Description of the Session 6: Appraising a student's explanation and engaging in a video workshop

In Session 6, participants will continue work on explaining, which has been a major theme in the module. Session 5 focused on producing "good" mathematical explanations, including naming features of "good" explanations. The session begins with a video workshop during which participants will focus on how students are reasoning and explaining. During the video workshop, participants will experiment with using "contribution starters" to help focus the discussion on student thinking and teaching moves that support students' reasoning. In the second part of the session, participants will view a third-grade student's explanation related to odd and even numbers through the lens of feature of "good" explanations.

Activities and goals of the session

Activities*	Times	Corresponding parts of the session	Goals
I. Preview	5 minutes	Part 1	• Participants will be oriented to the work of the session.
II. Learning from Practice: A video workshop	50 minutes	Parts 2 & 3	• Participants will use video evidence to notice and discuss how students interpret and approach the problem and justify their solutions. • Participants will continue to notice what a teacher can do to support students in making sense of a problem and in justifying their solution. • Participants will make use of contribution starters to support discussion in the video workshop group. • Participants will reflect on their reasons for selecting specific instances in the video to share. • Participants will consider how focus questions can support discussion that is focused on specific aspects of teaching. • Participants will consider how contribution starters enhanced and/or detracted from the discussion.
III. Appraising a student's explanation	25 minutes	Parts 4	• Participants will notice aspects of a student's explanation with particular focus on: ○ Having a clear purpose ○ Having a logical structure ○ Using representations and language clearly and carefully ○ Focusing on meaning that is oriented to the listener(s)
IV. Wrap up	10 minutes	Part 5	• Participants will understand ways of connecting the session content to their classroom.

*A conversation about a CCA from the last session is integrated into the session.

Classroom Connection Activities

Required
Type of task: Video workshop preparation Description: Use a version of the Odd + Odd = Even Problem that was considered during the last session. Video record the entire activity and collect student work samples (so that you can represent a range in student reasoning). Pick a 3-5 minute segment and reflect on it using the focus questions.
Type of task: Reading Description: Read the short excerpt "Developing Mathematical Reasoning in a Third-Grade Class" from a chapter by Ball & Bass (2003) that appeared in the research companion to the NCTM Standards.

Preparing for the session

☐ Make copies as needed:

- *Resources:* Handout: Video workshop agenda (Part 2); Handout: Contribution starters (Part 2); Transcript: Betsy's conjecture (Part 4); Handout: Analyzing an explanation (Part 4)
- *Supplements:* none

☐ 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.

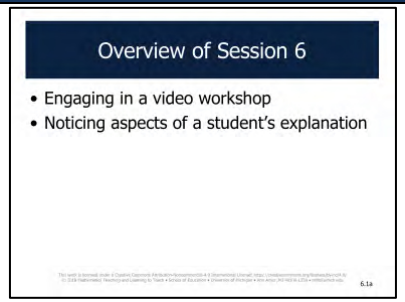
Scope of the module *(focal content of this session in* ***bold****)*

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**

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 (01:05): Session overview

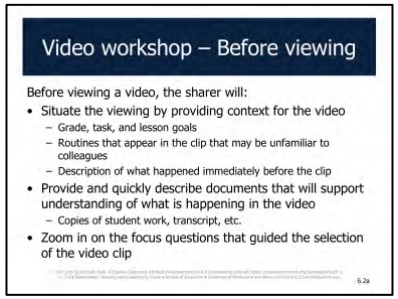
Detailed description of activity	Comments & other resources
1. Introduce the session: This session builds on the work started in prior sessions including features of "good" explanations introduced in Session 5 and the work that participants did with a scaled version of the Three-Coin Problem in their classrooms. Specifically, participants will engage in a video workshop with a focus on noticing: • how students approach and interpret the problem • how students justify their solutions • teaching moves that support students in interpreting the problem and justifying their solutions. The participants will appraise an explanation provided by a third-grade student using the features of explanations. The parts of the session focus on: • Student thinking and teaching practices: Noticing aspects of a student's explanation • Learning from practice: Engaging in a 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.*

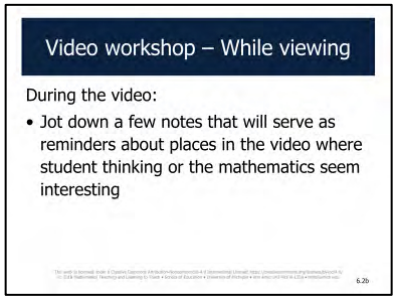


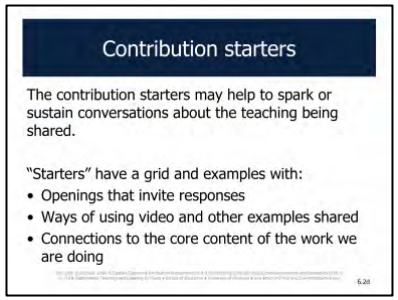
Part 2: Engaging in Video Workshop #3 (~35 minutes)

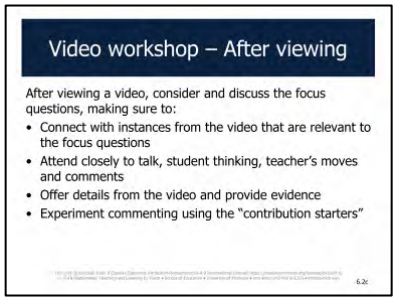
Goals	***Instructional sequence***	***Resources***
• Participants will use video evidence to notice and discuss how students interpret and approach the problem and justify their solutions. • Participants will continue to notice what a teacher can do to support students in making sense of a problem and in justifying their solution. • Participants will make use of contribution starters to support discussion in the video workshop group.	1. Introduce Part 2 by showing the video. 2. Introduce the video workshop agenda and contribution starters. 3. Engage in the video workshop in small groups.	• Video (01:16): Launching Video Workshop #2 • Handout: Video workshop agenda • Handout: Contribution starters

Detailed description of activity	Comments & other resources
1. Introduce Part 2: This part launches the second full video workshop in the module. 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. In addition, contribution starters are introduced as a means to support focused discussion of the video.	*It is important to continue to reinforce the idea that the purpose of the video workshop is to look at teaching, not the teacher. This is particularly important in this video workshop experience as discussion norms are being established in the small groups. A focus on teaching rather than the teacher will help participants be more comfortable sharing excerpts of their teaching with the small group.* *Participants may be skeptical about using the "contribution starters." When the materials were being designed, the developers read about the potential of these starters to enrich discussions focused on video. By trying the contribution starters out in this session, participants not only have the opportunity to see if the starters do help the discussion, but they also develop their "tool kits" for doing video workshop in increasingly productive ways. In this module, both of these things are important.* *Consider emphasizing that these are frames for encouraging participation, supporting collegial dialog, and maintaining a connection to the video and work samples that are being shared.*









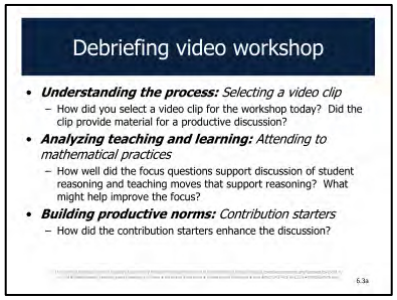
Detailed description of activity	Comments & other resources
2. Distribute copies of the *Handout: Video workshop agenda* and the *Handout: Contribution starters*. Discuss the two handouts and the rationale for them. Highlight the focus questions and point out that they are different from the focus questions used in the last video workshop. Have participants get into their video workshop groups. Suggest spaces where each of the groups should 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 may 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 teaching moves are used to support students in making sense of the problem? • How are students interpreting and approaching the problem? • How are students justifying their solutions? • What teaching moves are used to support students in justifying their solutions? 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 • Experiment commenting using the "contribution starters"	*The focus questions shift in this session to explicitly focus on interpreting problems and justifying solutions – both noticing what students are doing and teacher moves that support students in doing this work. Be sure to point out the change in focus questions to participants.* *When groups are determining who shares next time, emphasize that they should start with people who have not yet had the opportunity to share. If participants were working in pairs, then this is a chance for a participant to capitalize on what they learned from sharing last time. Make it clear that there are two video workshops left in the professional development series, and that in the final video workshop, there will be opportunities for every group member to share. This may help the groups make decisions about who will share in the next video workshop.*

Detailed description of activity	Comments & other resources
4) Determine who in the group will share video the next time	
3. Have participants engage in the video workshop for 30 minutes.	*Circulate to different video workshop small groups. Consider doing a quick check in with each group at the outset to make sure that all of the videos are playing properly and that it is possible for all of the group members to hear the audio and then settle in with a few groups to gain a more in-depth understanding of how participants are:* • *generatively selecting instances in the video to share;* • *using focus questions can support discussion that is focused on specific aspects of teaching; and* • *trying the contribution starters.* *These bullets are the points that will be taken up in the debriefing in Part 3 of this session.*

Part 3: Debriefing video workshop (~15 minutes)

Goals	***Instructional sequence***	***Resources***
• Participants will reflect on their reasons for selecting specific instances in the video to share. • Participants will consider how focus questions can support discussion that is focused on specific aspects of teaching. • Participants will consider how contribution starters enhanced and/or detracted from the discussion.	1. Introduce Part 3 and watch the video. 2. Have participants discuss the focus questions.	• Video A (01:30): Debriefing video workshop

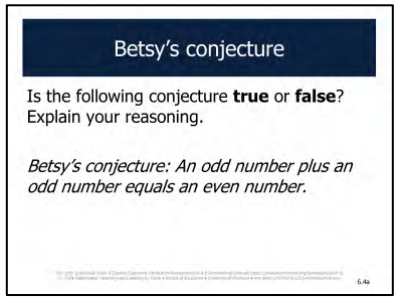
Detailed description of activity	Comments & other resources
1. Introduce Part 3: This part focuses on debriefing the experience in the video workshops. Debriefing is done is support learning about the process of video workshop. Knowing and being able to use the process is an important outcome of the professional development series. Watch the *video* in which Dr. Ball explains the purpose of debriefing the video workshop and introduces the focus questions for the debriefing.	*Make clear that the debriefing is being done to support learning about the process of video workshop. Knowing and being able to use the process is an important outcome of the PD. It will support teacher learning over time in ways that typical professional development work cannot do. By clarifying and deepening their knowledge of this process, participants will have a more "usable" understanding.*
2. Have participants discuss the following three focus questions in whole group: • *Understanding the process: Selecting a video clip*: How did you select a video clip for the workshop today? Did the clip provide material for a productive discussion? • *Analyzing teaching and learning: Attending to mathematical practices: Focus:* How well did the focus questions support discussion of student reasoning and teaching moves that support student reasoning? What might help improve the focus? • *Building productive norms: Contribution starters:* How did the contribution starters enhance the discussion?	*Three key points to consider:* • *Understanding the process: Careful selection of a video clip is essential for a productive discussion.* • *Analyzing teaching and learning: Focus questions can help support a focus on particular aspects of student reasoning as well as teaching moves.* • *Building productive norms: Contribution starters are a way to support making comments that are tied to specifics in the video. The contribution starter is one example of moves that video workshop participants should try over time to enhance their discussions.* *If there is time, try to gain a sense from participants about how this experience in video workshop compared with the first time (e.g., smoother, new expectations, clunky because they were trying out new foci and question starters, easier to position the cameras, easier to work with the video files, etc.).* *Invite participants who have lingering questions or need additional support in using equipment (cameras, tripods, etc.) talk with you at the conclusion of the session.*

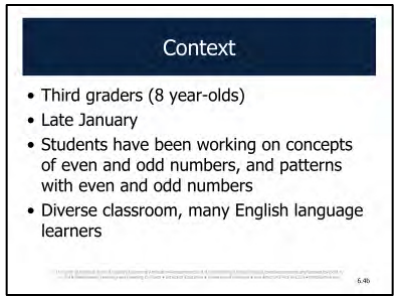
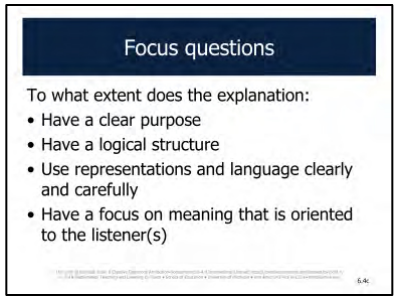


Part 4: Appraising a student's explanation (~25 minutes)

Goals	***Instructional sequence***	***Resources***

• Participants will notice aspects of a student's explanation with particular focus on:
  ○ Having a clear purpose
  ○ Having a logical structure
  ○ Using representations and language clearly and carefully
  ○ Focusing on meaning that is oriented to the listener(s)
	1. Introduce Part 4 including having participants consider Betsy's conjecture.
	2. Watch Video A in which the context and viewing focus for the classroom video are introduced. Then watch the classroom video (Video B).
	3. Discuss focus questions with a partner and then in whole group.
	4. Watch and discuss a subset of Videos C-D.
		• Video A (01:55): Setting the context for the video
		• Video B (01:37): Classroom video – Odd + Odd = Even
		• Video C (02:44): Teacher insight – Supporting explanations to the class
		• Video D (00:43): Teacher insight – Asking questions to scaffold explanations
		• Transcript: Classroom video – Odd + Odd = Even
		• Handout: Analyzing an explanation

Detailed description of activity	Comments & other resources
1. Introduce Part 4: This part launches a series of opportunities to use the features of "good" explanations to analyze students' explanations. Explain that the group will be viewing a third grade student's explanation through the lens of features of "good" explanations. The occasion for the explanation is a problem that, like the problem in the last session, is focused on types of numbers, specifically odd and even.  Show the conjecture that the third graders were trying to prove and have participants take 5 minutes to try to prove. *Betsy's conjecture: An odd number plus an odd number equals an even number.* Give participants a few minutes to discuss this conjecture with a partner.	*Reinforce the rationale, shared in the previous session, for engaging in activities where a key purpose is to name, describe, and analyze the characteristics of a "good" explanation. Rationale included:* • *providing a set of ideas that will support listening to, and guiding, students' explanations* • *supporting participants in planning explanations they will provide* • *developing professional language that supports dialog with colleagues.* *Make sure participants have thought about Betsy's conjecture and tried to prove it themselves before watching the classroom video.*

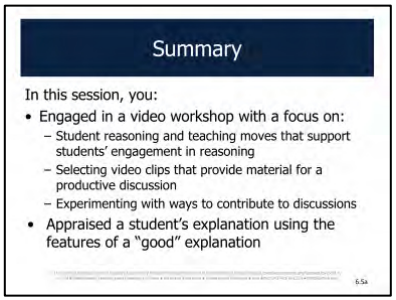
Detailed description of activity	Comments & other resources
2. Watch *Video A* in which Dr. Ball provides context for the video and introduces the viewing focus.   The viewing focus for this video is: To what extent does the explanation: • have a clear purpose • have a logical structure • use representations and language clearly and carefully • have a focus on meaning that is oriented to the listener(s) Distribute the *transcript: Betsy's conjecture* and then watch *Video B*.	*Knowing the features of a "good" explanation can focus what teachers listen for in students' explanations.* *Continue to establish how participants will be studying mathematics teaching together in the professional development series (records of practice; close attention to talk, student thinking, teacher's moves and comments; detail and evidence; learning to see and hear practices of teaching).* *The slides in this part will advance automatically as Video A plays. You may want to show the slides full screen as the video plays, or split the screen between the slides and the video.* *This is another model for what participants do when they share video in video workshops. In Video A, the following is shared: grade, task, lesson goal, what class has been working on, what has happened immediately before the segment.* *Consider posting a chart with the features of a "good" explanation.*
3. Have participants discuss with a partner for a few minutes the extent to which they saw the features of a "good" explanation in what the student said and did. Invite a few participants to share their insights and questions.	*Encourage close attention to the record of practice, student thinking, teacher's moves and comments.* *Responses to the viewing focus: To what extent does the explanation have:* • A clear purpose—*Betsy states that her purpose is to prove that "it's always true" that odd + odd = even. (lines 5-6)* • A logical structure—*Betsy starts her explanation with a specific example (drawing 14 lines to represent 7 + 7 and then circling the pairs) and then generalizes by saying that: "What we found is that all odd numbers if you circle them by twos, then there's one left over…. Then the two ones left over you can group together and it will make an even number." (lines 16-21)* • Representations and language used clearly and carefully ○ *The representation (7 lines + 7 lines, with pairs of lines circled) is*

Detailed description of activity	Comments & other resources
	pretty clear; the line connecting the two lines "left over" is helpful. However, the idea that "every odd number has 1 left over" is not completely clear, nor does Betsy provide a representation of this idea. ○ *Language is unclear in some places, e.g.,* "So if you plus one of- or if you plus another odd number, then…" *(lines 18-19) but clear in others, e.g.,* "…then the two ones left over you can group together and it will make an even number." *(lines 19-21).* • <u>A focus on meaning and is geared to the needs of the audience</u> ○ *Betsy often does not represent what she is saying on the board or attempt to connect what she is saying back to the representation she has drawn. She also speaks quickly and starts and stops in the middle of her sentences, which may make it hard for her classmates to follow.* ○ *The example she uses, 7 + 7, detracts from the generality of the explanation (as noted in Video D). Other students in the audience might think that there is something special about doubles that does not apply to any two odd numbers.* *It is important to keep in mind that students learn to give "good" explanations by having opportunities to revise their explanations in order to increase their quality. Just as students learn to write by having opportunities to revise their writing, they need to have opportunities to give mathematical explanations and then to revise them either independently or in collaboration with peers and teachers.*

Detailed description of activity	Comments & other resources
4. As time and interest permit, watch *Videos C* and *D.* • *Video C: Teacher insight – Supporting explanations to the class:* Consider pausing the video at 1:14 and asking participants to consider what kinds of things could be said to Betsy. Then, watch the rest of the video in which teachers share possibilities. • *Video D: Teacher insight – Asking questions to scaffold explanations:* Consider asking participants what questions that they might like to pose to Betsy.	*Video C: Teacher insight – Supporting explanations to the class* *In this video, the teachers and facilitator discuss the importance of helping students learn to give "good" explanations to the class (rather than only to the teacher). When teachers support students in making their explanations accessible to their peers, the whole class can benefit from hearing and thinking about their classmates' explanations.* *Video D: Teacher insight – Asking questions to scaffold explanations* *In this video, a teacher describes the importance of asking students questions about their explanations in order to "draw out" a more complete and clear explanation of their thinking.* *Critiquing mathematical arguments is important. Critics catch erroneous assumptions, flaws in logic, and other weaknesses that may be present in explanations. Responding to the questions or critiques of "skeptics" can help push forward the articulation and refinement of mathematical ideas included in an explanation.* *Note: Session 7 will explicitly consider the kinds of work that teachers do to support and respond to students' thinking like Betsy's explanation. The discussion here is just an initial entry into thinking about following up on her explanation.*

Part 5: Wrap up (~10 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 emphasizing that participants: • Engaged in a video workshop with a focus on: ○ Student reasoning and teaching moves that support student's engagement in reasoning ○ Selecting video clips that provide material for a productive discussion ○ Experimenting with ways to contribute to discussions • Appraised a student's explanation using the features of a "good" explanation 	
2. Distribute the handout you customized with selected Classroom Connection Activities and accompanying documents described below. • In your classroom, spend 15-20 minutes working on mathematics practices by using a scaled version of the Odd + Odd = Even Problem you considered during the last session. Video record the entire activity and collect student work samples (so that you can represent a range in student reasoning). Pick a 3-5 minute clip and reflect using the focus questions. • Read the short excerpt "Developing Mathematical Reasoning in a Third-Grade Class" from a chapter by Ball & Bass (2003) that appeared in the research companion to the NCTM Standards. This reading traces students' opportunities to learn about mathematical reasoning across several experiences, including a variation of the Three-Coin Problem and the "Odd + Odd = Even" video viewed in this session. Make connections between the examples in the reading and your own teaching and participation in the professional development session. You may also use the ideas from this reading to support your teaching of the Odd + Odd = Even Problem.	*This CCA requires participants to engage in a video workshop related activity in preparation for the next session. Previously in the module, video workshops have not happened in adjacent sessions. At this point, however, there are two video workshops in two adjacent sessions because participants are ready to try making this way of learning from teaching more of a routine and less like a "special occasion".* *This is a way of "ramping up" skills and comfort with the process, just as other aspects are being "ramped up" (e.g., focus questions that are more tightly focused on reasoning, more ways to think about how to pick a "good" clip, and trying out "contribution starters").*

Allow a few minutes for participants to think on their own or with colleagues about the scalings of the problem that they might want to use with their students prior to the next session. They can also ask questions about any of the scalings at this time.	

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.