Common Core Circles - Monitoring

Common Core Circles

A Joint Venture of

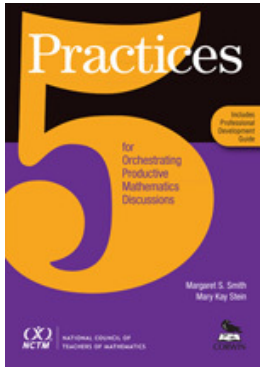
CMC-S and CAMTE

CAMTE
California Association of
Mathematics Teacher Educators

Practices for Orchestrating Classroom Discussion in the Mathematics Classroom

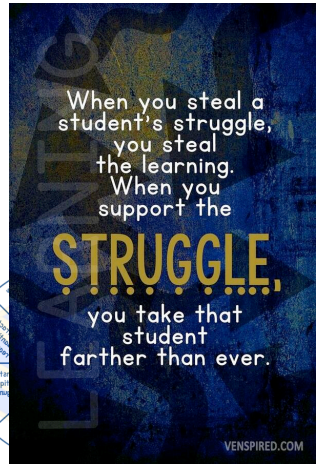
1. ***Anticipating*** student responses to challenging mathematical tasks;
2. ***Monitoring*** students' work on and engagement with the tasks;
3. ***Selecting*** particular students to present their mathematical work;
4. ***Sequencing*** the student responses that will be displayed in a specific order; and
5. ***Connecting*** different students' responses and connecting the responses to key mathematical ideas.

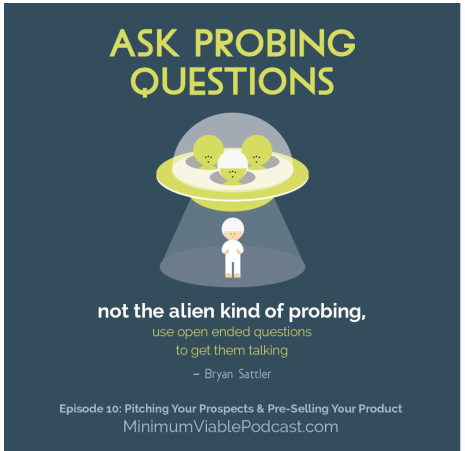
Smith, Margaret S., Stein, Mary Kay; *5 Practices for Orchestrating Productive Mathematics Discussions; NCTM; 2012*



Goals

- Participants will understand what monitoring looks like in a Productive Common Core Mathematics classroom.
  - Evidence, what evidence?
  - You want me to probe? What?
  - Struggle, who me?





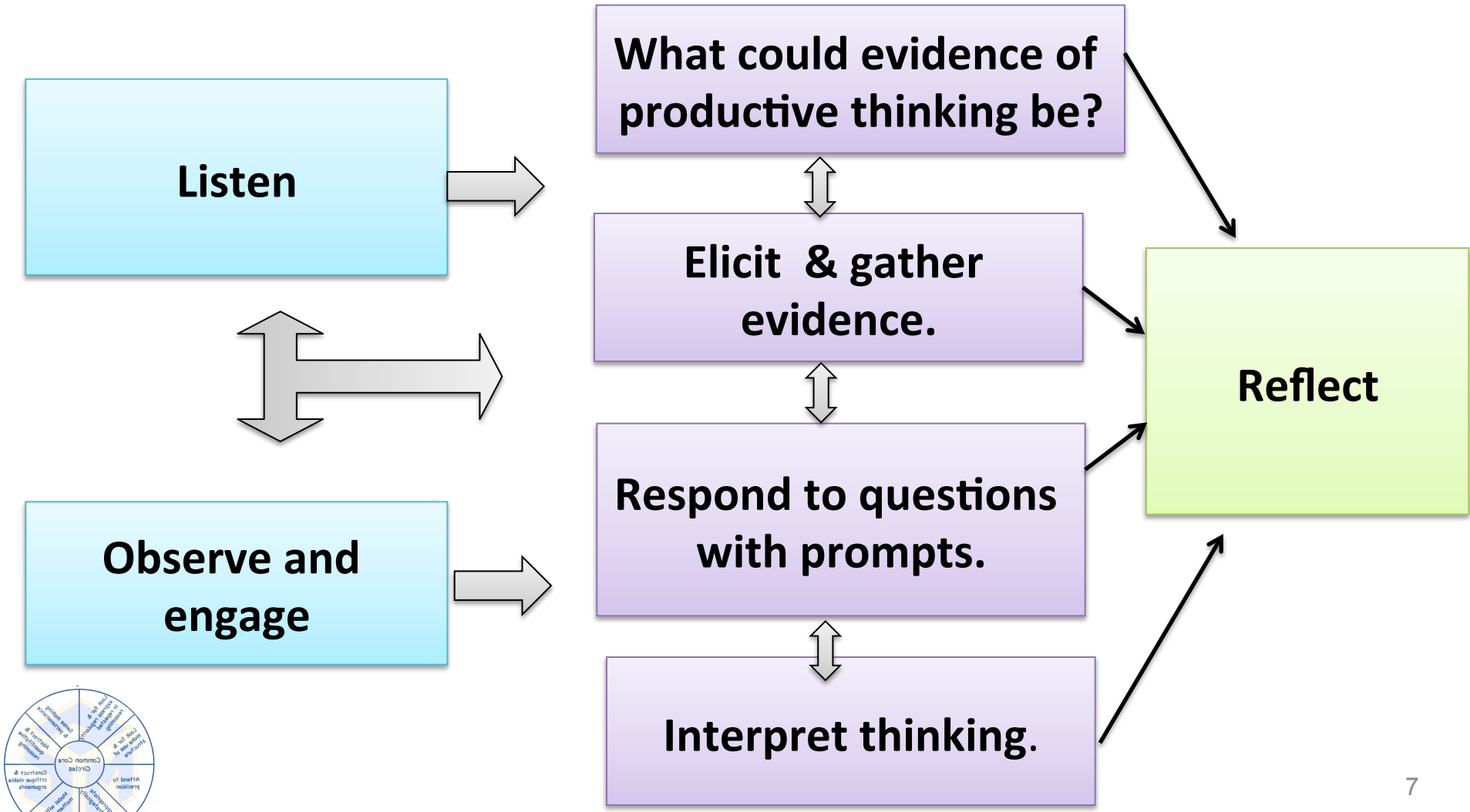
Task Instructions

- Read the task.
- Work on the task alone for two minutes, then in a small group.
- When completed, share your work with others.

Candy Jar

- A candy jar contains 5 Jolly Ranchers & 13 Jawbreakers. Suppose you had a new candy jar with the same ratio of Jolly Ranchers to Jawbreakers, but it contained 100 Jolly Ranchers. How many Jawbreakers would you have? Explain how you know.
- Complete the task in as many ways as you can.
- When done, share your work with a neighbor.

Monitoring Student Learning: What are Teachers Doing?



What could evidence of productive thinking be?

Elicit & gather evidence.

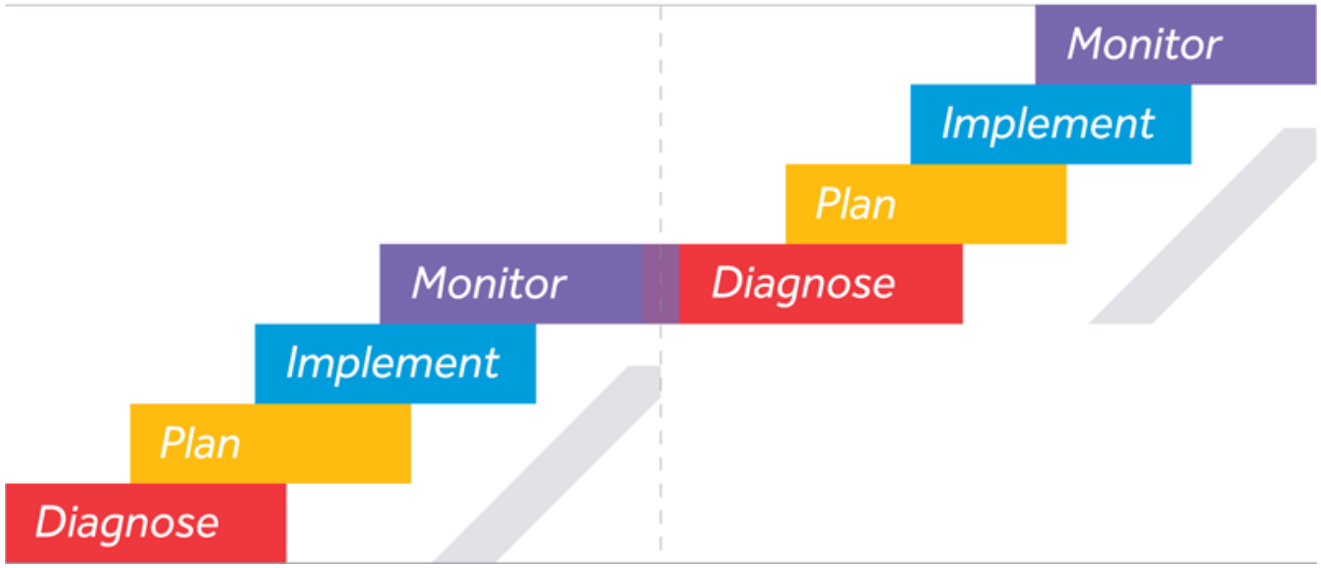
Respond to questions with prompts.

Interpret thinking.

- Keep questions at an appropriate level of difficulty.
- Ask students to comment or elaborate on one another's answers.
- Ask questions that build on, but do not take over or funnel, student thinking.
- Ask questions that probe thinking and require explanations and justification.
- Ask questions that make the mathematics more accessible for student examination and discussion.
- Allow sufficient wait time so that more students can formulate and offer responses.

Evidence from Formative Assessment

- Once we know what it is that we want our students to learn, then it is important to collect the right sort of evidence about the extent of students' progress toward these goals.
  - Black and Wiliam, 1998

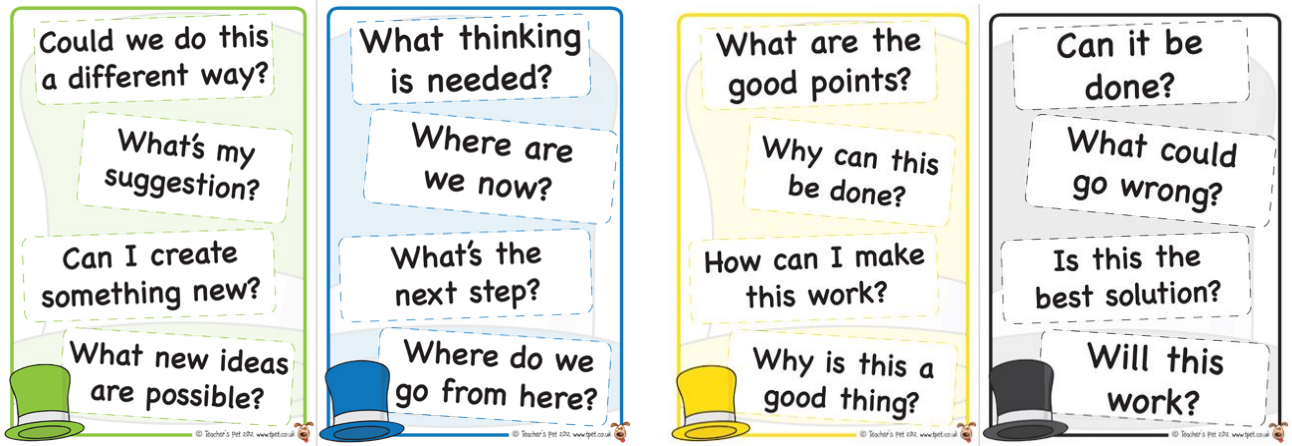


Evidence Embedded in Teaching

- Opportunities for pupils to express their understanding should be designed into any piece of teaching, for this will initiate the interaction whereby formative assessment aids learning.
  - Black and Wiliam, 1998

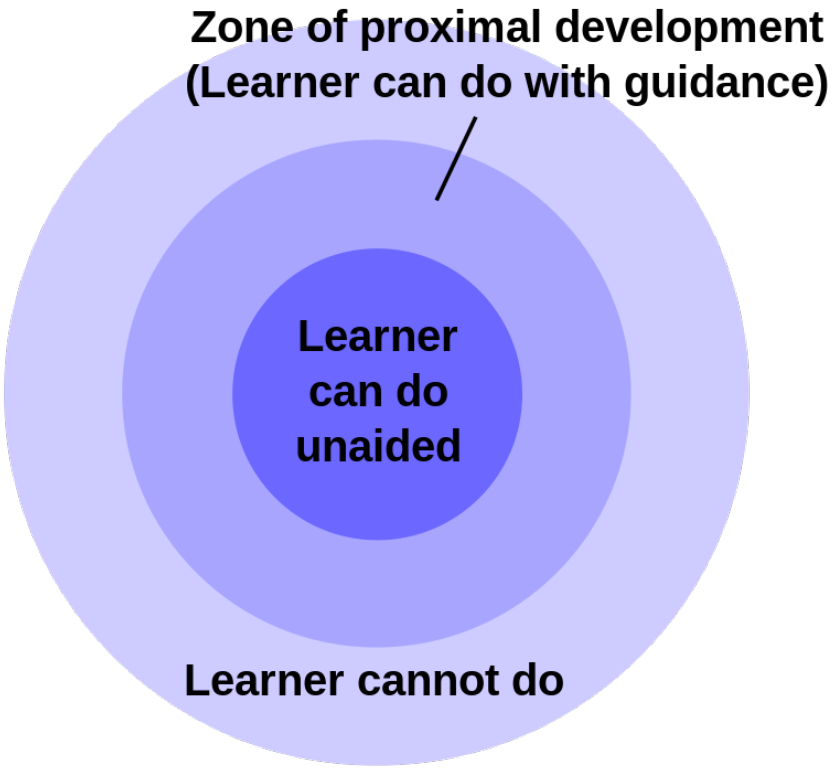
Question Planning

- Planning such questions takes time and should be done before the lesson, so the teacher can address students' confusion during the lesson (instead of the next day.)
  - Black and Wiliam, 1998



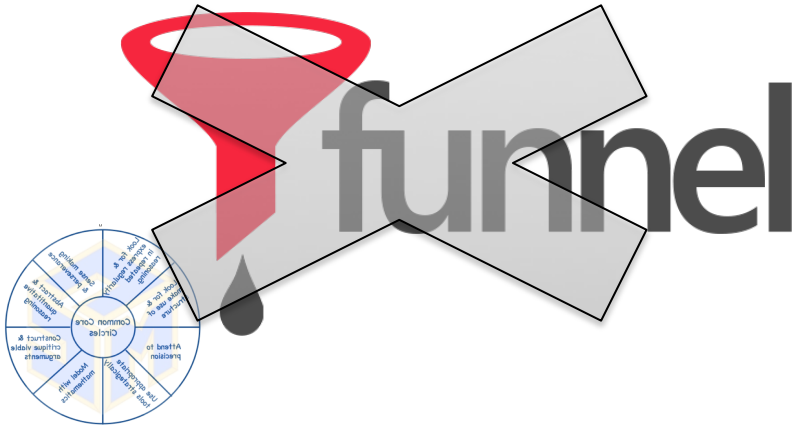
Balancing

- Keeping questions at an appropriate level of difficulty.
  - Neither too easy nor too hard.
  - Questions that encourage constructive struggling.



Probing Questions

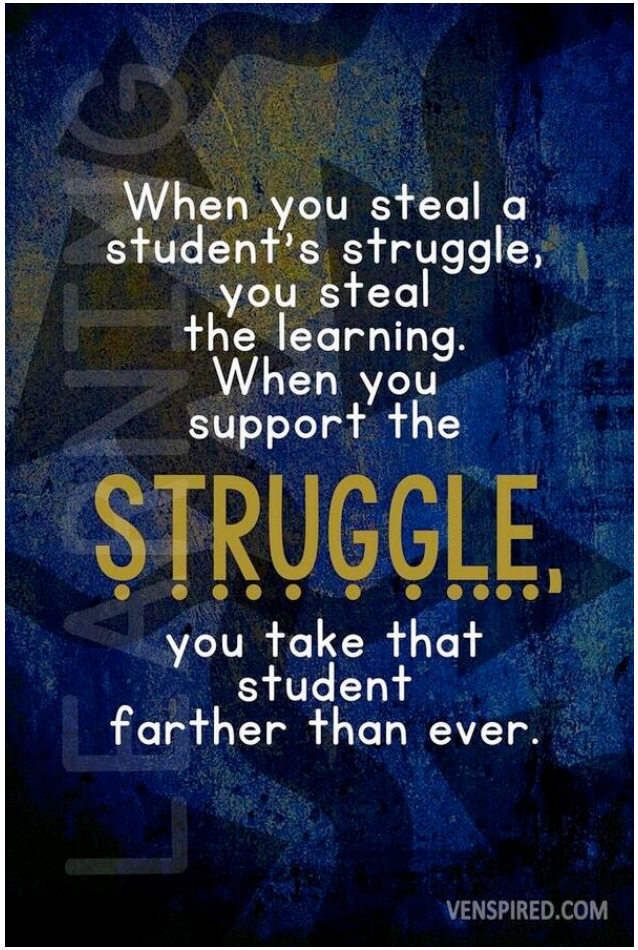
- Ask questions that build on, but **does not take over or funnel,** student thinking.



Probing Questions

- Clarification, “What did you mean by___?”
- Purpose “Why did you say ____?”
- Accuracy “How does that compare with what you said earlier?”
- Examples “Sorry I don’t fully understand. Can you give an example?”

Constructive Struggling

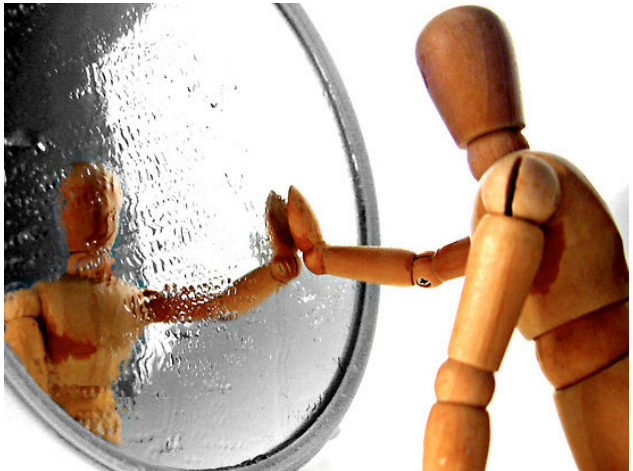


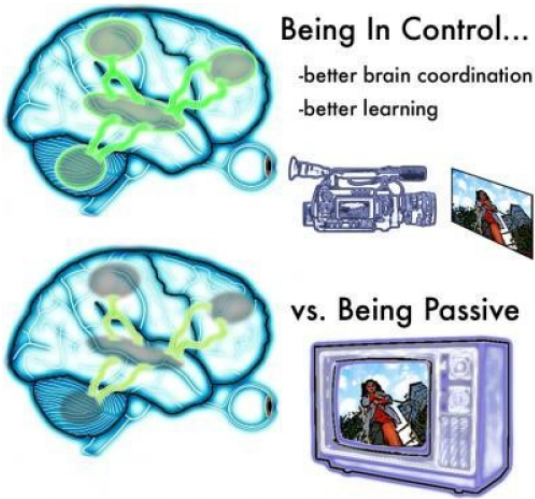
MP1: Make sense of problems and persevere in solving them.

Questioning for MP 3

Construct viable arguments and critique the reasoning today.

- Probe for student justification of solutions.
- Invite students to reflect on their ideas.
- Allow students to play active roles in their own and each other's learning.

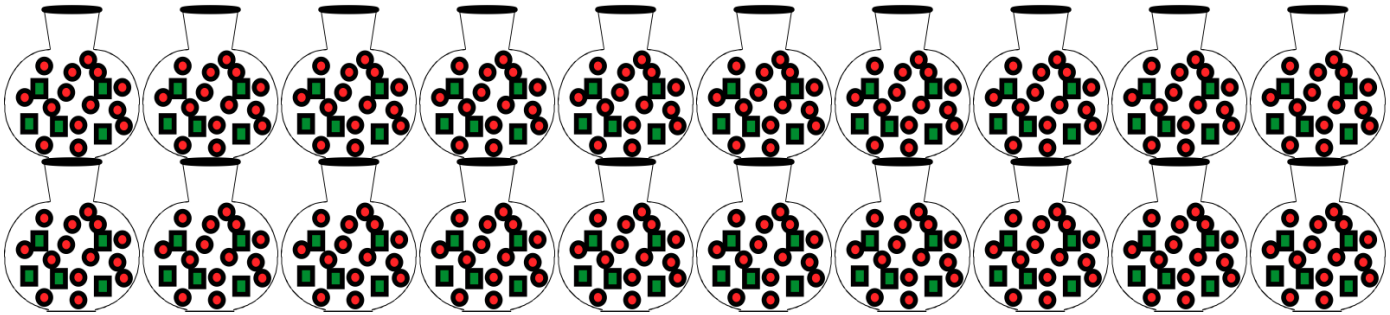




Instructions

- Analyze and discuss student solutions to the task.
  - What do you "hear" the students saying?
  - How do the students understand the math involved?
  - What is your evidence of this?
- Generate questions to further probe student thinking of the mathematics in each solution.

Student A

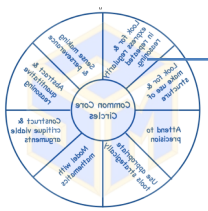


- Questions:

Student B

- Questions:

JR	JB	JR	JB
5	13	55	143
10	26	60	156
15	39	65	169
20	52	70	182
25	65	75	195
30	78	80	208
35	91	85	221
40	104	90	234
45	117	95	247
50	130	100	260



Student C

100 JR is 95 more than the 5 I started with. So I will need 95 more JB than the 13 I started with.

5 JR + 95 JR = 100 JR

13 JB + 95 JB = 108 JB

- Questions:

Student D

(x20)

5 JR ---→ 100 JR

13 JB ---→ 260 JB

- Questions:

Student E

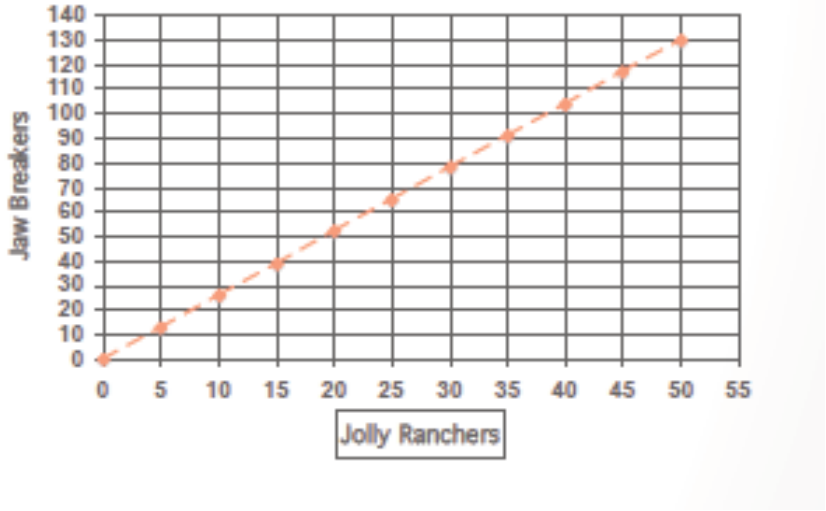
(x100)
1 JR → 100 JR

2.6 JB → 260 JB
(x100)

- Questions:

Student F

- Questions:



The Mathematics

- Jolly Ranchers:
  - Claims
  - Domains and Conceptual Categories
  - Depth of Knowledge
  - Standards for Mathematical Practice
  - California Common Core Mathematics Content Standards

Conclusion

- Participants have experienced what monitoring looks like in a Productive Common Core Mathematics classroom.
  - Evidence, how do you know when your response makes sense?
  - You want me to probe? Questions to go deeper not to funnel.
  - Struggle, who me? Productive struggling is how we learn something new. Struggle on!!!

Common Core Circles Committee Members Who Worked on Presentation

- Bruce Arnold
- Diana Ceja
- Diane Kinch
- Annette Kitagawa
- Melanie Maxwell
- Jennifer Montgomery
- Lisa Usher-Staats
- Sara Munshin
- Michael Farber
- Bruce Grip
- Rosa Serratore
- Dina Williams

Things To Do

- Handout AK and BA – 16
- Student work-2 column
- The Mathematics
- The Candy Jar Problem
- Tasks for other levels: white paper
- 40 handouts