Description of the Session 7: Capitalizing on students' explanations and engaging in a video workshop

Session 7 continues work on supporting student explanations and provides participants with another opportunity to engage in video workshop. In Session 6, participants viewed a third-grade student's explanation related to odd and even numbers through the lens of features of "good" explanations. In this session, participants will consider the ways in which they can capitalize on the explanations students share by examining what teachers can do to ensure that everyone in a class has access to each other's explanations. Then participants consider how teachers can use students' explanations to drive the mathematical work forward by encouraging and supporting constructive critique of an explanation. In the second half of the session, participants engage in a third video workshop experience, deepening their understanding of the process and learning more about the debriefing part of the process.

Activities and goals of the session

Activities	Times	Corresponding parts of the session	Goals
Conversation about a CCA from the last session	5 minutes		• Participants will connect ideas about mathematical reasoning from the Ball & Bass article with experiences from their own teaching.
I. Preview	5 minutes	Part 1	• Participants will be oriented to the work of the session.
II. Capitalizing on the explanations that students share	25 minutes	Parts 2 & 3	• Participants will be able to use the features of "good" explanations to analyze students' explanations. • Participants will consider how contributions from students can enhance the mathematics of an explanation given by a classmate and/or be understood as a collective explanation. • Participants will consider the moves a teacher can make to maintain an environment in which the entire class is engaged in reasoning.
III. Learning from Practice: A video workshop	50 minutes	Parts 4 & 5	• Participants will reflect how each step of the video workshop process worked and learn the importance of the "process debrief" in making video workshop a productive learning experience. • Participants will consider what they were able to notice in their groups related to supporting students' engagement in explaining or other mathematical practices. • Participants will consider the types of comments that help to focus the conversation on teaching.
IV. Wrap up	5 minutes	Part 6	• Participants will understand ways of connecting the session content to their classroom.

Classroom Connection Activities

Required
Type of task: Extending in-class work Description: Identify one key mathematical concept, process, or idea that will need to be explained in the unit that you are currently working on. Anticipate features of the explanations that students might provide for this concept/process/idea and consider an explanation that you might provide.
Type of task: Reading Description: Reasoning Standard from the Principles and Standards for School Mathematics (NCTM, 2000). Consider how the four main sections of the standard connect with the work you have been doing with your students and your participation in the professional development sessions. Also, consider how the ideas described in the standard connect to the CCSS mathematical practices.

Preparing for the session

☐ Make copies as needed:

- *Resources:* Transcript: Classroom video – Odd + Odd = Even (Part 2); Transcript: Classroom video – Critique of an explanation for Odd + Odd = Even (Part 3); Handout: Video workshop agenda (Part 4)
- *Supplements:* Handout: Video workshop contribution starters (Part 4)

☐ Customize and make copies of the Classroom Connection Activities

☐ Test technical setups: Internet connection, speakers, projector

☐ Set up spaces for the video workshops

Developing a culture for professional work on mathematics teaching (ongoing work of the facilitator throughout the module)

1. Encourage participation: talking in whole-group discussions; rehearsing teaching practices; coming up to the board as appropriate.
2. Develop habits of speaking and listening: speaking so that others can hear; responding to others' ideas, statements, questions, and teaching practices.
3. Develop norms for talking about teaching practice: close and detailed talk about the practice of teaching; supporting claims with specific examples and evidence; curiosity and interest in other people's thinking; serious engagement with problems of mathematics learning and teaching.
4. Develop norms for mathematical work:
    a) Reasoning: explaining in detail; probing reasons, ideas, and justifications; expectation that justification is part of the work; attending to others' ideas with interest and respect.
    b) Representing: building correspondences and making sense of representations, as well as the ways others construct and explain them.
    c) Carefully using mathematical language.
5. Help participants make connections among module content and develop the sense that this module will be useful in helping them improve their mathematics teaching, their knowledge of mathematics, their understanding of student thinking, and their ability to learn from their own teaching.
6. Help participants understand connections between module content and the Common Core State Standards.

*Scope of the module (focal content of this session in **bold**)*

Mathematics	Student thinking	Teaching practice	Learning from practice
• making and justifying/refuting conjectures and generalizations • recognizing and using multiple approaches to solve mathematics problems • understanding features of a "good" mathematical explanation and producing "good" explanations • identifying foundations of mathematical reasoning • using and knowing the mathematical practices identified in the CCSS	• **monitoring students' mathematical reasoning** • **noticing collective elements of mathematical reasoning**	• supporting students' engagement in mathematical practices by teaching them explicitly • **supporting students in explaining their mathematical reasoning** • **establishing and maintaining an environment that emphasizes reasoning** • adapting tasks to nurture mathematical reasoning	• **using norms that support engagement in video workshop** • **understanding the video workshop process** • **learning to analyze teaching and learning in the context of video workshop**

Conversation about a Classroom Connection Activity from last session (~5 minutes)

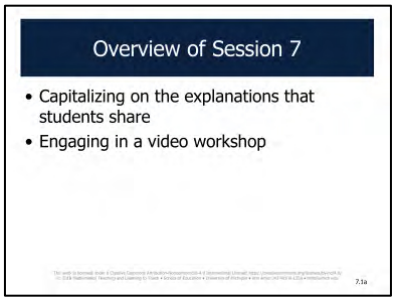
Goals	***Instructional sequence***	***Resources***
• Participants will connect ideas about mathematical reasoning from the Ball & Bass article with experiences from their own teaching.	1. Discuss the Ball & Bass reading using focus questions.	

Detailed description of activity	Comments & other resources
1. Discuss the Ball & Bass reading "Developing Mathematical Reasoning in a Third-Grade Class." Consider posing questions such as: • Did many of your students explain that they knew they had found all of the combinations the same way that Sheena and Mei did in the reading? • What other explanations or justifications did students use? How did classmates respond to what was shared? • What questions can teachers ask to elicit and support students in reasoning that extends beyond particular solutions and strategies?	*In the CCA prompt, participants are asked to consider Sheena and Mei's ideas as shared on page 34.* *Specifically, Mei says:* *"You first think of what you can make from, you can make out of nickels, dimes, and pennies; and then you write them down and you think about it some more until…then you get them all."* *She appears to believe that she has found all of the solutions because she cannot think of any more amounts.*

Part 1: Preview (~5 minutes)

Goals	***Instructional sequence***	***Resources***
• Participants will be oriented to the work of the session.	1. Introduce the session and watch Video A.	• Video A (01:10): Session overview

Detailed description of activity	Comments & other resources
1. Introduce the session: This session advances work from the previous session on mathematical explanations and video workshops. The session begins by revisiting the "odd + odd = even" explanation that was discussed in the last session, but the focus this on what teachers can (or need to) do when an explanation is shared. For example: • How do teachers use insights from that in-the-moment analysis as the basis for questions or other moves that further develop the mathematics being discussed? • What needs to be done to make contributions accessible to all students? In the second half of the session, participants engage in another video workshop experience in which they will notice: • students' conjectures • the use of language, logic, and representations to support those conjectures • the teaching moves used to support students' engagement in reasoning and/or mathematical practices In addition, participants will deepen their knowledge of the process of engaging in video workshop. Have participants watch the *video* in which Dr. Ball frames the work of the session.	*A conversation about a CCA from the last session is integrated into the session.*



Part 2: Capitalizing on the explanations that students share (~10 minutes)

Goals

- Participants will be able to use the features of "good" explanations to analyze students' explanations.
- Participants will begin to consider the moves a teacher can make to maintain an environment in which the entire class is engaged in reasoning.

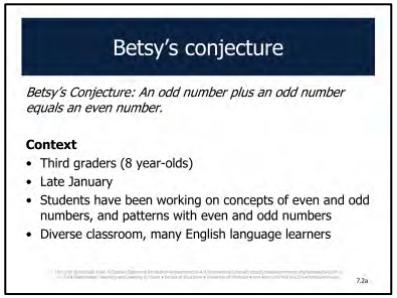
Instructional sequence

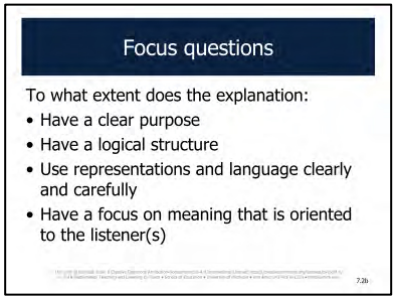
1. Introduce Part 2 and then view Video A.
2. Show Video B and then discuss how one might follow up on Betsy's explanation.

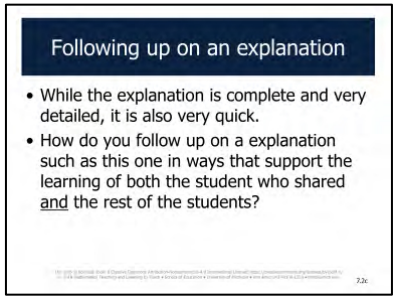
Resources

- Video A (01:37): Classroom video – Odd + Odd = Even
- Video B (01:46): Using what students say instructionally
- Transcript: Classroom video – Odd + Odd = Even

Detailed description of activity	Comments & other resources
1. Introduce Part 2: This part launches work on collective explanations by focusing on what teachers can do to make sure that everybody in the class has access to explanations shared by other students. This work is grounded in awareness of the features of "good" explanations and skill in using those features to attend to what is in a student's explanation. Provide a rationale for the work in this segment: when students give explanations in class, the teacher has a responsibility not only to follow up on the explanation in ways that support the learning of the student who gave the explanation, but also to follow up on the explanation in ways that support the learning of all of the other students in the class. Explain that participants will be rewatch a classroom video from the last session as a way to launch a discussion on how to follow up on students' explanations in ways that support the learning of the whole class. Show *Slide: Betsy's conjecture* and reorient participants to the classroom video they watched in the previous session, in which Betsy presents a proof of her conjecture that "*An odd number plus an odd numbers equals an even number.*" Introduce the viewing focus, which is the same as the focus from Session 6: To what extent does the explanation: • have a clear purpose • have a logical structure • use representations and language clearly and carefully • have a focus on meaning and that is oriented to the listener(s)	*The focus of this module has been on explanation. There are lots of contributions in mathematics that have purpose, structure, representations and careful use of language. The distinguishing feature here is that the students/teacher are focusing on the "why" of mathematics that is conveyed in an explanation.* *It might help to make explicit that rewatching video is often helpful when attending to teaching and learning. It allows viewers to notice new things, as well as to reevaluate past insights.* *The point of rewatching point in this part is to prepare participants to engage in thinking about how to follow up on an explanation. The video does not need to be discussed.*





Detailed description of activity	Comments & other resources
Then, distribute the *Transcript: Classroom video – Odd + Odd = Even* and rewatch the classroom video from the last session (*Video A).*	
2. Watch *Video B* in which Dr. Ball frames the problem of following up on explanations showed by students, including two purposes (advancing the learning of the student who has shared the explanation and advancing the learning of the class). This is an instance in which a student shares an explanation. The explanation is very detailed and quick. Contributions like this are not a rare occurrence in classroom teaching, and yet it is sometimes difficult to know how to follow up on them in ways that support the student who just shared and also support the rest of the class. After showing the video, pose the following task: Imagine you were the teacher trying to establish an environment that nurtures the mathematical reasoning of all students, what are some possible next moves that might serve that purpose? • How do you follow up on an explanation such as this one in ways that support the learning of both the student who shared and the rest of the students? Have participants discuss with a partner for about 3 minutes. Invite participants to share their ideas about how to follow up on Betsy's explanation. 	*Recall that the establishing an environment that nurtures the mathematical reasoning of all students involves attending to:* *(a) math* *(b) students' reasoning* *(c) teaching in ways that are focused on helping students do the math (rather than the teacher doing the math)* *Participants might say that the teacher should ask questions to clarify the explanation in order to help the other students better understand the reasoning behind the explanation. They might suggest that the teacher could ask another student to restate Betsy's explanation or ask her a clarifying question.*

Part 3: Articulating ways of supporting students' reasoning and explanations (~15 minutes)

Goals

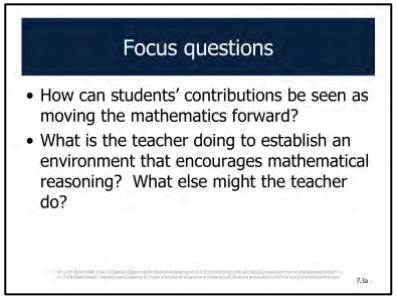
- Participants will consider how contributions from students can enhance the mathematics of an explanation given by a classmate and/or be understood as a collective explanation.
- Participants will consider the moves a teacher can make to maintain an environment in which the entire class is engaged in reasoning.

Instructional sequence

1. Introduce Part 3 by showing Video A.
2. Watch and discuss Video B.
3. Watch and discuss Video C and Videos D-E as time and interest permit.

Resources

- Video A (00:54): Setting the context for the video
- Video B (02:16): Classroom video – Critique of an explanation for Odd + Odd = Even
- Video C (00:41): Teacher insight – Appreciating the critique
- Video D (00:51): Teacher insight – Suggesting ways to follow up on the critique
- Video E (00:47): Teaching students to construct arguments and critique the reasoning of others
- Transcript: Classroom video – Critique of an explanation for Odd + Odd = Even

Detailed description of activity	Comments & other resources
1. Introduce Part 3: This part continues work on following up on students' explanations collective explanations by considering teaching moves that can enhance the mathematics of an explanation given by a student and the moves that a teacher can make to maintain an environment in which the entire class is engaged in reasoning. Watch *Video A* in which Dr. Ball introduces this part and the focus questions for the classroom video: • How can students' contributions be seen as moving the mathematics forward? • What is the teacher doing to establish an environment that encourages reasoning? What else might the teacher do? 	
2. Distribute the *transcript.* Watch *Video B* in which students in the class critique Betsy's conjecture. Have participants discuss the focus questions in small group. Invite several participants to share their responses in the whole group.	*Participants might comment that students move the mathematics forward by questioning whether the conjecture would work for all numbers and by discussing whether this question could be answered without actually trying all numbers.* *Participants might notice that the teacher encouraged reasoning for all students in the class by summarizing and (at times) making written records of students' arguments and by asking other students what they*

Detailed description of activity	Comments & other resources
	thought about these arguments. They might suggest that the teacher could also encourage reasoning by asking all students to record their reactions to the arguments being put forth in the classroom discussion.
3. As time and interest permit, watch *Videos C-E* in which teachers in the professional development share their responses to the focus questions. Show *Video C* first as it raises an important mathematical issue. Then select from *Videos D-E* to highlight ideas that have not yet come up in the group or responses that were articulated where the group would benefit from considering another teacher's way of expressing the idea. • Video C: Teacher insight – Appreciating the critique • Video D: Teacher insight – Suggesting ways to follow up on the critique • Video E: Teaching students to construct arguments and critique the reasoning of others	*There will not be time in the session to share all of these videos. Ask participants to consider the focus questions below for each video.* *Video C: Teacher insight – Appreciating the critique* *Before viewing the video, ask participants to consider whether Betsy is showing a general case or a proof of a specific example. View the clip in which teachers in the professional development discuss this and ask participants how they would follow up with regard to this point.* *Video D: Teacher insight – Suggesting ways to follow up on the critique* *A participant shares a way that she might follow up on the critiques to Betsy's response. After viewing the clip, ask participants to generate a question that they could use to help students move beyond considering an example to considering the mathematical structure.* *Video E: Teaching students to construct arguments and critique the reasoning of others* *This video highlights reasons that it is important to support students in explaining their arguments in mathematics. After viewing the video, ask participants to consider and share ways that they teach students to construct mathematical arguments.*

Part 4: Engaging in Video Workshop #3 (~35 minutes)

Goals

- Participants will use video evidence to notice and discuss the conjectures that students make and how they justify their conjectures.
- Participants will continue to notice what a teacher can do to support students' engagement in reasoning or mathematical practices.

Instructional sequence

1. Introduce Part 4 by showing the video.
2. Engage in the video workshop in small groups.

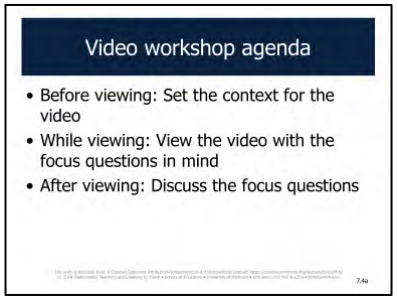
Resources

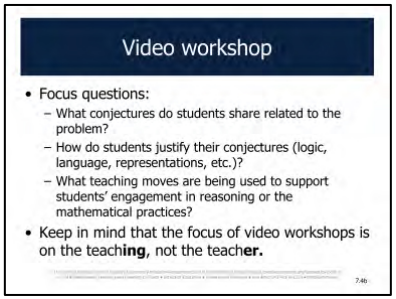
- Video A (00:59): Launching Video Workshop #3
- Handout: Video workshop agenda

Supplements

- Handout: Video workshop contribution starters

Detailed description of activity	Comments & other resources
1. Introduce Part 4: This part launches the third full video workshop in the module. The aim of this work is to learn about student thinking and teaching practice from instances of teaching and to develop skill with a process that can be used over time to support learning from one's own teaching. Watch the *video* in which Dr. Ball launches the video workshop work in this session. This video includes review of the parts of the video workshop and what participants should be doing in each part.	*It is important to continue to reinforce the idea that the purpose of the video workshop is to look at <u>teaching</u> not the teacher. This is particularly important in this video workshop experience as discussion norms are still being established in the small groups. A focus on teaching rather than the teacher often helps participants feel more comfortable sharing excerpts of their teaching with the small group. You will be raising this point again in Part 5.*





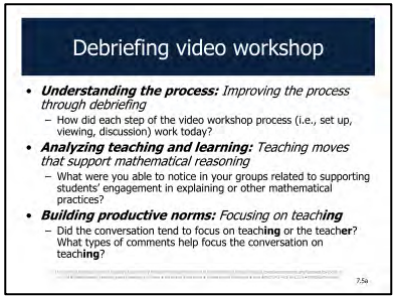
Detailed description of activity	Comments & other resources
2. Distribute copies of the *Handout: Video workshop agenda.* Have participants get into their video workshop groups. Suggest spaces in the room for each of the groups to work and provide pointers about using the technology. During the video workshop, participants should do the following: 1) Set context for video (5 minutes) The sharer will: • Situate the viewing by providing context for the video: — Grade, task, and lesson goals — Routines that appear in the clip that might be unfamiliar to colleagues — Description of what happened immediately before the clip • Provide and quickly describe documents that will support the understanding of what is happening in the video (e.g., copies of student work, transcript, etc.) • Zoom in on the focus questions that guided the selection of the video clip 2) View video with the focus questions in mind (5 minutes) Focus questions: • What conjectures do students share related to the problem? • How do students justify their conjectures (logic, language, representations, etc.)? • What teaching moves are used to support students' engagement in reasoning or mathematical practices? During the video: • Jot down a few notes that will serve as reminders about places in the video where student thinking or the mathematics seems interesting 3) Discuss the focus questions (20 minutes) In the discussion, make sure to: • Connect with instances from the video that are relevant to the focus questions • Attend closely to talk, student thinking, teachers' moves and comments • Offer details from the video and provide evidence	*In line with the work participants did in the previous parts, the focus questions shift in this session to explicitly focus on the conjectures that students share, how students justify their conjectures (logic, language representations), and teacher moves that support students' engagement in reasoning and/or mathematical practices.* *Contributions starters (introduced in the last video workshop) may be useful for some video workshop groups (see the supplements section for the Handout: Video workshop contribution starters).* *Make it clear that all participants will share during the final video workshop.*

Part 5: Debriefing video workshop (~15 minutes)

Goals	***Instructional sequence***	***Resources***
• Participants will reflect how each step of the video workshop process worked and learn the importance of the "process debrief" in making video workshop a productive learning experience. • Participants will consider what they were able to notice in their groups related to supporting students' engagement in explaining or other mathematical practices. • Participants will consider the types of comments that help to focus the conversation on teaching.	1. Introduce Part 5 and watch the video. 2. Have participants discuss the focus questions.	• Video A (01:54): Debriefing video workshop

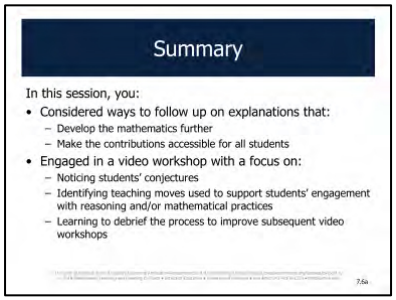
Detailed description of activity	Comments & other resources
1. Introduce Part 5: This part focuses on debriefing the experience in the video workshops. Debriefing should continue to be a routine part of the video workshop process so that the video workshop can continually be improved and renewed. Watch the *video* in which Dr. Ball frames the purposes for debriefing video workshop and introduces three categories of debriefing: understanding the process, analyzing teaching and learning, and building productive norms.	

Detailed description of activity	Comments & other resources
2. Ask participants to consider the following three focus questions: • *Understanding the process: Improving the process through debriefing*: How did each step of the video workshop process (i.e., set up, viewing, discussion) work today? • *Analyzing teaching and learning: Teaching moves that support mathematical reasoning:* What were you able to notice in your groups related to supporting students' engagement in explaining or other mathematical practices? • *Building productive norms: Focusing on teaching:* Did the conversation tend to focus on teaching or the teacher? What types of comments help to focus the conversation on teaching? Elicit discussion of the focus questions in whole group.	*Understanding the process:* *Make clear that the group is modeling the debriefing process by talking in whole group about how each step of the video workshop process went. In the future, debriefing should take place within the video workshop group.* *Debriefing is a crucial step in the process that is often neglected. It is key in making video workshop a productive and sustainable process. Teachers need to feel that engagement in video workshop is worth the time and effort. Debriefing is a mechanism to:* • *make it "acceptable" to raise points about how video workshop is working and how it could be improved* • *explicitly mark that the group is committed to improvement and meeting the needs of its members* *You may have to press participants to keep this conversation at the "meta" level. The debriefing discussion should focus on improving the process of video workshop rather than only on sharing insights from the workshop.* *This focus on debriefing is another example of how knowing and being able to use the process is an important outcome of this professional development. It will support learning over time in ways that typical professional development work just does not do. By clarifying and deepening their knowledge of this process, participants will have a more "usable" understanding.* *Analyzing teaching and learning:* *Encourage participants to leverage the dialog with colleagues as a resource for planning, enacting instruction, or reflecting on your own teaching in ways that enhance students' opportunities to reason or their own repertoire of teaching moves.* *Building productive norms:* *Encourage participants to focus on the situations, content, and pedagogies occurring in the video as something that all teachers encounter or use. This will support the idea that the learning is collective rather than corrective for the person whose video is being watched.*



Part 6: Wrap up (~5 minutes)

Goals	***Instructional sequence***	***Resources***
• Participants will understand ways of connecting the session content to their classroom.	1. Summarize the work of the session. 2. Explain and distribute the Classroom Connection Activities.	

Detailed description of activity	Comments & other resources
1. Summarize the session by noting that the session focused on how teachers can capitalize on the explanations that students share in ways that make the engagement collective and constructive. Specifically, participants considered way to follow up on a explanations to develop the mathematics further and to make the contributions accessible for all students. The third video workshop experience provided new opportunities to learn from specific instances of teaching by noticing students' conjectures, identifying the teaching moves used to support students' engagement with reasoning and/or mathematical practices, and developing greater familiarity with the video workshop process by learning to debrief the process to improve subsequent video workshops. 	

Detailed description of activity	Comments & other resources
2. Distribute the *handout* with Classroom Connection Activities and accompanying documents described below. The activities will produce ideas or products that are necessary for subsequent sessions. • Identify one key mathematical concept, process, or idea that will need to be explained in the unit that you are currently working on. Anticipate features of the explanations that students might provide for this concept/process/idea and consider an explanation that you might provide. Specifically: a) Student explanation: How do students typically explain this concept/process/idea? What points do students typically include in their explanations? What is typically missing from student explanations and/or what is hard for students to describe or represent? What is challenging about supporting students in explaining? b) Teacher explanation: When you explain this concept/process/idea, what are the key components you make sure to include? What representations do you use (and why)? What terms do you try to use (or make sure to avoid)? What examples do you use (and why)? Write your responses and bring them to the next professional development session. • Read the Reasoning Standard from the Principles and Standards for School Mathematics (NCTM, 2000). Consider how the four main sections of the standard connects with the work you have been doing with your students using the problems from the professional development work. Also, consider how the ideas described in the standard connect to the mathematical practices as described in the Common Core State Standards.	

List of Common Core State Standards Mathematical Practices

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