the end of the session. Allow 3-4 minutes to complete.

Section 1



Slide 6

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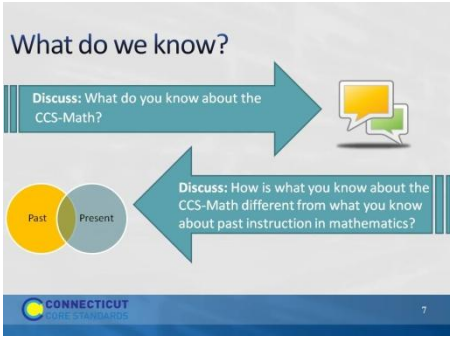


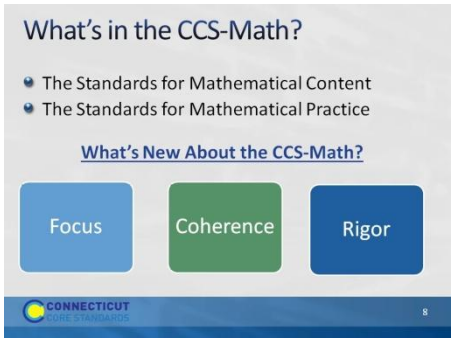
Slide 7

What do we know? – Have participants take **five minutes** to answer the first question on the slide by talking with the people at their table. Space has been provided on **page 7** for participants to make a list of everything they collectively know about the CCS-Math.

When time is called, debrief the small groups discussions as a large group and chart participants' key understandings about the CCS-Math. After a list is generated, ask the question 'how is what they know about the CCS-Math different from what they know about past instruction in mathematics'. Possible answers to listen for include: in the past mathematics focused on basic skills and the CCS require a focus on learning to solve problems and in the past mathematics was taught from perspective of repetitive calculations and now mathematics needs to focus more on solving problems. Use this quick comparison as you proceed to the next few slides that summarize shifts in the CCS. Refer back to participants answers and move quickly through those that the group clearly knows about and linger a bit more on the ones that present new information.

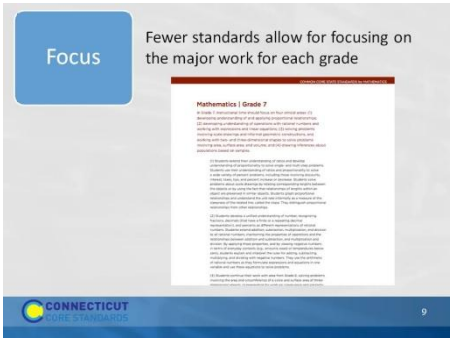
Explain to participants that as you go through the next slides that they can make additional notes in the *What do*

we know about the CCS-Math? on **page 7** in the Participant Guide.



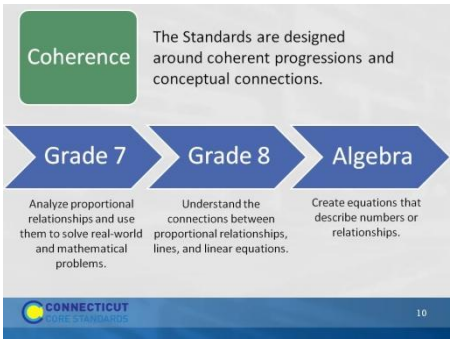
Slide 8

- **What's in the CCS-Math?** There are two parts to the Connecticut Core Standards for Mathematics; Standards for Mathematical Content Standards and Standards for Mathematical Practice. Together they define what students should understand and be able to do in their study of mathematics in order to be College and Career Ready.
- The Standards for Mathematical Content are very specific about concepts, procedures, and skills that are to be learned at each grade level, and contain a defined set of endpoints in the development of each. Explain to participants that while today's focus is on the Standards for Mathematical Practice, we will be going in-depth into the Standards for Mathematical Content in the next a future session.
- Focus participants back on the Standards for Mathematical Practice. Explain that these standards are often simply called the Practice Standards or the practices, and that is the way they will be referred to during the remainder of this session. The practices include the mathematical habits of mind and mathematical expertise that students should develop such as reasoning, communication, making arguments, and modeling.
- What's New About the CCS-Math?
- In order to meet both the Content Standards and the Practice Standards, the writer's of the Common Core explicitly based the standards on three very important fundamentals of mathematics that were missing from or were not as explicit in different versions of mathematics standards. Those are: Focus, Coherence, and Rigor. Explain to participants that we will now take a few moments using the next five slides to explore how these are embedded within the Common Core.



Slide 9

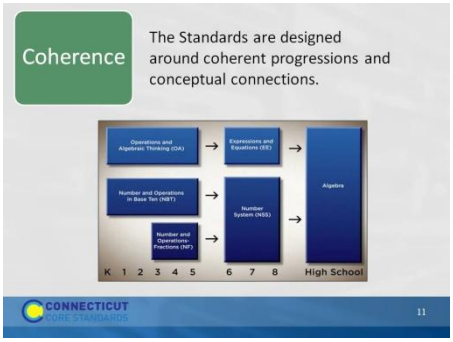
Focus: The writers of the standards worked very hard to reduce the number of expectations at each grade level. This work was not done arbitrarily. They focused on the different domains of mathematics, such as operations and algebraic thinking, number and operations in base ten, geometry, and measurement and data, and determined what work was critical for students at each grade level to address in order to develop the concepts in each domain over time. This reduction in number of standards allows teachers to shift their instruction to focus on the major work at their grade level and to spend more time in each of these critical areas in order for students to develop a deep understanding through investigation, inquiry, and problem solving.



Slide 10

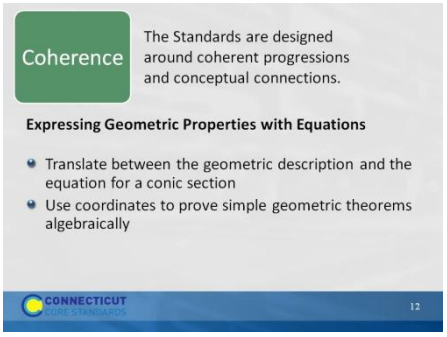
Coherence: Coherence means ensuring that there is a clear sequence of concepts and skills that build on each other across the grades. In the example on the slide, point out grade 7 standard 2b, and grade 8 standard 5. The connection between these is that, in grade 7, students work on the idea of unit rate, and then, in grade 8, they connect the unit rate to the slope of a line. Point out that the grade 7 and 8 standards then lead to algebra standard 2 which requires that students create equations and graphs to express relationships between quantities.

The progressions can be accessed here: http://ime.math.arizona.edu/progressions/ for additional reference



Slide 11

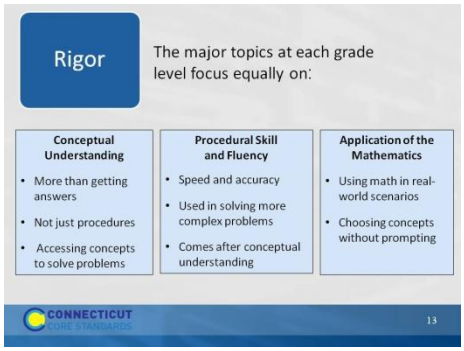
Coherence: The chart on the slide shows one of the progression in the CCS-Math that builds up to algebra in high school. Be sure to explain that this is just one of the progressions. Other progressions that cover additional domains will be addressed in future modules. The point here is to show the purposeful nature of the vertical progressions. Within this particular progression, note that the Operations and Algebraic Thinking standards in grades K–5 lead up to and are designed to help middle school students work with Expressions and Equations, which will then help students to be successful in high school algebra. This same progression takes place with the Number and Operations domains. In K–5, the Number and Operations standards are split over two domains, Base Ten and Fractions. This does not mean that the standards within the domains are not connected, but that there is a focus on each. Fractions are not explicitly focused on until 3rd grade after students have formed a foundation for Base Ten. Deep work over time within these two Number and Operations domains will support middle school students to be able to work within the Number System, supporting further success as they progress into high school algebra.



Slide 12

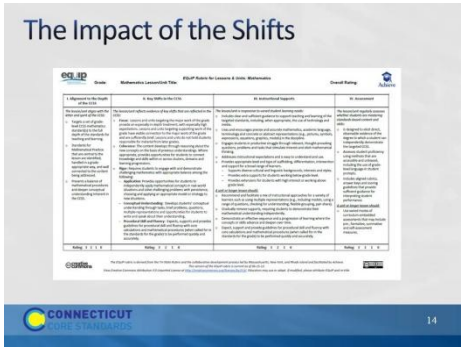
Coherence: As highlighted in the example of slide 10, coherence also means ensuring that connections and relationships among ideas are highlighted and made clear. Students should see each standard as an extension of previous learning, not as a new and separate topic of study. The geometry standards listed in the slide have an explicit connection to other standards, mostly related to algebra. These connections should be made explicit. If participants want to see the grade level progressions for geometry, they can reference the Progressions

Document located at: http://ime.math.arizona.edu/progressions/



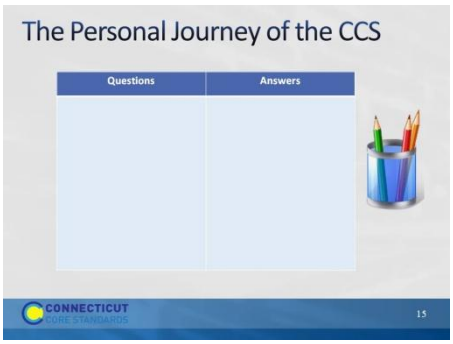
Slide 13

Rigor: Rigor means learning that is based in the deep understanding of ideas AND fluency with computational procedures AND the capacity to use both to solve a variety of real world and mathematical problems. Tell participants that conceptual understanding, procedural skill and fluency, and application of mathematics will be addressed in much more depth in future modules when we discuss planning lessons around specific content learning goals and when we discuss how to assess both the Practice and the Content Standards.



Slide 14

The Impact of the Shifts: Distribute copies of the EQuIP rubric. Explain to participants that the EQuIP Rubric is a tool for evaluating CCS-Math lesson plans. Allow participants to review the rubric on their own and then as a group. As they discuss the rubric in their groups, ask them to think about their responses to the comparison of mathematics instruction in the past and in the present that were provided in the first activity of this section, and to think now about how those changes will impact planning, teaching, and learning at the classroom level. Debrief the small group discussions by adding to the chart of what participants know about the CCS-Math.



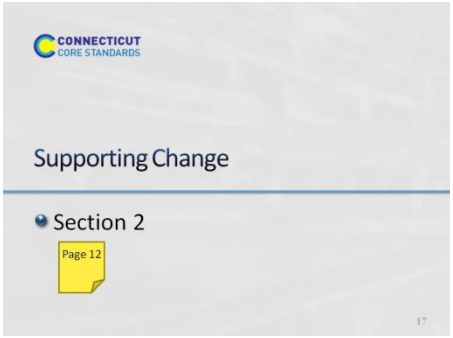
Slide 15

The Personal Journey of the CCS: Explain to participants that before they move on the next section, you want them to take a moment to write down, in the Questions column in the chart on page 10 any questions that they personally have right now about the CCS-Math. Further explain that throughout this and future sessions they can refer back to their list of questions and document the answers as they are found.

Slide 16

Phil Daro: Tell participants that to finding answers to their questions they will now hear from Phil Daro, one of the major figures involved in writing the Common Core Standards and a professor at Stanford University, as he discusses what mathematics instruction should look like in the era of the Common Core and the need for change in mathematics teaching and learning. Play the video and then wrap-up Section 1 by debriefing the video with participants as a large group. Use the overarching topic of change to transition to Section 2, in which participants will begin to look at their role in helping teachers make the changes within their classroom that have been discussed.

Section 2



Slide 17

Section 2: Supporting Change

Section 2 Training Objectives:

- To understand the stages of change that teachers will go through as they work through their implementation of the CCS.
- To practice the process for setting norms within a learning group in order to anticipate how they will support teachers through their stages of change.

Section 2 Outline:

1. Participants will first be introduced to the stages of change and will discuss the implications of working with teachers through these stages. A focus will be placed on creating a professional learning environment in which teachers feel comfortable in expressing their ideas, strengths, and challenges on their personal implementations of the CCS.
2. Participants will then go through the process of setting norms for working within their professional groups in this session as a way to model the types of considerations that will need to be made back at their school. As they engage in this process, participants will work in their group to answer questions such as: *In a conversation what is something that encourages you to speak your mind? What is something that deters you from expressing your ideas?* Responses will be recorded on chart paper. Later, in Section 4, when perseverance is addressed, these norms will be referenced as a way to look at creating a classroom environment in which the Standards for Mathematical Practice can be developed.

Supporting Documents

Stages of Change

Creating an Environment for Personal Change

Materials

Chart paper, markers

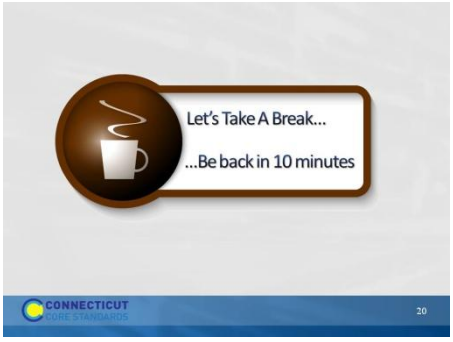
Slide 18

- **Change Isn't Easy:** Explain to participants that change is often difficult, and full implementation of the new standards cannot and will not happen overnight. It will be a process. In this regard, it is helpful to think about the stages of change, and to be aware of and celebrate progress through the stages. Note that the chart on the slide has been provided on **page 12** of the Participant Guide.
- Review the stages as follows:
- Stage 1 is Awareness – simply knowing what is being asked and what it means
- Stage 2 is Application and Experimentation – Getting your toes wet, trying out new strategies and perspectives
- Stage 3 is Ownership – That's the moment you get buy-in; you believe in the change and take it on personally
- Stage 4 is Advocacy and Innovation – This is the point where you are proficient and can help others and make improvements in the work itself.
- Let participants know that, as coaches, they should look for signs of where people are and find appropriate ways to support them where they are, and to leverage current stage. They need to understand that for many teachers, the CCS-Math may represent a new way of understanding math themselves.
- It's also important to know where you are as a coach on this road and to keep yourself moving, celebrating the progress you make and simultaneously preparing for the next steps.
- After reviewing the stages, ask participants to think about where the teachers in their school are now and how they can help teachers work through these stages of change. Depending on where each school is in their implementation of the CCS, some teachers may only be at the Know It stage, while others may be at the Try It stage or beyond. For those that are at the Know it stage, participants will need to think carefully about the information being presented within each module in order to determine how they will bring the information back to teachers. They will also need to consider how they will help teachers to implement strategies that will be presented in order to help teachers to move to the Try It stage. Knowing where teachers are in the change process will help participants frame their goals for each session in terms of what they need to do to help teachers move forward towards Advocacy and Innovation.
- Transition to the next activity by explaining to participants that because teachers are all at a different place with the change process, the environment for change needs to be one that supports each individual.

Transition to the next activity by explaining that one way they can begin to shape the environment for change is to have teachers set norms for how they will work together and discuss the changes that are taking place.

Slide 19

Creating an Environment for Personal Change? Ask participants to silently answer the questions on **page 13**. Tell them that when everyone at the table has written their answers, they share responses, noting any features of conversation that seem really important in facilitating comfort and productivity. Then ask participants to share one or two important ideas from each table. As they share, chart the responses. Develop a consensus around the list for how participants will try to keep the conversation comfortable and productive for everyone. Hang the completed list on the wall, as later, when perseverance and student discourse are addressed, these norms can be referenced. Explain that these norms for working together will be used throughout the work that participants will do within each module and that this is a process that they can use back at their school to help teachers begin to get comfortable with working with each other through the changes required by the CCS.



Slide 20

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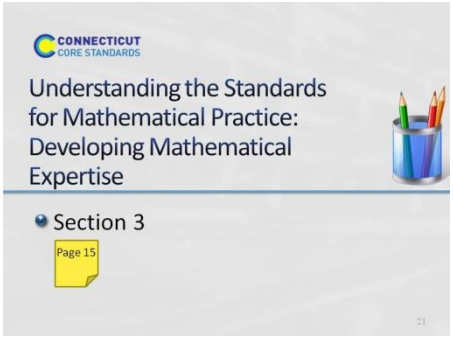
Section 3



Slide 21

Section 3: Understanding the Standards for Mathematical Practice: Developing Mathematical Expertise

Section 3 Training Objectives:

- To introduce all eight of the Standards for Mathematical Practice and adapting the language of the practices to make each grade level appropriate without reducing rigor.

Section 3 Outline:

1. Section 3 begins with participants solving problems that are each aligned to one of the Standards for Mathematical Practice.
2. The facilitator then provides information on each of the eight practices, including information about the standard, what the standard means, instructional supports for helping students to develop the practice, and sample "I Can" statements. Throughout the presentation, participants will answer questions and work in groups to determine which of the problems was an example of the practice, and to create grade level "I Can" statements for each of the practices based on their new understanding of each practice.
3. The section wraps up with teachers discussing how they would pair the practices based on their attributes and then being shown Bill McCallum's Mathematical Practices Grouping Chart.

Supporting Documents

Problem Set: Practice Standards Alignment

Understanding the Mathematical Practices

Materials

Chart paper, markers

Key Implementation Notes:

In this activity, participants will work sample problems that will help them to understand what each of the Standards for Mathematical Practice look like in a classroom situation. Participants will work the problems without knowing the Practice Standard they are most aligned with and the alignment is revealed later during the presentation.

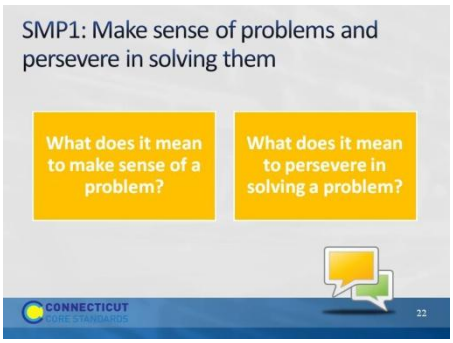
Begin the activity by asking participants to form eight GRADE LEVEL table groups. Once grade level groups have

been formed, ask participants to turn to the Problem Set in their Participant Guide on pages 15-16. Number the groups. Participants should work the problem that coincides with their group number. Participants should work the problem individually and hold off on the group discussion until directed to do so during the presentation of each of the Practice Standards.

While participants are working the problems, hang eight pieces of chart paper around the room. Each piece of chart paper should be labeled with one of the practices. After participants finish working, the problems in the Problem Set tell them to move around the room and rate their personal understanding of each of the practices. They should use a rating scale of 1–5 with 1 having little or no understanding and 5 having a deep understanding of the practice. This exercise will allow you to gauge participants' understanding of the practices and help you to determine the pace of the practices presentation.

During the interactive presentation on all eight of the practices, participants will need their copy of the Standards for Mathematical Practice. Suggest that participants use the *Understanding the Mathematical Practices* on pages 17-24 to make notes and answer questions in each of the designated areas.

Note: You should spend approximately **5-7 minutes** per practice for the first four practices, and then **20-25 minutes** on the small group discussions of the last four practices and **5-10 minutes** debriefing the small group discussions.



Slide 22

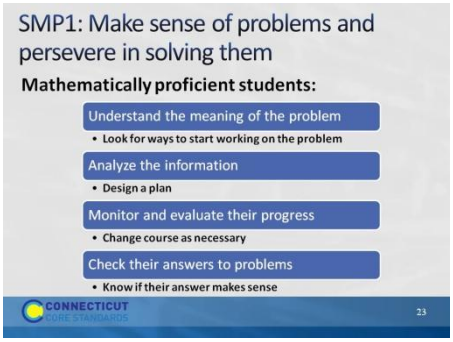
SMP1: Have participants think for a moment about the questions on the slides. Ask for one or two volunteers to share their answer to the questions.

Responses that you want to listen for include points such as:

- Making sense of a problem means that students are able to break the problem into usable parts and determine how each part will be used to answer the question.
- Making sense of a problem means that students are able to use the information in the problem to determine the final questions to be answered.
- Persevering in solving a problem means that students 'stick with it' and do not give up when they find themselves challenged.
- Persevering in solving a problem means that students are able to ask questions about the problem that will

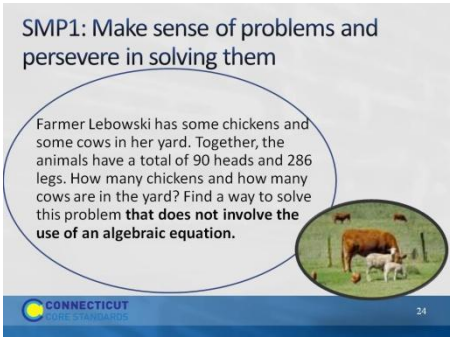
help them clarify points of the problem and make the final problem question make sense rather than wait for someone to tell them how to solve the problem.

These two questions are answered in more depth over the next four slides.



Slide 23

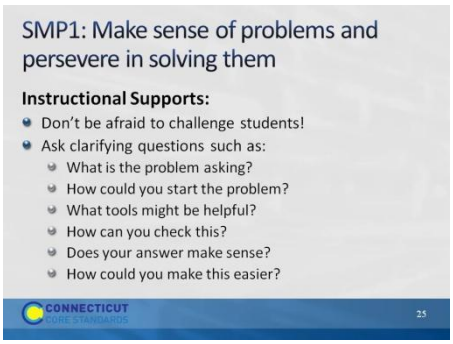
SMP1: Review the checklist of attributes on the slide. As you get to the end of the list, ask for participants who had a problem that required them to do a number of these things as they came up with a solution. Allow groups a minute to discuss with their group to determine if their problem was the one most closely aligned to this practice. Note: Participants may say that all of the problems had some element of this practice, however the problem on the next slide was chosen because it exemplified this practice more than any of the others.



Slide 24

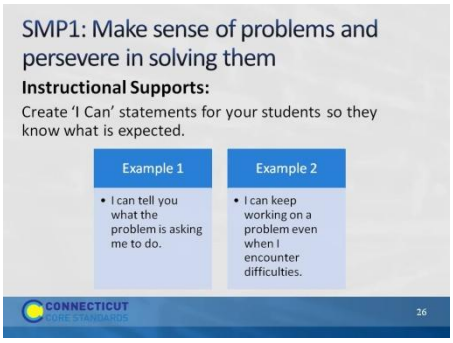
SMP1: Explain that this problem was chosen as the most closely aligned to this practice. Ask for a volunteer from the group who worked this task to discuss this alignment. Key points to make:

- There is no simple algorithm that will solve the problem directly. Students have to find a way to think about the problem and develop a strategy. It may require several false starts.
- Students may be uncomfortable thinking about a problem that is not routine. They will have to work through that in order to successfully answer the question in the problem.



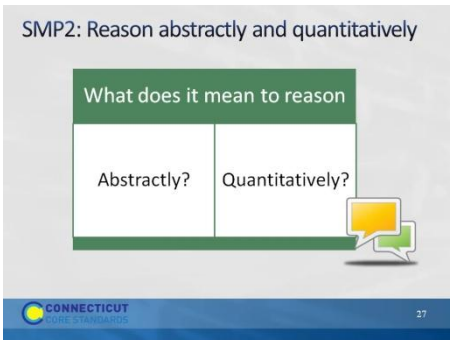
Slide 25

SMP1: Review the instructional supports on the slide. Note for participants that the first support or idea, "Don't be afraid to challenge students!" will be seen throughout the practices. Ask participants what they think it means to challenge students. During the discussion, focus their thinking on challenging students by requiring students to really think about the mathematics. The Common Core is not about learning how to get an answer, as we heard Phil Daro discuss. The Common Core is about learning to solve problems. Solving problems is much more rigorous than getting answers. Students need to be challenged to gain conceptual understanding of the mathematics being taught and must reach a point of being able to recognize, on their own without prompting, when to apply the mathematics that they have learned to solve problems in new situations. This will be challenging and possibly uncomfortable for many students, however, students will need to be challenged in order to develop their mathematical expertise.



Slide 26

SMP1: Review the 'I Can" statements on the slide. Ask participants if they would add any statements here that would better fit students at their grade level. As volunteers provide their statements, make sure that they align with the practice so that students are receiving the correct information.

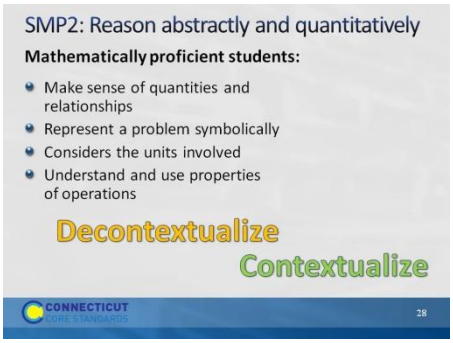


Slide 27

SMP2: Review the questions on the slide. Allow participants to think for a moment and then ask for volunteers to share their answers.

As you listen to participants' answers, listen for things such as:

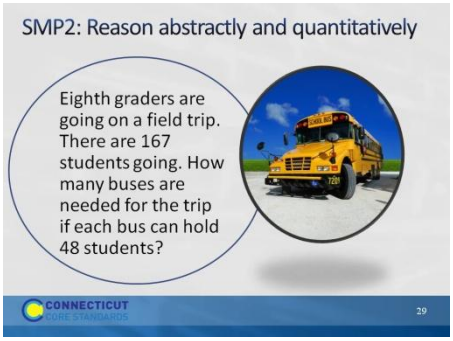
- Reasoning abstractly means to reason within a context or within a situation, form theories, understand problems on a complex level through analysis and evaluation, and to know when and how to apply knowledge when solving problems.
- Reasoning quantitatively means to apply their mathematical skills to solve a problem. Students understand the values that they are working with and are able to relate those to the problem itself.



Slide 28

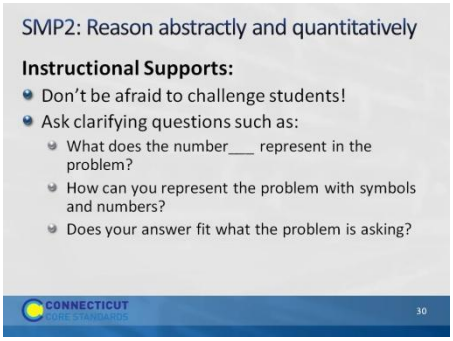
SMP2: Review the points on the slide. At the end of the list, know that some participants may not understand what it means for students to able to *decontextualize* and *contextualize*. To *decontextualize* means to be able to pull the values out of the problem situation and do the work with them that needs to be done. For example, in the problem, Olivia has 4 apples and Sophia has 6 apples. If they both give their apples to Anna, how many apples will Anna have? When *decontextualizing*, students are able to represent the problem as 4+6=10. And then to *contextualize*, they are able to put the final values back in to the problem situation. If students were given the number sentence 4+6=10 and are able to create a problem situation that makes the number sentence, this would be considered *contextualizing* as well.

Before moving to the next slide ask participants to look at the problems they solved and determine whose problem would be aligned with this practice.



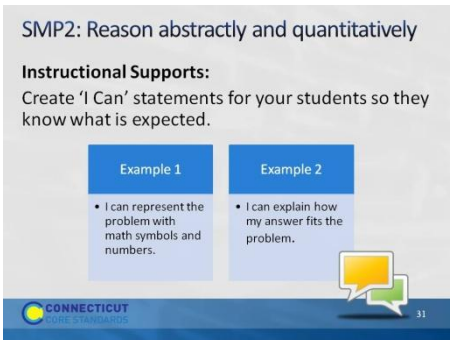
Slide 29

SMP2: Reveal that the 'field trip' problem was chosen for this practice because, not only do students need to apply Practice 2 when working the problem, but they must also think about their answer within the context of the problem itself. While 167 divided by 48 gives us an answer of 3.47 or 3 with a remainder of 23, a student cannot use their calculated answer to solve the problem because the problem is not asking them to solve 167 divided by 48. The problem is asking them to determine how many buses are needed. Division is one tool that can be used to determine this. Others are estimating, rounding, etc. The final answer is four buses are needed.



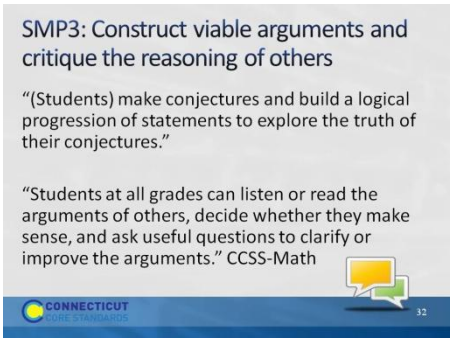
Slide 30

SMP2: Review the instructional supports on the slide.



Slide 31

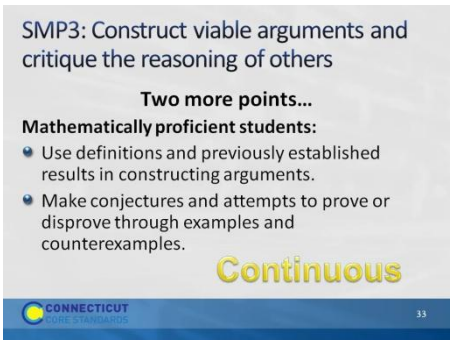
SMP2: Review the 'I can" statements on the slide. Ask participants if they would add any statements here that would better fit the students at their grade level. As volunteers provide their statements, make sure they align with the practice so that students are receiving the correct information.



Slide 32

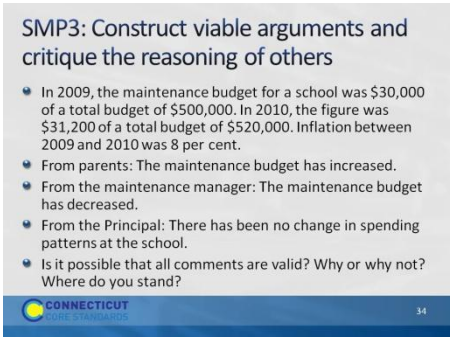
SMP3: Have participants read the two quotes on the slide. Ask them to tell you some thoughts or key words that jump out at them. Chart their responses so that there is a visual to discuss. Some things to watch and listen for are: construct arguments, arguments of others, decide, ask useful questions, and improve arguments. As participants look at the completed list of their responses on chart paper, have them think about what is not said. After a 30 second wait time, explain that this practice is not just about students explaining their work. It is about students telling why what they did worked, or didn't work. Remember, it's important for students to know and understand where something went wrong. Not knowing why something did or did not work can lead to misconceptions. Critiquing the reasoning of others does not mean to simply tell if another student got the answer right or wrong. It means that a student has to understand a peer's approach and be able to tell why the mathematics behind that approach worked or did not work.

Use the next four slides to support these two quotes.



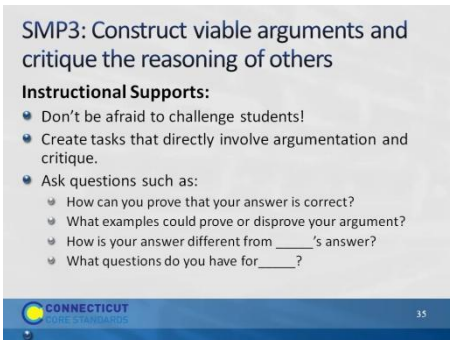
Slide 33

SMP3: Review the points on the slide and further emphasize to participants that this practice is *continuous*. Constructing viable arguments and critiquing the reasoning of others is something that should be done in small and large group discussions, in a student's own work, etc. This should happen all the time. Before moving on, have participants determine which of the problems align most closely with this practice.



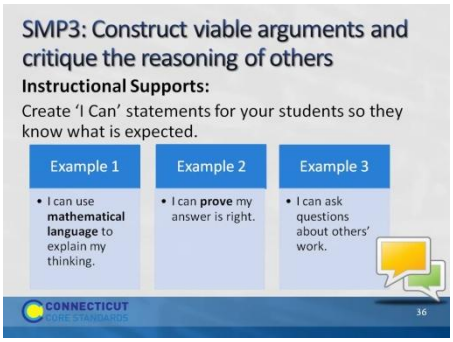
Slide 34

SMP3: Explain that this problem was chosen because students have to justify their answer using mathematics. In a classroom situation, this would be a good opportunity to have students compare answers and strategies. If students reach different answers, ask students to examine each other's approach and to determine whose answer is right and why. Ask participants if anyone currently does this in their classroom and if so, have them describe the strategies they use. Allow other participants to ask questions. The next two slides provide additional instructional supports for Practice 3.



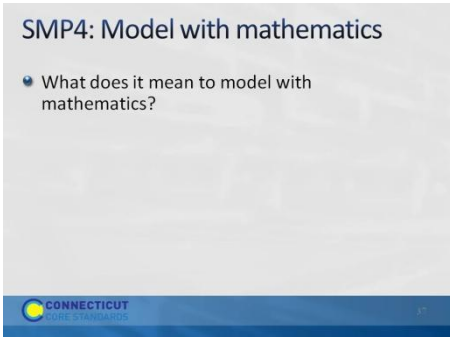
Slide 35

SMP3: Review the instructional supports on the slide.



Slide 36

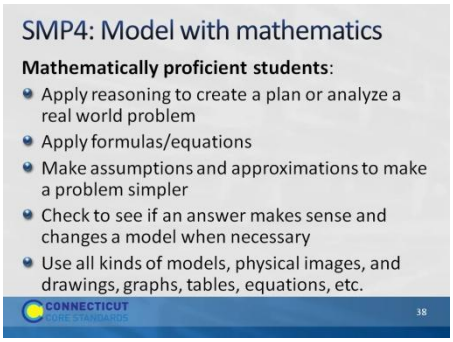
SMP3: Review the 'I Can' statements on the slide and ask participants if they would add anything to the list. Allow volunteers to share their ideas and then move to the next practice.



Slide 37

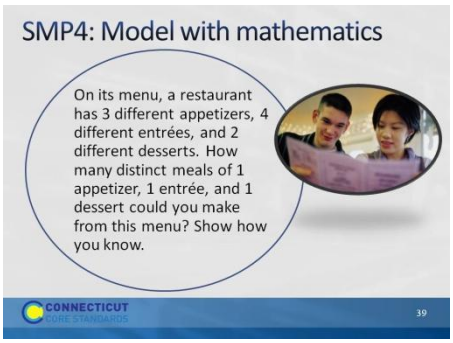
SMP4: Ask participants to think about the question on the slide and explain that Practice 4 is one that tends to be interpreted rather narrowly. Modeling with mathematics is not just about building a concrete model or drawing a picture. It is more about doing those things to model mathematical situations and using those to develop an equation that makes sense for the problem. There is more on this over the next four slides. Before moving on, ask

participants which of the problems in the Problem Set best aligns to the practice of modeling with mathematics.



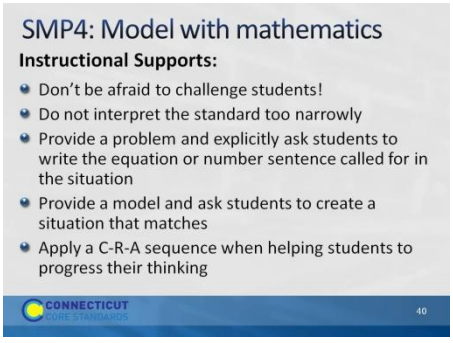
Slide 38

SMP4: Review the points on the slide.



Slide 39

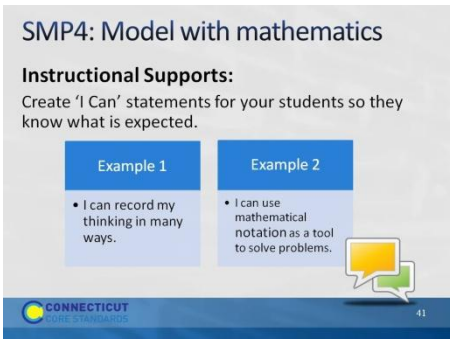
SMP4. Explain that, in this problem, students will generally have to come up with some type of model that will help them to solve the problem.



Slide 40

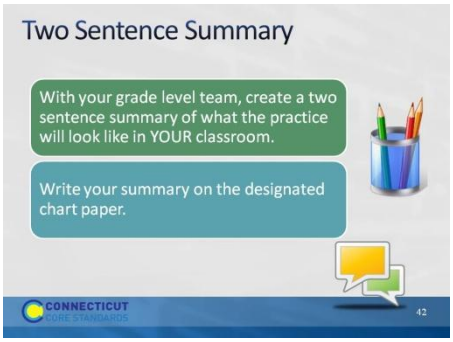
SMP4: Review the instructional supports on the slide. When you get to the last point, ask participants if they have heard of a C-R-A approach? If some have, ask them to explain this approach to the others. If no one has, explain

that it is a continuum that they should use with students as they work through problems. Start with the *concrete* (C) such as using counters or cubes, move to the *representational* (R) such as pictures and drawings (things you have to create on paper that you cannot hold in your hand and physically manipulate), and then to the *abstract* (A) using mathematical symbols. As students work through problems, they can go back and forth along this continuum. For example, if a student is having trouble at the abstract stage, they can go back a stage until they are successful and then move forward again.



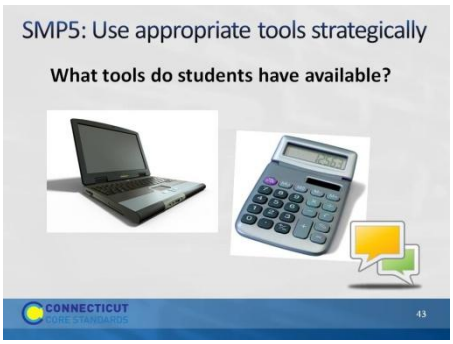
Slide 41

SMP4: Review the 'I Can' statements on the slide. Ask participants if they would add anything to the list that would make these statements more grade-level specific. After volunteers have shared, move to the next practice.



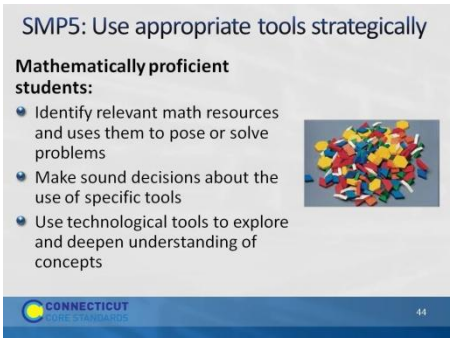
Slide 42

Two Sentence Summaries: Around the room, hang pieces of chart paper that are labeled with the first four practices. There will need to be three pieces of chart paper per practice. Label the first sheet "Grades 6 & 7," the second sheet "Grades 8 & 9," and the third sheet "Grades 10-12." Allow participants **10 minutes** to complete this portion of the activity and then move on to the last four practices.



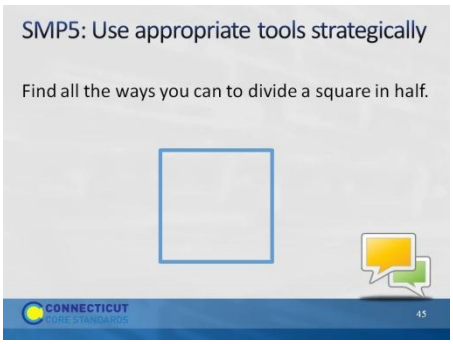
Slide 43

SMP5: Have participants brainstorm a list of the tools that students have available to them—in and out of the classroom—and to then share responses. If not brought up by participants, add tools such as calculators, computers, physical models, sketches, tables and charts, graph paper, geoboards, number lines, word walls, lists of problem solving strategies, their own previous work, etc. These may be things that we do not normally think of as "tools" but all can be used strategically when solving problems.



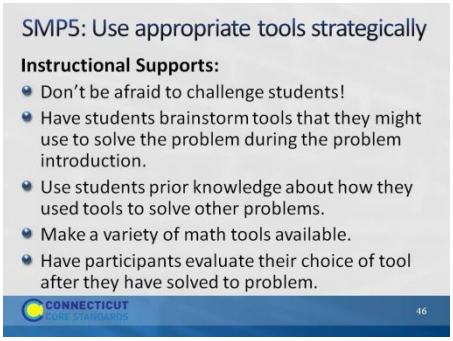
Slide 44

SMP5: Review the points on the slide and ask participants to determine which problem from the Problem Set most closely aligns with this practice.



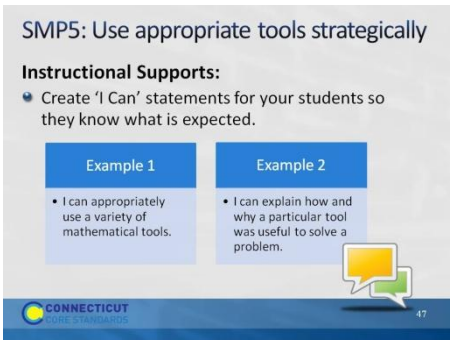
Slide 45

SMP5: Now that participants have had practice looking at four other problems and determining the alignment to the practices, have them talk for a moment at their tables and determine why this problem was chosen to represent the practice of using appropriate tools strategically. As participants talk, points that you will want to listen for (and to bring up, if participants do not) are: students may need simple 'low tech' tools like paper squares to fold and/or draw on or, if available a computer program that will let them do the same. But they will probably need some type of tool in order to solve the problem.



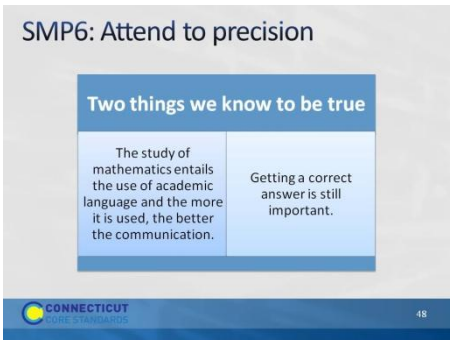
Slide 46

SMP5: Review the instructional supports on the slide.



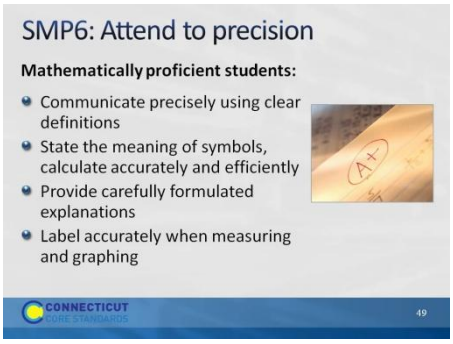
Slide 47

SMP5: Review the 'I Can' statements on the slide and ask participants if they want to add anything to make these grade-level specific. Ask for volunteers to share their thoughts and then move to the next practice.



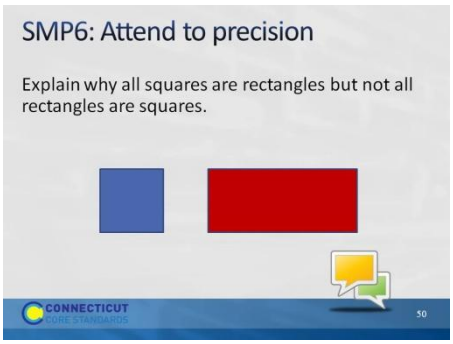
Slide 48

SMP6: Review the two points on the slide. Explain that, while we have to focus much of our attention on how students think and reason within mathematics, we do still want them to be precise as well.



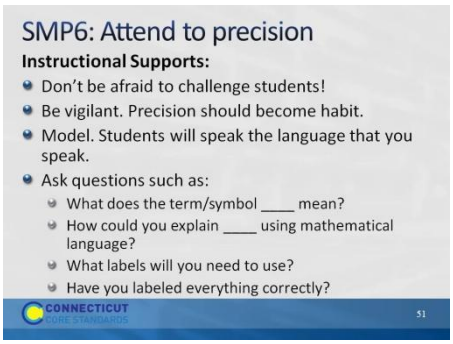
Slide 49

SMP6: Review the points on the slide.



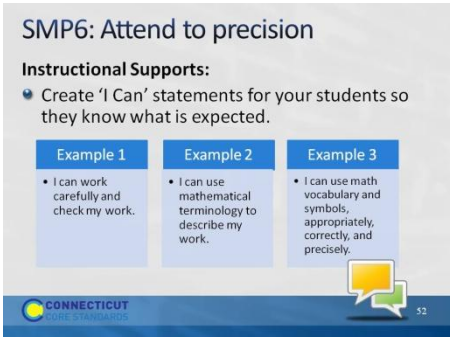
Slide 50

SMP6: Have participants work for three minutes in their small group to determine what types of mathematical language students would need to use when answering this question from the Problem Set.



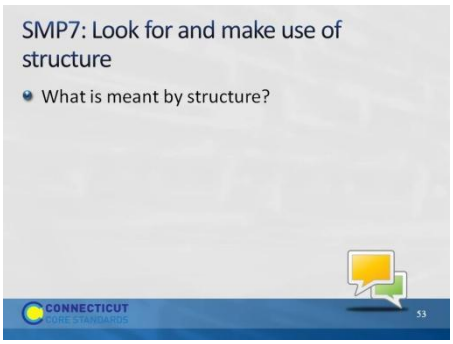
Slide 51

SMP6: Review the instructional supports on the slide.



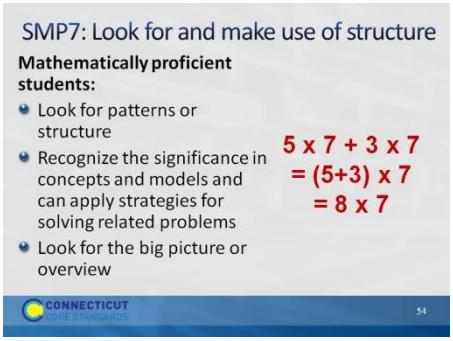
Slide 52

SMP6: Review the 'I Can' statements on the slide and ask participants if they would add any to the slide to make them more grade-level specific. After volunteers give their statements, move to the next practice.



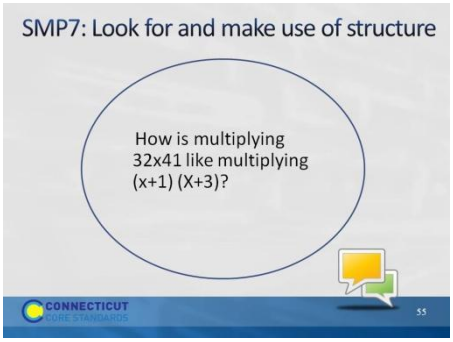
Slide 53

SMP7: Ask participants to think about the question on the slide and, in their table groups, try to come up with an answer to describe structure in mathematics. If participants struggle with this, let them know that, it's ok. Practices 7 and 8 are two of the most difficult practices for teachers to visualize. This is due in part to the language used within the practice, which doesn't always align to the language that would be used.



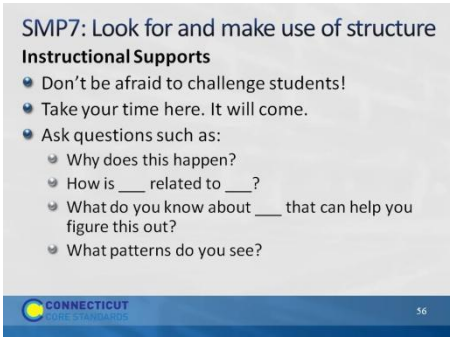
Slide 54

SMP7: Review the points on the slide. Use the example to further describe the idea of using structure. Students use structure when they understand that 8 x 7 is the same as 5 x 7 plus 3 x 7.



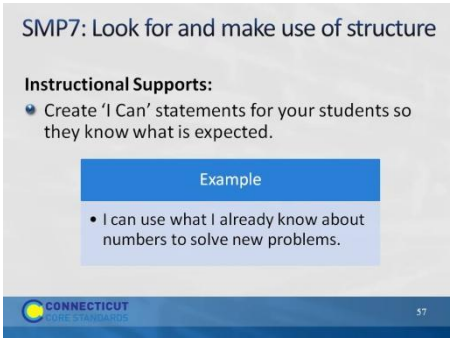
Slide 55

SMP7: Have participants look at their solution to this problem and determine what structure they used to solve this problem. They should notice that 32 is (30+2) and 41 is (40+1), so 32 x 41 is the same as (30+2)(40+1). The steps in the standard algorithm for multiplying 32 x 41 are the same steps as the "FOIL" method for multiplying (x + 1) (x + 3).



Slide 56

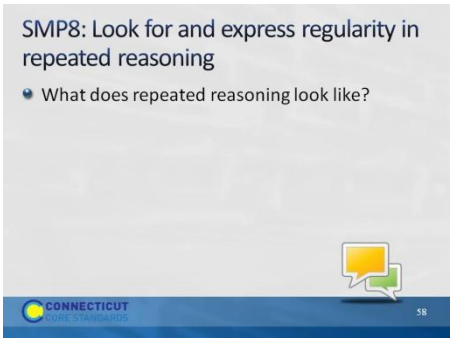
SMP7: Review the instructional supports on the slide.



Slide 57

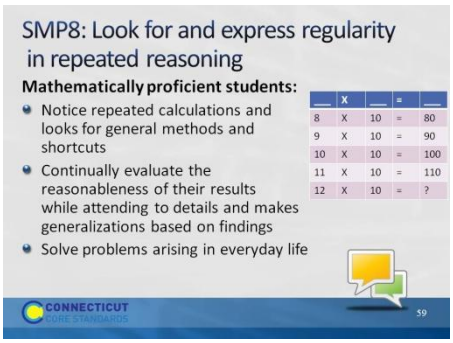
SMP7: Review the 'I Can' statement on the slide. Ask participants to come up with at least one other statement

that can be used at their grade level. After volunteers have shared their statement, move on to the final practice.



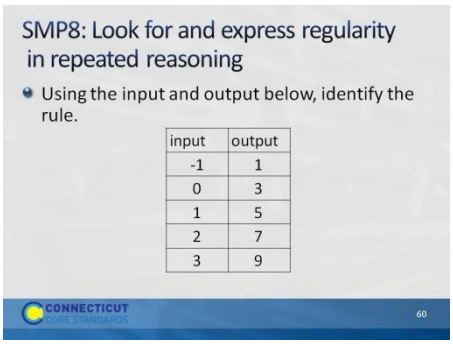
Slide 58

SMP8. To introduce this final practice, have participants think about examples they have seen of students using repeated reasoning in their classroom. An example might be determining a function based on the pattern seen in a table, chart, or graph. The next four slides will be used to support this practice.



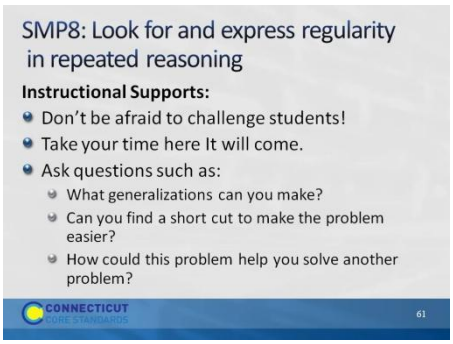
Slide 59

SMP8: Review the points on the slide. Ask participants how students can use repeated reasoning to find the missing value in the chart.



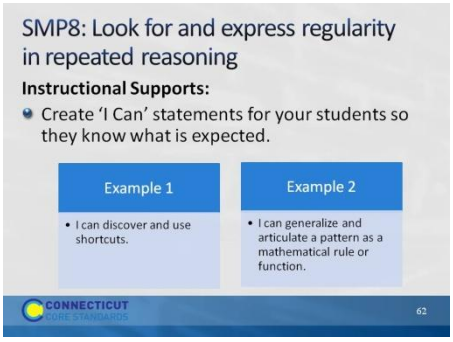
Slide 60

SMP8: Now challenge participants to look at this problem in the Problem Set. Ask for those that worked this problem to share their solution.



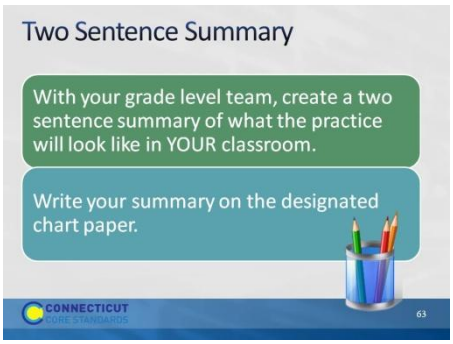
Slide 61

SMP8: Review the instructional supports on the slide.



Slide 62

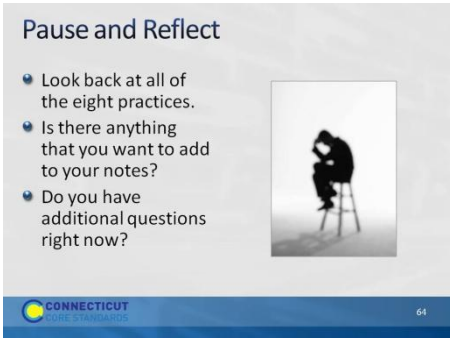
SMP8: Review the 'I Can' statements on the slide. Ask participants one last time to modify these to make them grade-level specific. Once volunteers have shared, move to the next slide.



Slide 63

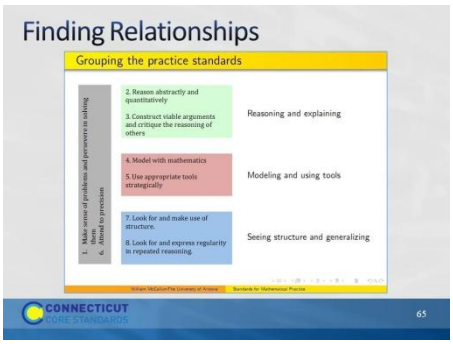
Two Sentence Summaries: Around the room, hang pieces of chart paper that are labeled with the final four practices. There will need to be three pieces of chart paper per practice. Label the first sheet "Grades 6 & 7," the second sheet "Grades 8 & 9," and the third sheet "Grades 10-12." Allow participants **10 minutes** to complete this portion of the activity.

Once participants have completed their summaries, have them revisit the chart on which they gave their initial rating of understanding and ask them to change the rating based on the last hours' worth of work. Discuss with participants changes in their thinking, what they better understand now, and what they want to do once back in their classroom.



Slide 64

Pause and Reflect: Allow participants two or three minutes to look back over their notes on the practices and make any needed additions. Before moving to the next slide, ask participants how they might group the standards based on the relationships they see and that we have discussed thus far. The next slide will show an example of how the practices have been grouped by some of the writers of the CCSS-Math.



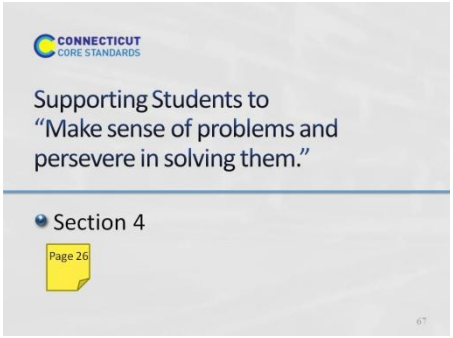
Slide 65

Finding Relationships: Explain to participants that Bill McCallum, one of the writers of the CCSS-Math, put together this chart to show how the practices can be grouped or organized based on their relationships. Ask participants if they would have grouped them differently and why. If participants are unsure of this grouping have them look for evidence in the standards themselves that support the organization found here. Further explain that Practice 1: "Make sense of problems and persevere in solving them" and Practice 6: "Attend to precision" are considered the overarching habits of mind of mathematical thinkers. This does not mean that these two practices are somehow more important. It means that these two practices are related to each of the other six practices. If needed, go back and look at the sample problems that were completed for each of the eight practices and have participants find evidence of Practice 1 and Practice 6 in each. When participants are ready to move on, let them know that because of the relationship that Practices 1 and 6 have to the other six practices, we are going to look more in-depth at each of those practices.

Slide 66

Remind participants of the need to be timely. Allow 45 minutes. State time to return.

Section 4



Slide 67

Section 4: Supporting Students to "Make sense of problems and persevere in solving them"

Section 4 Training Objectives:

- For participants to experience a mathematics task from a student's perspective in order to gain a deeper understanding of what it means to make sense of a problem and persevere in solving it

Section 4 Outline:

1. Participants will begin by working through the *Kites* task. Participants will debrief the task as a large group and talk about the experience from a personal standpoint.
2. Participants will then work together to discuss what would be needed to help students make sense of this problem and to persevere in solving it.
3. Using this information and the experience of the *Kites* task, participants will create a description of a classroom environment that is set up to help students "*Make sense of problems and persevere in solving them.*"

Supporting Documents:

Kites Activity

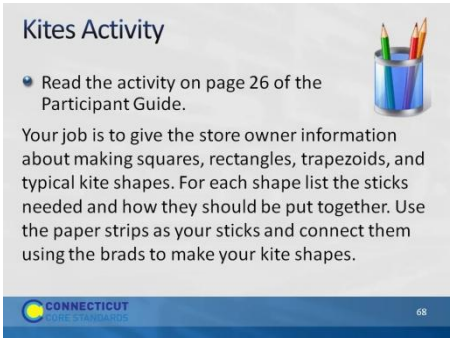
Materials:

Chart paper, markers
Strips of card stock – 1 set per table
Metal brad – 1 per participant
Graph paper – 1 cm squares – 2 sheets per participant
Rulers – 1 per table
Protractors – 1 per table

Key Implementation Notes:

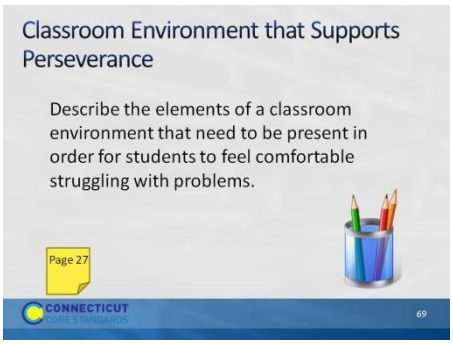
In this activity, participants will work a challenging problem and then discuss what information they needed in order to make sense of the problem and how they helped themselves to persevere. With that in mind, be sure to

move throughout the room as participants work, ask questions that will help participants move forward if they get stuck, and to listen closely as groups work. Make note of interesting comments, ideas, and strategies that you will want to make sure to raise in the large group discussion.



Slide 68

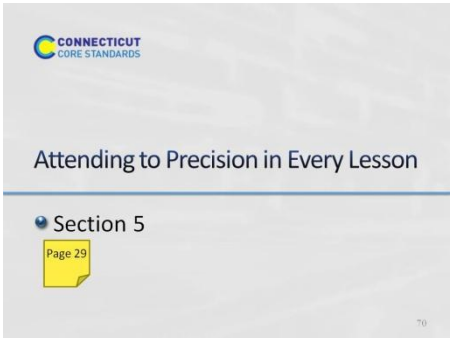
Kites Activity: Explain to participants that you want to give them an opportunity to see, think, and feel what their students do when solving problems. Have them first read the problem on the slide and on the *Kites* handout and take three minutes to start working on this alone. **As they read the problem on the slide, demonstrate how to attach the sticks with a brad and how to use the manipulative.** When three minutes are up, ask participants to work in small groups to solve the problem. The first five minutes of their group work should involve each group member taking one minute to present their initial thoughts. Others should listen quietly. After the five minutes of sharing has been completed, have participants work together to expand on those ideas and solve the problem. Give them **15 minutes** to work and explain that each group should put their final solution on chart paper. If you see that groups are struggling, stop the work about every five minutes and have the whole group discuss where they are, what their thinking is, and what strategies they are trying. This is a good way to help those that are struggling to hear other ideas and perspectives, rather than waiting until the end. Use this time to answer questions that participants might have about the problem. Just be careful not to give away a possible solution with your answers. When time is finally called, have groups share their work and, as a large group, talk about what made this problem challenging, what did they do to make sense of the problem, and what it felt like to persevere with this problem. This will give participants insight into what we are asking students to do.



Slide 69

Classroom Environment that Supports Perseverance. Direct participants attention back to the norms they created for working together as adults and ask them to think about the environment that was created that allowed them to feel comfortable with struggling and persevering with the *Kites* problem. Now, ask them to think about how those environmental elements translate into the classroom environment. Have participants create a description of a classroom environment that supports perseverance. As time permits, have volunteers share their ideas before moving on to the next activity. Key aspects that need to be brought out the conversation include, a safe environment for asking questions, an understanding that mistakes are important steps in learning, an understanding that multiple perspectives are helpful in creating a solution strategy, and that there is not always one right way to solve a problem. Transition to the next section by explaining to participants that even though multiple and varied strategies for solving the same problem are promoted within the standards, one thing that must stay constant is students attention to the precision of the mathematics.

Section 5



Slide 70

Section 5: Attending to Precision in Every Lesson

Section 5 Training Objectives:

- To provide participants with a deeper understanding of how to help students attend to precision in classroom lessons.

- For participants to begin to identify instructional strategies that can be implemented to help students attend to precision.

Section 5 Outline:

1. Participants will watch a classroom lesson in which the teacher helps students attend to precision.
2. In groups, they will then discuss how this teacher gets students to attend to both the precision of the mathematical language and the calculations needed to complete the work.
3. The facilitator will wrap up Section 5 by charting the instructional strategies identified by the participants and using that list of strategies to transition to Section 6.

Supporting Documents

Video Observations Sheet

Materials

Chart paper, markers

Video

Cathy Humphreys working on the diagonals problem with students. The video can be found here: http://www.insidemathematics.org/index.php/standard-6 **(view the 4th video in the grade 9-10 series)**

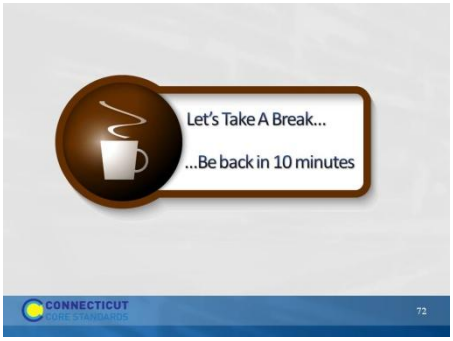
Key Implementation Notes:

Because this is participants' first time conducting a video observation in this module series, explain to participants that when they watch video of others' teaching that they need to keep in mind that no one lesson is perfect. The teacher and students sometimes make mistakes, that the teacher may do or say something that the participant may find annoying or not in-line with their personal beliefs. However, each video presented as we go forward has been chosen for a distinct purpose and that purpose is the lens through which the video should be observed. For example, in this section the key things for participants to pay attention to are the strategies that the teacher uses to help her students attend to precision within the lesson.

Slide 71

Let's Observe: Play the video of Cathy Humphreys working on the diagonals problem with students. The video can be found here: http://www.insidemathematics.org/index.php/standard-6 **(view the 4th video in the grade 9-10 series).** As they watch, ask participants to use the *Video Observation handout* (page 29) to record how they observe the teacher helping her students to attend to precision. After the video, debrief the participants'

observations as a large group and chart the strategies identified. Before the break, have participants look back at their questions and fill in any answers that have been found thus far.



Slide 72

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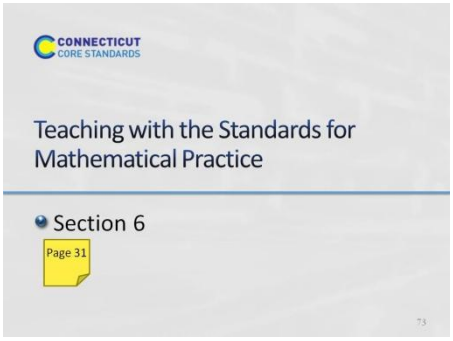
Section 6



Slide 73

Section 6: Teaching with the Standards for Mathematical Practice

Section 6 Training Objectives:

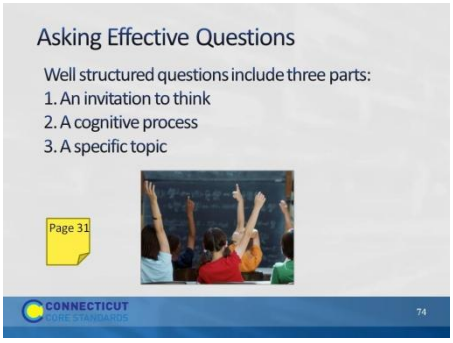
- To introduce participants to specific instructional strategies that will promote the development of the mathematics practices.
- To help participants plan for the inclusion of the mathematical practices in everyday classroom lessons.
- To provide an opportunity for participants to apply the EQuIP Rubric for evaluating lesson plans.

Section 6 Outline:

1. Participants are first engaged in an exploration of the instructional strategies of asking effective questions, engaging students in mathematical discourse, and teaching and learning mathematics through multiple representations. Through their exploration, participants will engage in a discussion around how these

strategies can be used to help students develop the mathematical practices.

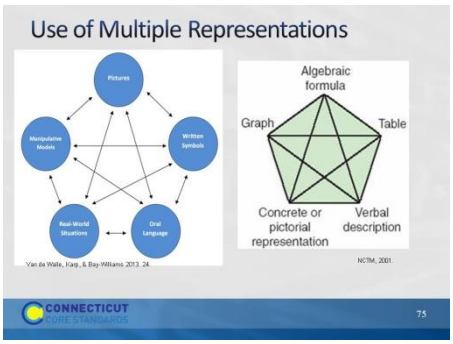
2. Participants will then use this information to assist in an examination of a sample lesson plan through the lens of the EQuIP Rubric. During the lesson examination, participants will focus only on sections of the rubric that specifically discuss the Standards for Mathematical Practice.
3. Participants will build off of this experience and work within a small group to plan a set of instructional suggestions around a given mathematics task that teachers could use with students and that will meet the expectations set forth in the EQuIP. The facilitator will wrap up this Section 6 by having participants discuss their experience and identify possible teacher questions and challenges that they may encounter back at their school.



Slide 74

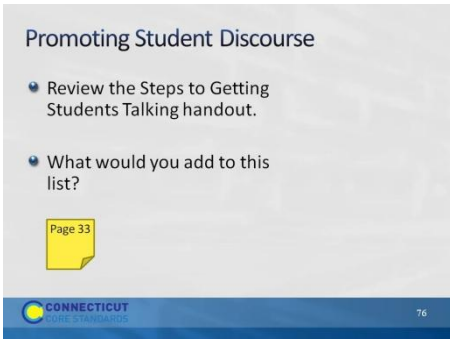
Asking Effective Questions: Begin the discussion by asking for some examples of questions that were asked in the *Kites* activity and have participants think about why the those questions were asked. Then, have participants compare the those questions to the list of questions generated during Section 3 around each of the practices. Lead participants in a discussion of how the questions were similar and how they were different.

Have participants review the *Asking Effective Questions* handout. As they review, have them highlight or underline ideas that are new to them that they would like to try or that are important for them personally to remember. Also, have participants consider how they will introduce the strategy of asking effective questions to teachers at their school. Point out to participants that in Connecticut, and in alignment with the SBAC Content Specifications, we use Hess' Cognitive Rigor Matrix which expands on the ideas that Bloom's taxonomy frames for better questioning. If time permits, ask for volunteers to share their thoughts.



Slide 75

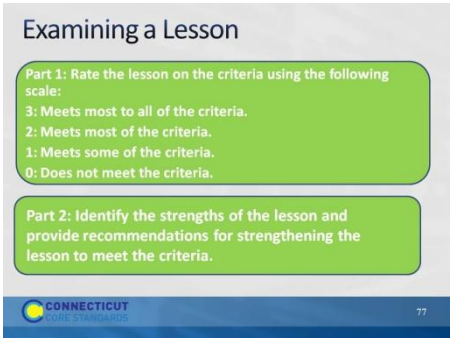
Use of Multiple Representations: Have participants look at the two models for using multiple representations on the slide. Explain that the model on the left can be used by younger students to guide their use of multiple representations while the model on the right can be used by older students. Have participants discuss briefly in their groups how the different representations are connected in both models. Have participants discuss how the use of multiple representations were used in solving the *Kites* problem and have them provide examples of the Practices that can be supported by their use. Wrap up the discussion by calling on 5–6 participants in rapid succession and having them give one sentence that summarizes their thinking about the use of multiple representations and one strategy for introducing the importance of multiple representations to their teachers.



Slide 76

Promoting Student Discourse: Have participants look at their copy of the eight practices and identify how many have "communication of ideas" embedded within them. The answer is that *all eight say* something about communication somewhere in the standard. This just reiterates the importance of having students talk both in small and large groups as this gives them practice with learning to express their mathematical thinking and ideas.

In small groups, have participants review the *Steps to Get Students Talking* (page 33) in the Participant Guide and ask each group to come up with two more ideas that they got from the video or from the discussion today to add to the list. Wrap up this discussion by having groups share their two ideas.



Slide 77

Examining a Lesson. Explain to participants that in this activity they are going to work together as a group to examine a lesson plan designed to teach the standards. They will examine this lesson by using the EQuIP rubric. Note for participants that every criteria on the rubric WILL NOT be used at this point. Have participants note or underline the following criteria as these are the criteria that they will use in their examination:

I. Alignment to the Depth of the CCSS: Bullet 2.
II. Key Shifts in the CCSS: Application under Bullet 3.
III. Instructional Supports: Bullets 1-4.
Within their group, participants should use the lessons and the space on **page 38** to complete both parts of the lesson examination.

Part 1: Rate the lesson on the criteria using the following scale:

3: Meets most to all of the criteria.

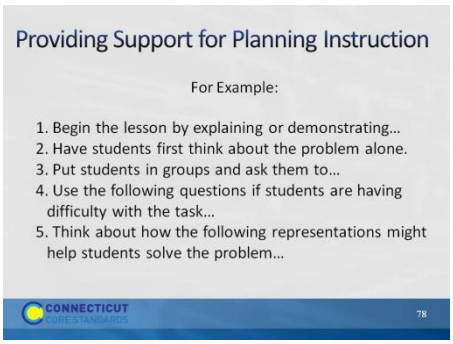
2: Meets most of the criteria.

1: Meets some of the criteria.

0: Does not meet the criteria

Part 2: Identify the strengths of the lesson and provide recommendations for strengthening the lesson to meet the criteria.

After groups work, engage participants in a large group discussion on their findings. Transition to the next activity by explaining to participants that they will use their experiences with the practices, solving *Kites,* and examining the lesson to think through instructional suggestions that they might provide a teacher around a central mathematics task within a lesson.

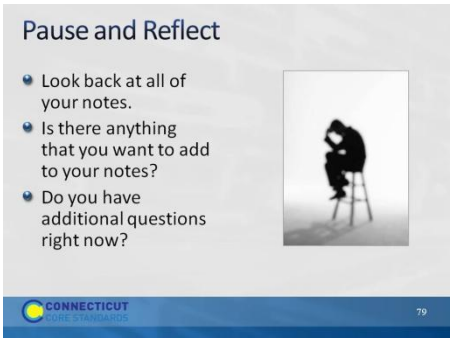


Slide 78

Providing Support for Planning Instruction: Have each group choose one task from those provided. Explain for their lesson, they will create several suggestions that they might give a teacher if they were helping them to plan a lesson around the task. For example their list might look something like:

1. Begin the lesson by explaining or demonstrating...
2. Have students first think about the problem alone.
3. Put students in groups and ask them to...
4. Use the following questions if students are having difficulty with the task…
5. Think about how the following representations might help students solve the problem...

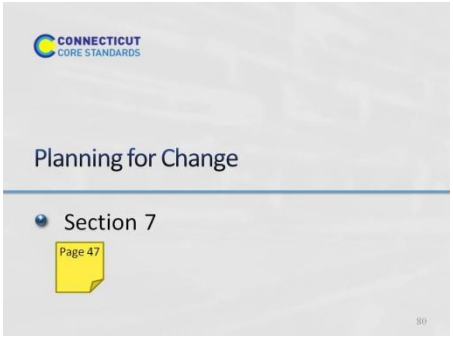
As time permits have participants share their suggestions with the larger group.



Slide 79

Pause and Reflect: Before moving to the next activity, allow participants two or three minutes to look back over their questions and fill in any new answers found in the second half of the day.

Section 7



Slide 80

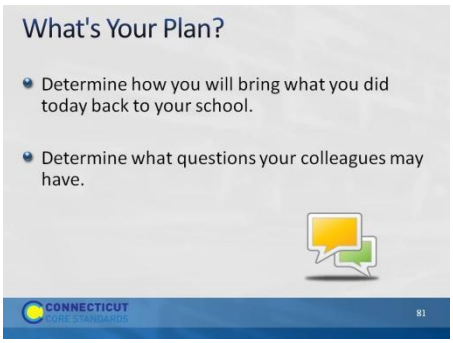
Section 7: Supporting Change

Section 7 Training Objectives:

- To have participants create a plan for disseminating big ideas from the session with teachers at their school.
- To have participants anticipate specific teacher questions and challenges around implementing lessons that incorporate the Standards for Mathematical Practices.

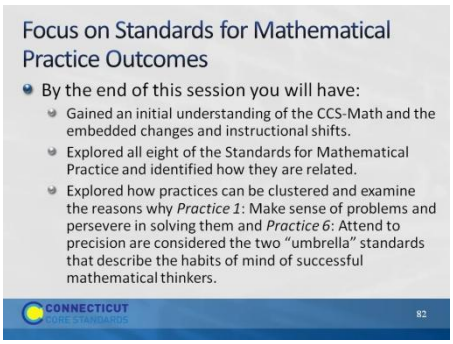
Section 7 Outline:

Participants will work in grade band groups to reflect on the module activities and discuss how big ideas from each will be shared with teachers back at their school. Facilitator will review module outcomes.



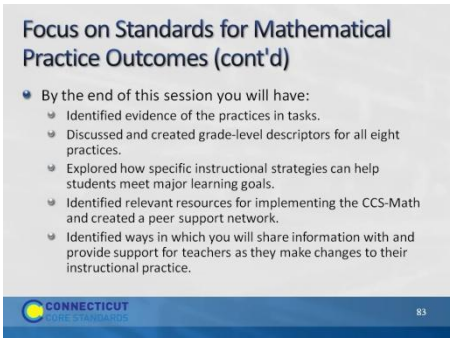
Slide 81

What's Your Plan? Allow participants the remaining time to plan for disseminating key learning from each of the module sections back at their school.



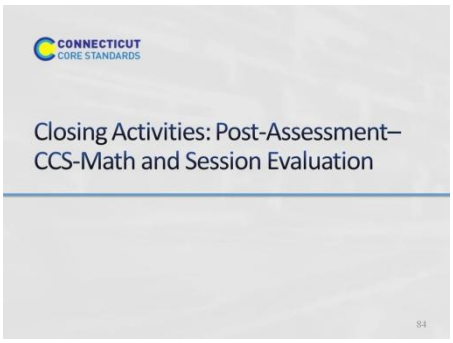
Slide 82

Review the outcomes for the day.



Slide 83

Review the outcomes for the day.



Slide 84

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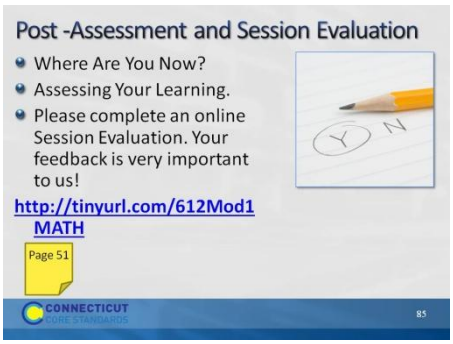

Slide 85

This Post-Assessment will be the same as the Pre-Assessment they took in the beginning of the session. This assessment is to gauge their learning based on the activities of the full day session. Remind the participants to fill out their **Session Evaluation** survey online.

Slide 86

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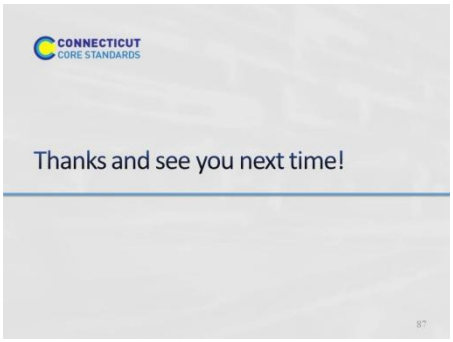

Slide 87

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