North Carolina Math Summit • Growth Mindset in Mathematics
August 10 and 11, 2016 • Cary, NC

Deborah Loewenberg Ball

LEARNING TO SEE, CONNECT WITH, AND BUILD STUDENTS' RESOURCES:

Focusing on STUDENTS by Zooming in on the Work of TEACHING

SCHOOL OF EDUCATION
UNIVERSITY OF MICHIGAN

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- Rebecca Gadd, Lauren Hickman, Lindsey Mann, Jill Mortimer, Blake Noel, Charles Wilkes, Amber Willis

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All this talk about not focusing on young people's deficits—why does this matter so much? Isn't our job to figure out what young people don't know and help them grow?

So—focusing on young people's strengths is crucial for effective and equitable instruction and for advancing social justice.

1. Learning occurs through a process of building on prior knowledge and experience.
2. Strong academic and mathematical identities are a means to developing competence. They are also instructional goals.
3. For young people who are members of historically marginalized groups, stereotype threat and other biases interfere with and impede children's performance.

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Okay, I see why this is important. But it isn't easy. How do I learn to be more skillful at recognizing and using young people's strengths?

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MY CHOICE OF VIDEO SEGMENTS FOR THIS SESSION

- Non-professional video (“home video quality”)
- My own teaching, but why?
- Diverse classrooms: race, ethnicity, language, SES
- Complex mathematical work, but elementary level
- Still (I hope) useful for the specific goals of this session: to learn to see and use students’ resources

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MAKING THE SHIFT FROM A PREOCCUPATION WITH DEFICITS TO A FOCUS ON STRENGTHS

- Seeing past "distractions" or non-mathematical issues
  - Behavior that distracts the teacher, but not the student or the other students (Noel, 2014)
  - How learners talk (as they are learning; and when they are speaking academic language, or in English when that is not their first language)
- Pausing on "apparently incorrect" answers
  - Actually not incorrect
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  - More correct than incorrect

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THE MINICOMPUTER

(Papy Minicomputer)

- Abstract mathematical context for work on number relationships, mathematical structure, arithmetic properties (e.g., distributive property), even and odd numbers
- Also a setting for developing skills of mathematical argument and analysis, as well as proof
- Novel and complex mathematical environment for students (and extends well into secondary level)

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THE MINICOMPUTER

12

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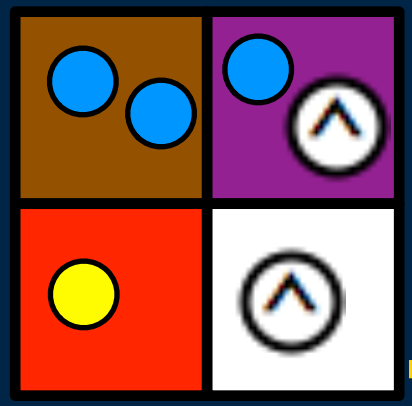

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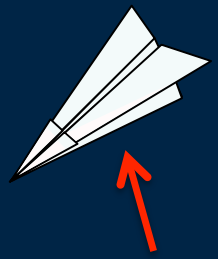
SEEING VIRSHAWN

Virshawn between
11:19 – 11:25



Paper airplane

What do you see of Virshawn?

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At 11:26, the teacher says,

"You know what, Virshawn, I am going to need you to come up here closer where you can see and hear and won't be distracted."

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Over the next minute, Virshawn is raising his hand to answer questions.

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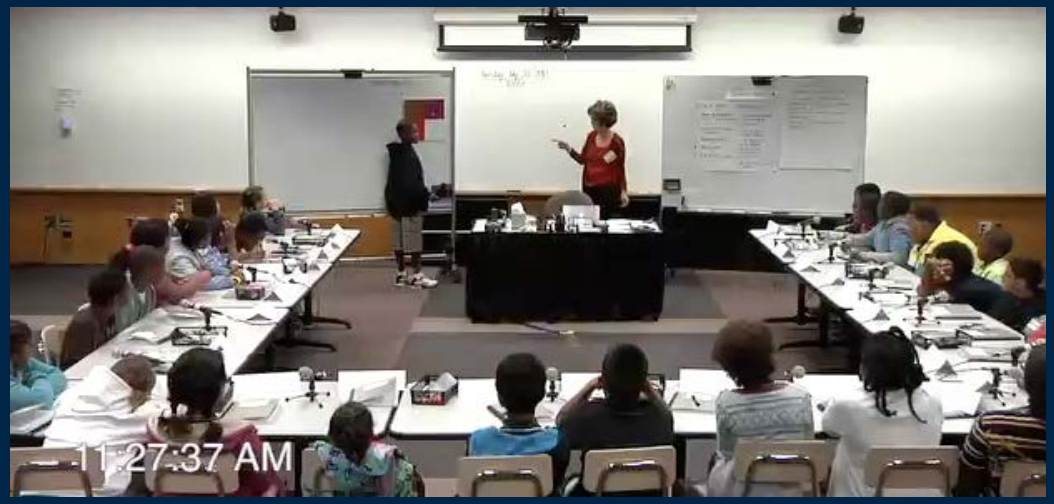
At 11:27, the teacher says,

"Virshawn, you get to come up and make a number because you are the closest person to the board."

"You can have two checkers and you can put them wherever you want, and make a number, and then you can call on somebody ."



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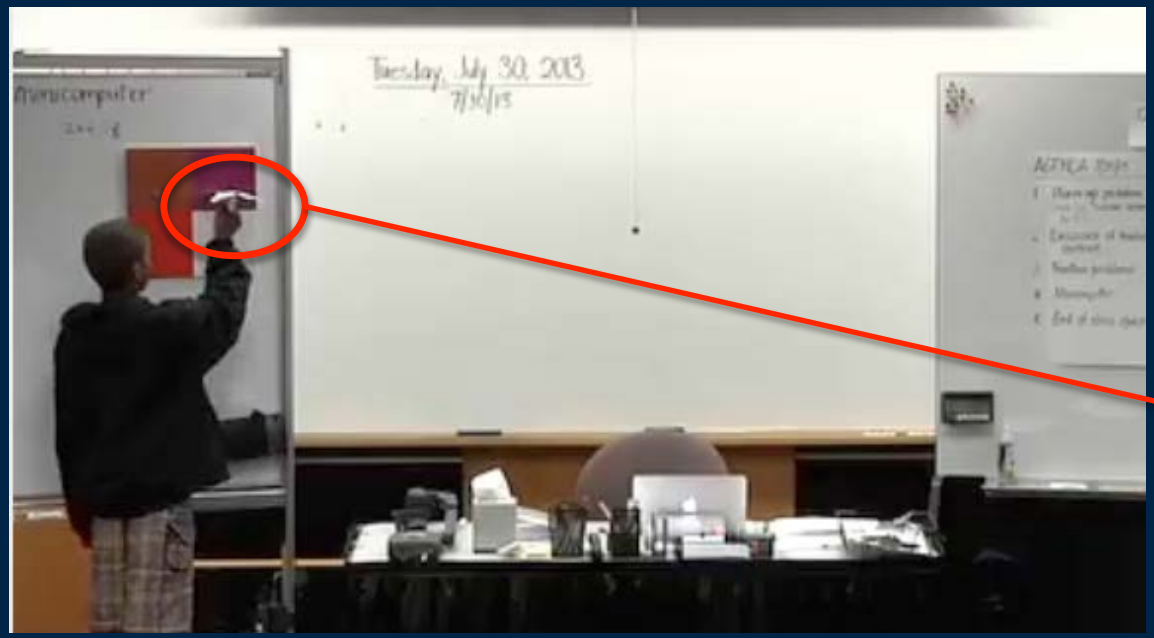
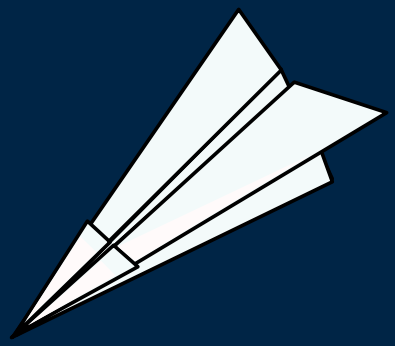
AT 11:28, VIRSHAWN TAKES THE ROLE OF THE TEACHER





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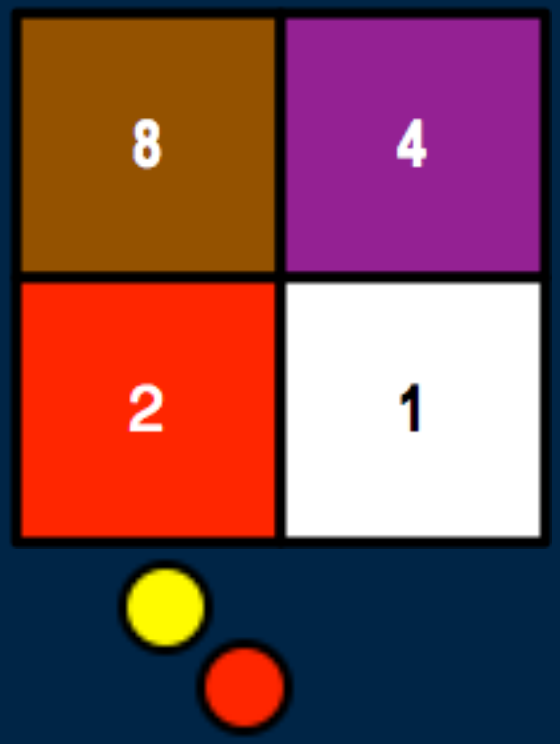
VIRSHAWN, ONE WEEK LATER

THE TWO-CHECKER PROBLEM

What numbers are possible to make on the Minicomputer with exactly two positive checkers?



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ADDING A NEGATIVE CHECKER!

The children found that 7, 11, 13, 14, and 15 were impossible with exactly two checkers.

EXTENSION:

Can you make 7, 11, 13, 14, and 15 if you have a negative checker? You must use both positive checkers and you can use one negative checker if it is useful.

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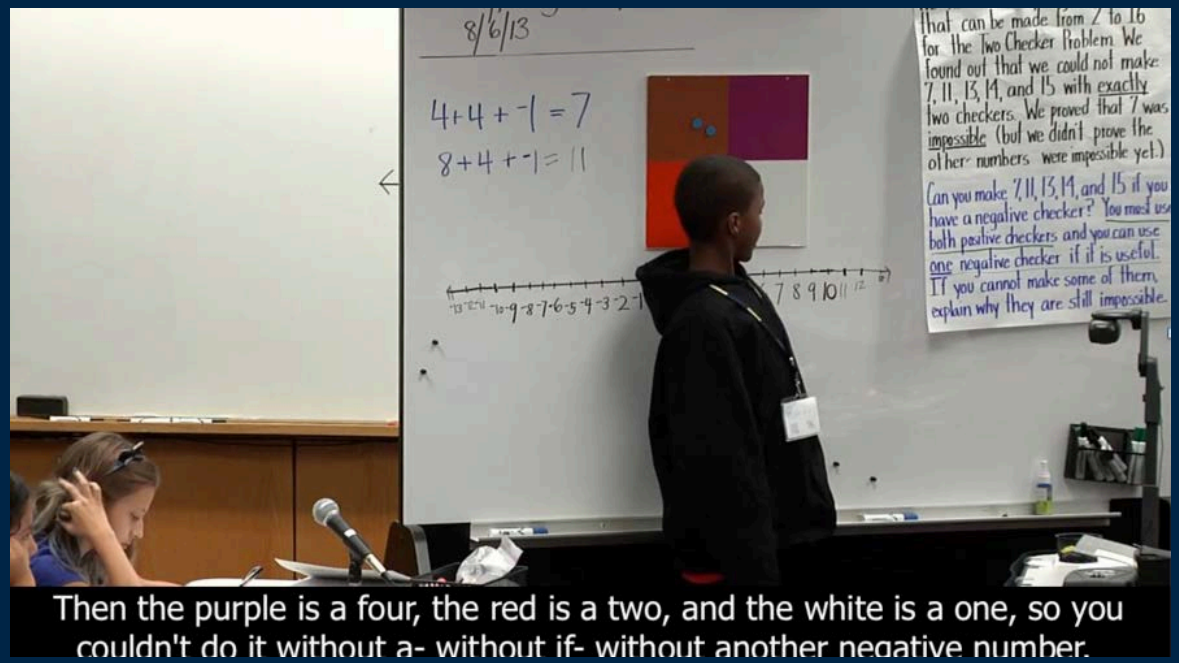
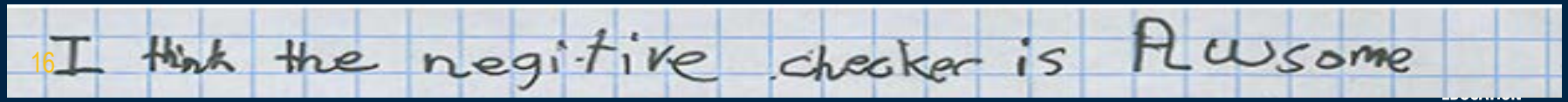
VIDEO: HOW DOES THIS DAY RELATE TO WHAT HAPPENED ONE WEEK EARLIER?





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WHAT IS THE WORK OF SEEING AND BUILDING ON VIRSHAWN'S STRENGTHS IN THIS EXAMPLE?

- Trusting Virshawn to be mathematically engaged
- Making explicit positive mathematical roles that actively include and support children (e.g., "being the teacher")
- Creating opportunities to "practice mathematics"
- Making available an opportunity to develop agency through "proving the impossible"
- Focusing on mathematics as a context for positive roles and identity

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SEEING STUDENTS' RESOURCES AND ASSIGNING MATHEMATICAL COMPETENCE

A set of practices that deliberately deploy the power of teaching to:

1. Broaden and label what being competent in mathematics means
2. Intervene to position who (and what) is seen as competent in math class
3. Support individual students to develop their mathematical and academic identities and competence

Sources: E. Cohen and R. Lotan, complex instruction; J. Boaler's work; *Smarter Together: Collaboration and Equity in the Elementary Mathematics Classroom* (Featherstone, Crespo, et al., 2011);

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Sounds good.
What does that
require of me?

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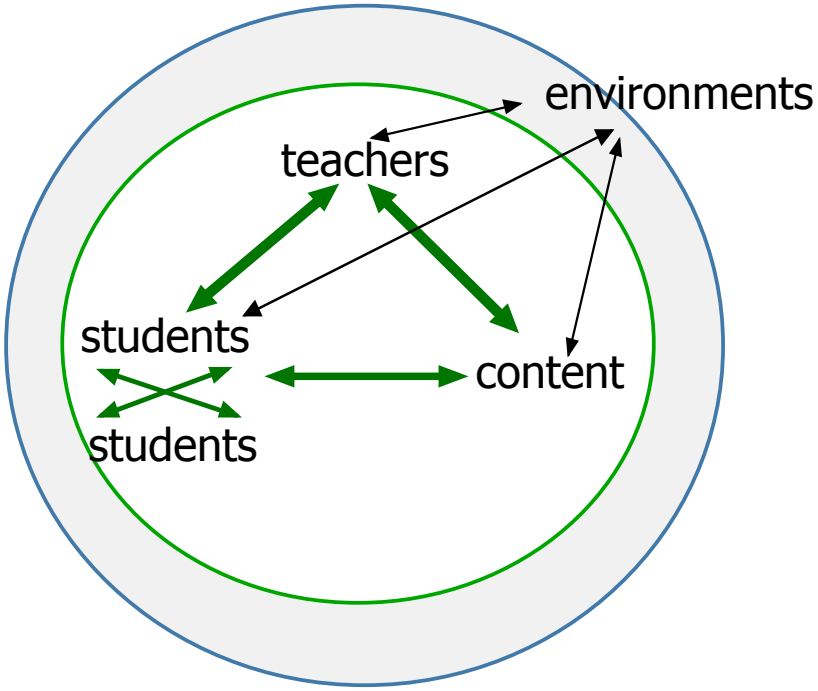
WHAT IS TEACHING?



Cohen, Raudenbush, and Ball (2003)

Teaching is co-constructed

- . . . in broad socio-political, historical, economic, cultural, community, family environments
- . . . through the interpretations and interactions of teachers, students, and "content"

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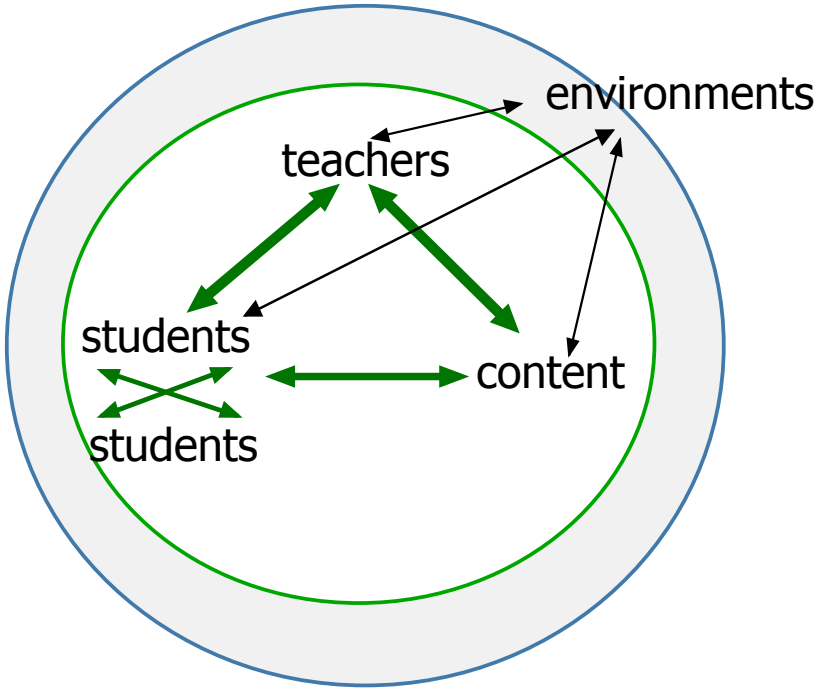
WHAT IS THE WORK OF TEACHING?



Taking responsibility for deliberately maximizing the quality of these interactions . . .

- . . . in ways that maximize the probability that students learn
- . . . worthwhile content and skills

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WHY "WORK" OF TEACHING"?

1. To focus our attention on what teachers DO and to distinguish this from other features of classrooms, such as instructional formats, classroom culture and norms, what students are doing, how the curriculum is designed

But what about small group work, open-ended problems, "grit," etc.? Aren't those what teachers DO?

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WHY "WORK" OF TEACHING"?

1. To focus our attention on what teachers DO and to distinguish this from other features of classrooms, such as instructional formats, classroom culture and norms, what students are doing, how the curriculum is designed
2. To honor the effortful and deliberate nature of teaching and not to leave it invisible, implicit, and taken for granted

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WHAT DOES "ASSIGNING COMPETENCE" REQUIRE IN TEACHING?

1. Broaden and label what being competent in mathematics means
2. Intervene to position who (and what) is seen as competent in math class
3. Support individual students to develop their mathematical and academic identities and competence

1. Be able to see what is "mathematical" and what is "competent"
2. Have techniques for making these moves to intervene
3. Strategically using these techniques with particular students in authentic and well-timed ways

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30 fifth grade students
21 African American, 4 Latin@, 4 White
Low-income community
Most children have been unsuccessful in school mathematics

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AN INHERENT FACT OF TEACHING

Is that we are always communicating, relating, and making sense across difference, including:

- Age
- Gender
- Race, ethnicity, culture, religion
- Identities
- Language
- Experience

So this means that fundamental to the work of teaching is attuning to other people, and being oriented to others' ideas and ways of thinking and being

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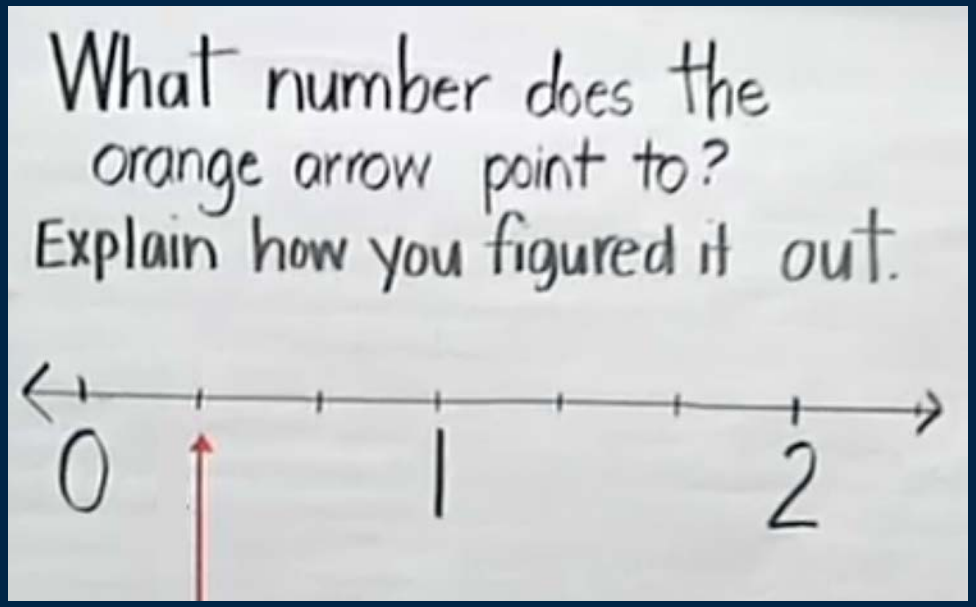
THE STUDENT'S TASK



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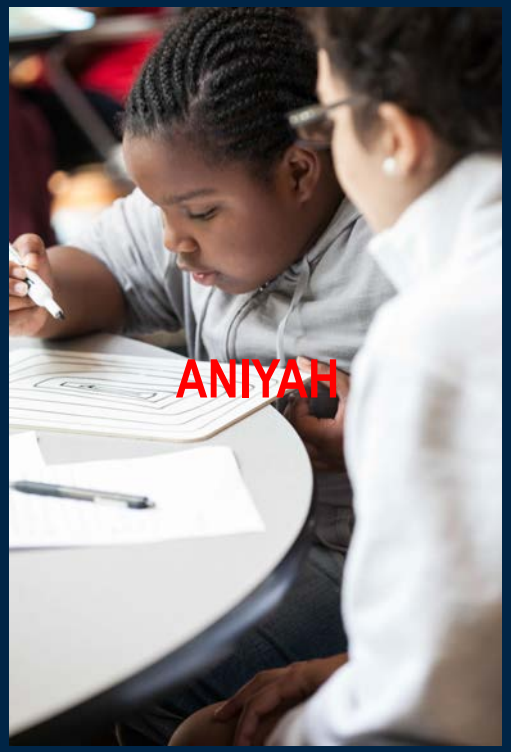

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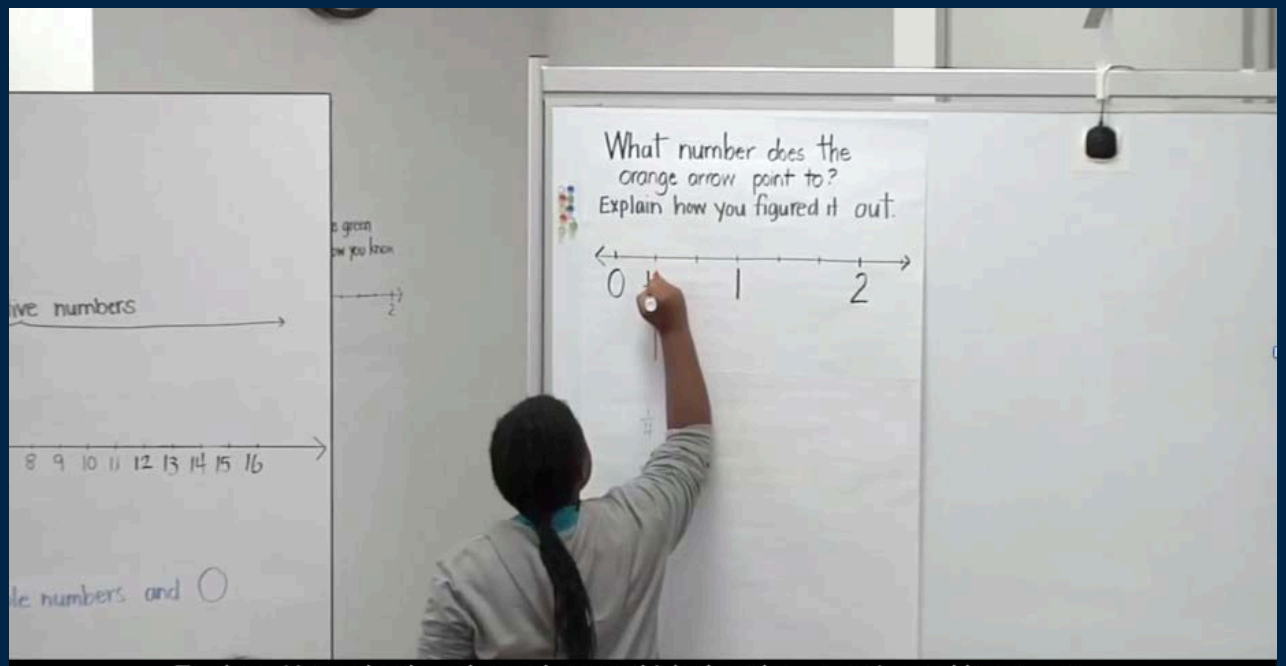
VIDEO: ANIYAH AND TONI



Teacher: Listen closely and see what you think about her reasoning and her answer.

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WE WILL WATCH ANIYAH AND TONI AGAIN, AND A LITTLE MORE, BUT FIRST . . .

What is involved in seeing individual students before the discussion of solutions?

- While all the students are working on this task, before Aniyah goes to the board, the teacher circulates around the room.
- The teacher scans what students are writing to decide how to discuss solutions.

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READING STUDENTS' WORK

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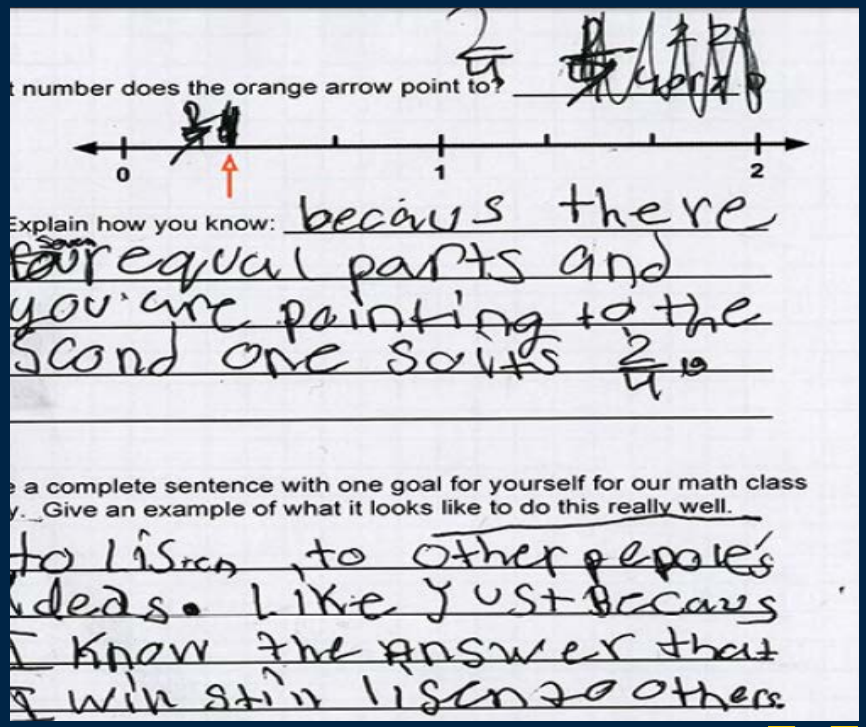

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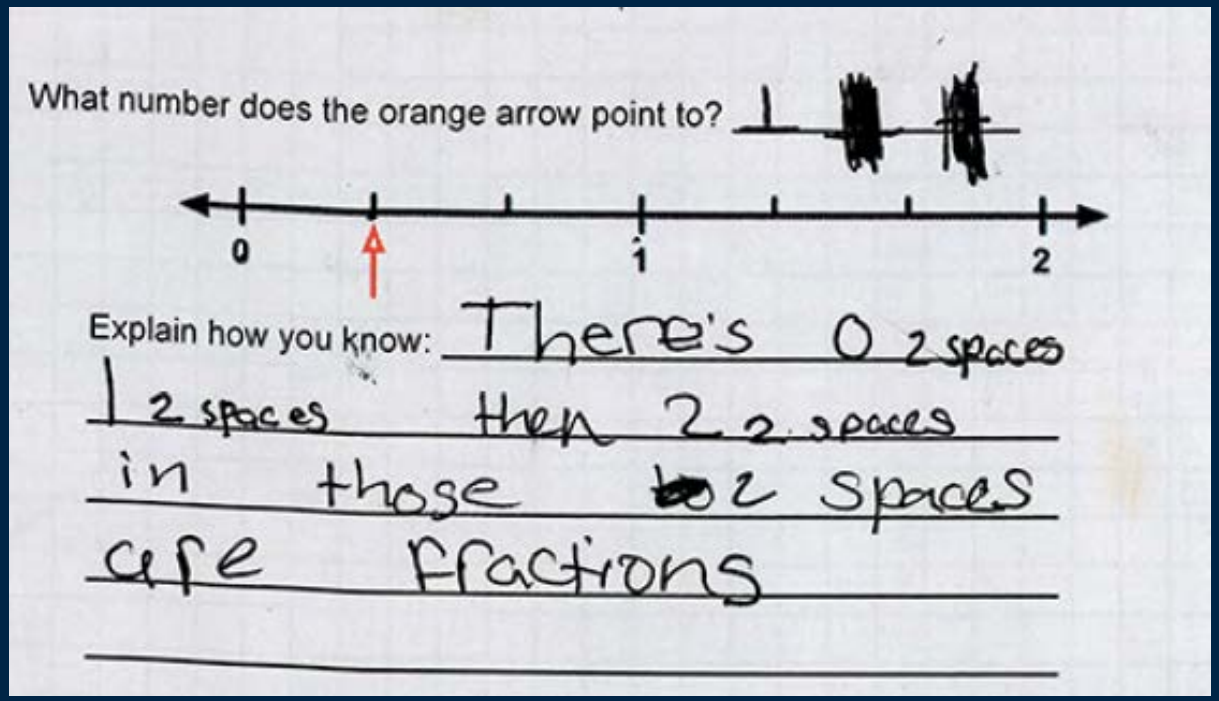
READING STUDENTS' WORK



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READING STUDENTS' WORK

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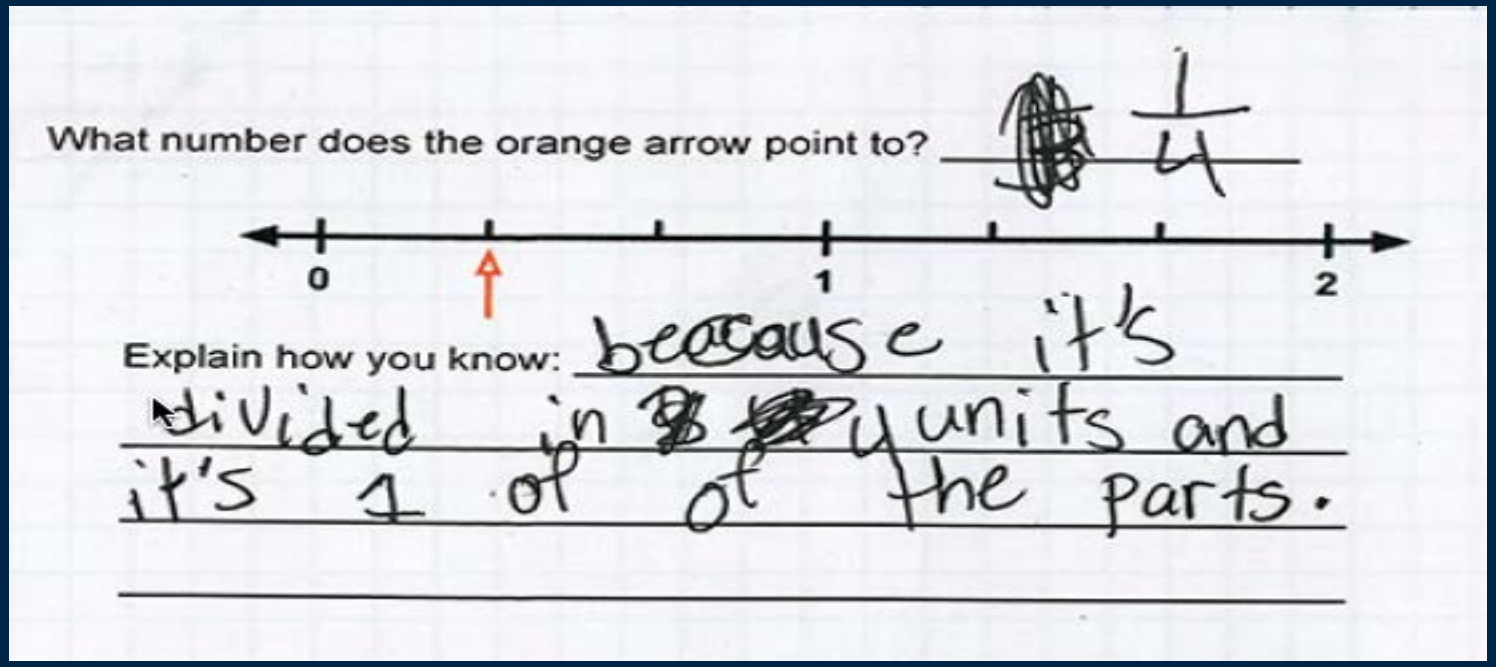

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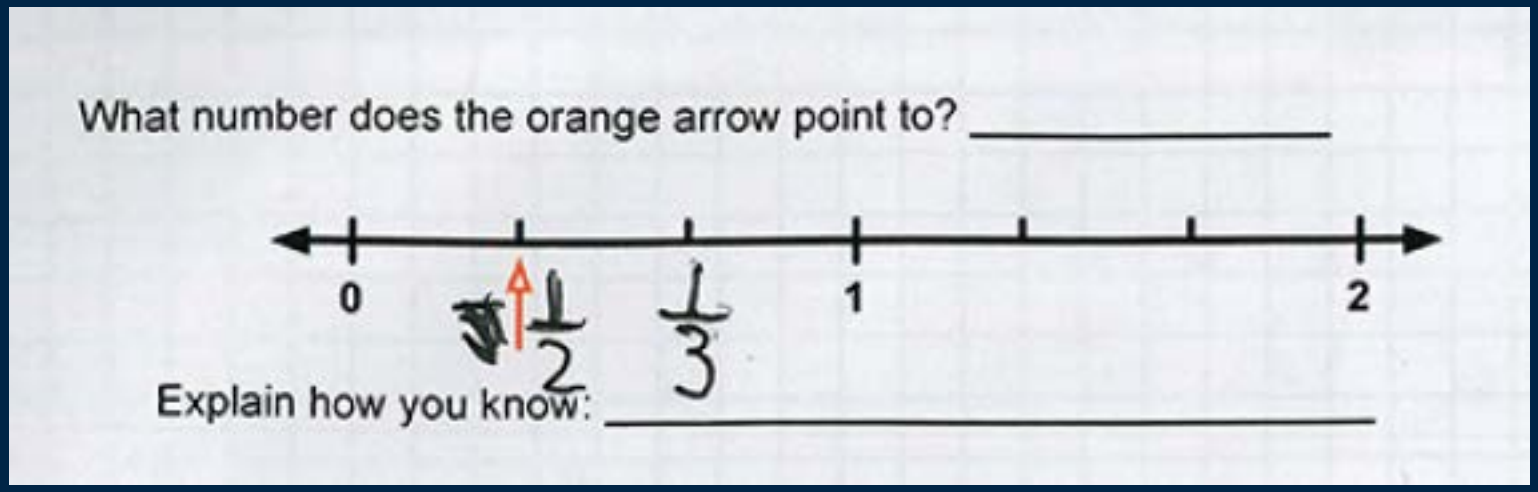
READING STUDENTS' WORK

1/3 without mathematical explanation



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ANIYAH, TONI, LAKEYA, DANTE

What does each student know? What is he or she able to do?

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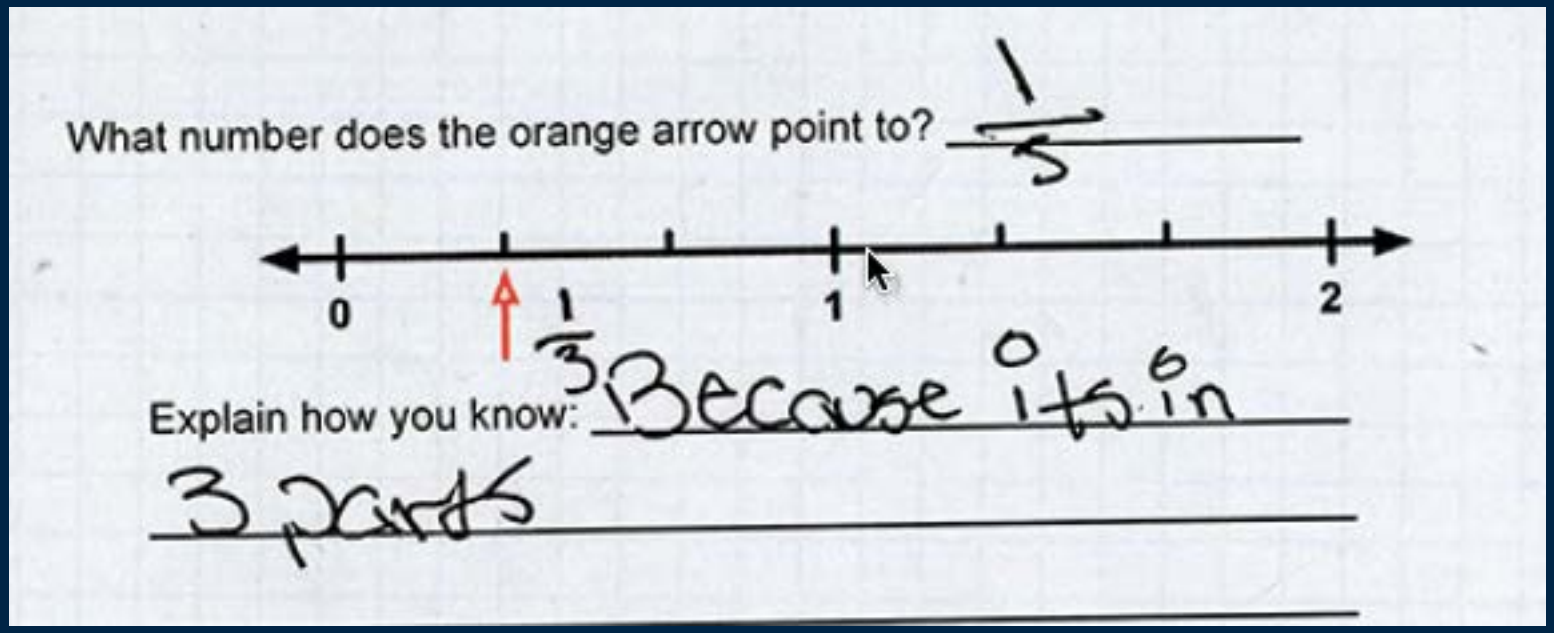
TONI



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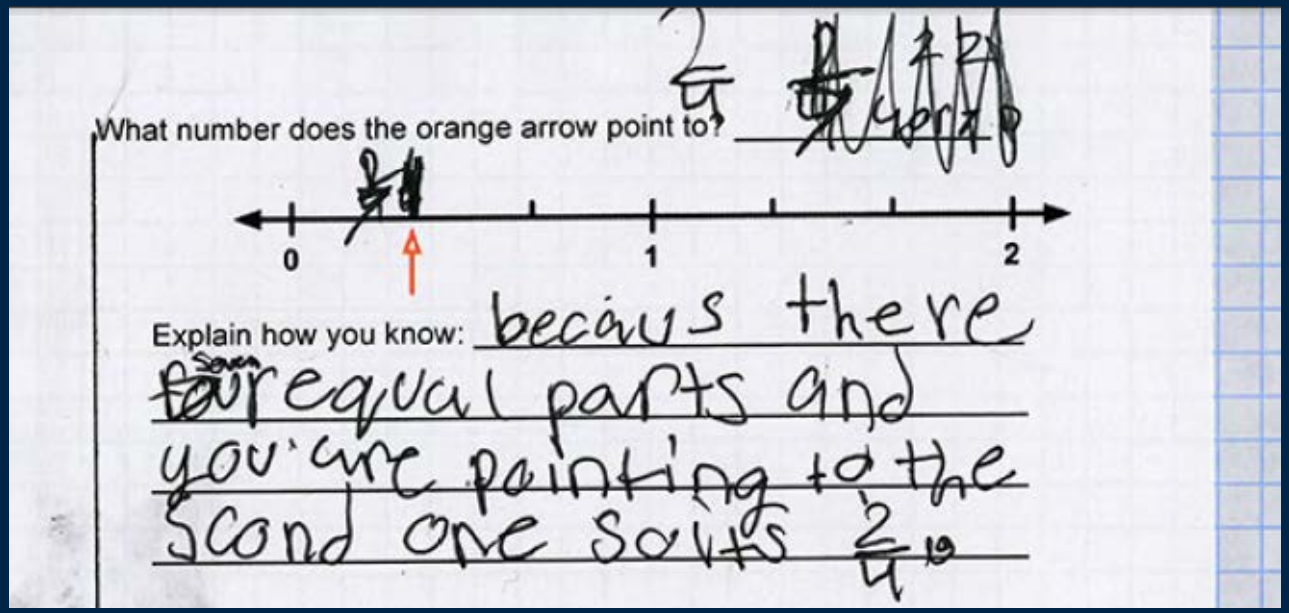
LAKEYA



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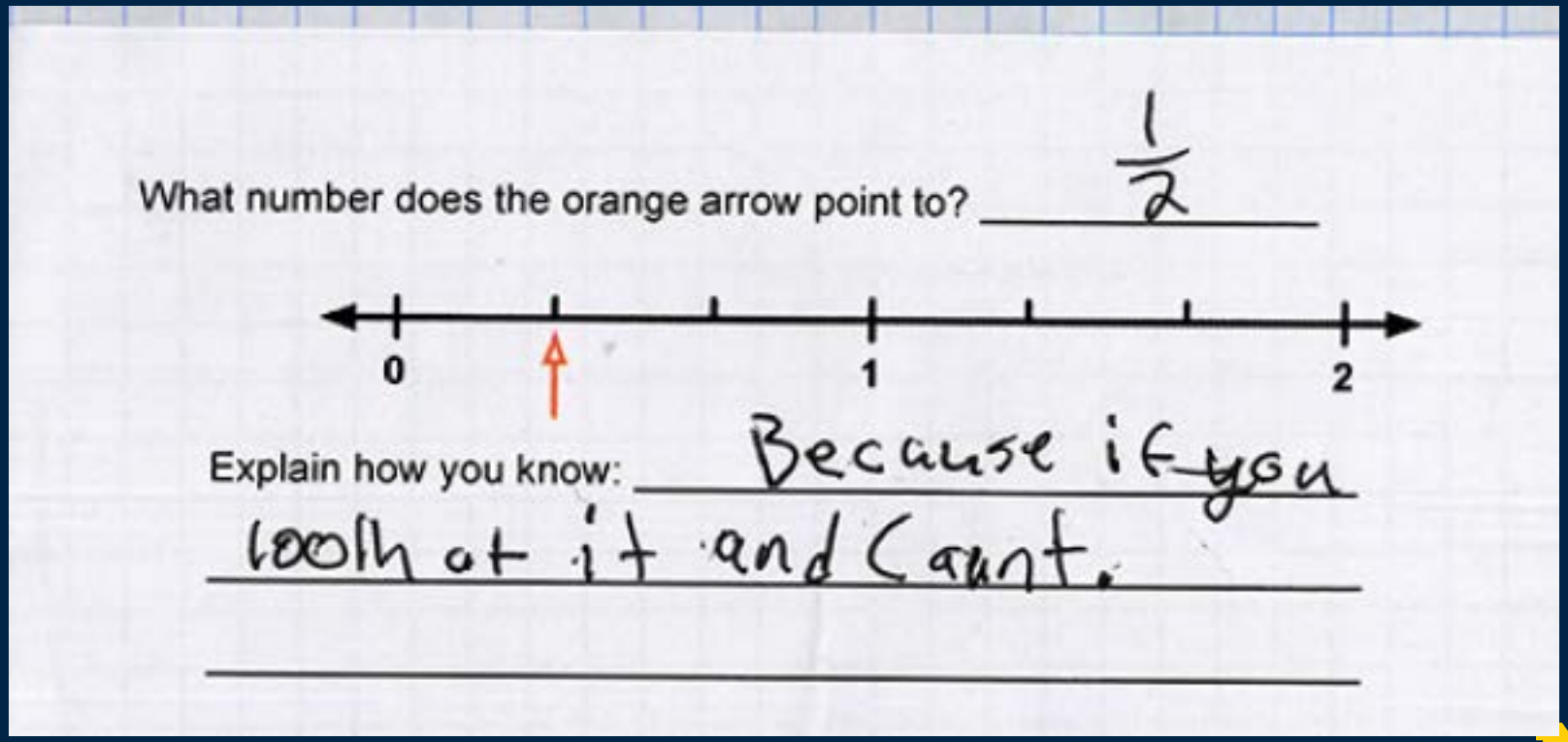
DANTE



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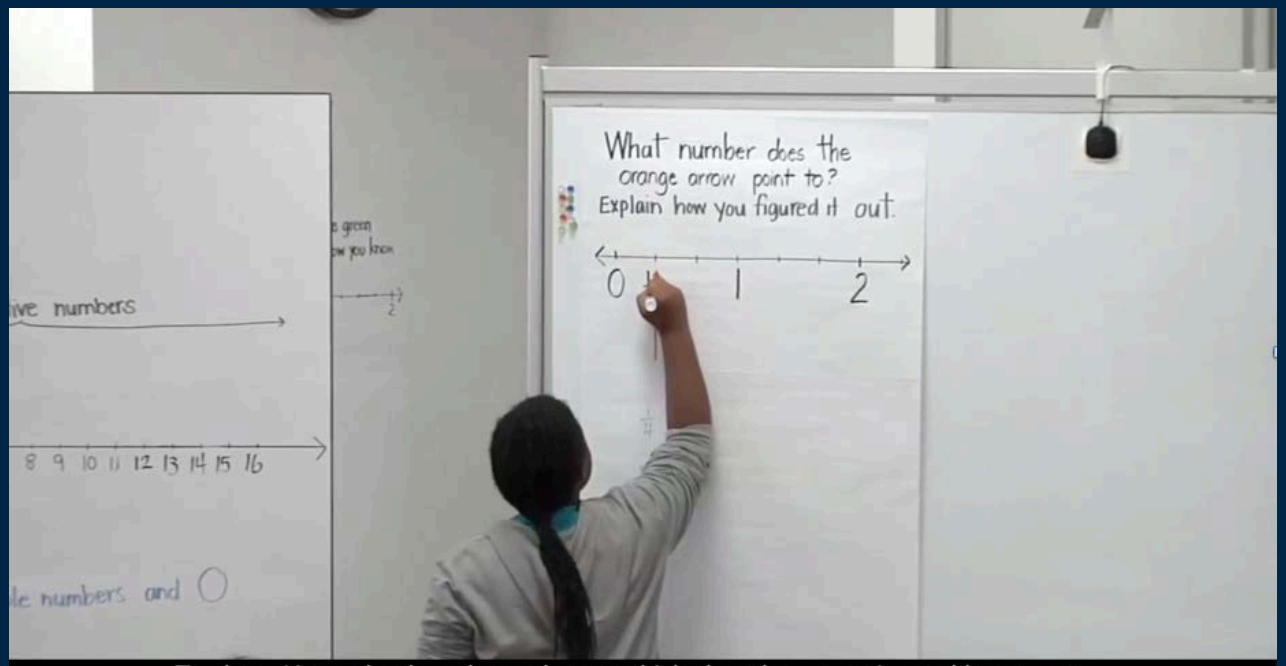
VIDEO: ANIYAH, TONI, LAKEYA, DANTE



Teacher: Listen closely and see what you think about her reasoning and her answer.

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WHAT IS INVOLVED FOR THE TEACHER?

- Hearing, seeing, and reading students, in “real time”
  - During a class discussion
  - While circulating in the classroom
  - When reading students’ writing

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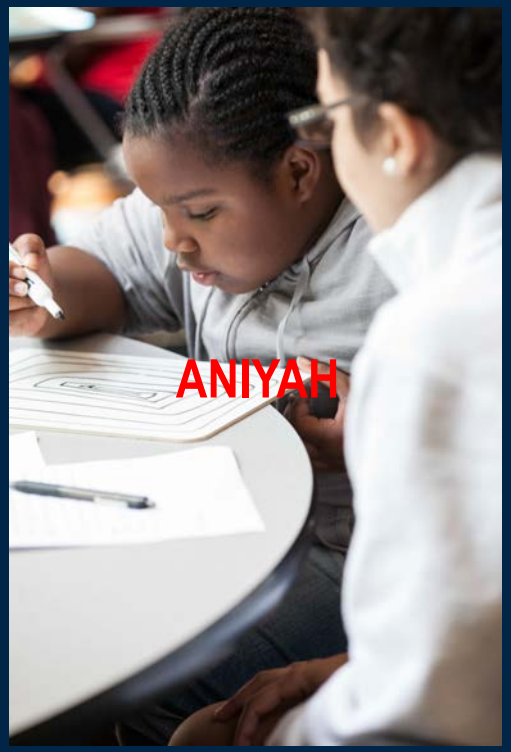

What does **Aniyah** know and what can she do?
What does **Toni** know and what is she able to do?

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WHAT DO MANY "HEAR" IN ANIYAH AND TONI?

ANIYAH

- She has the wrong answer: 1/7

TONI

- She is playing with her hair ans trying to get attention
- She is trying to embarrass Aniyah

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WHAT *DO* ANIYAH AND TONI KNOW AND WHAT *CAN* EACH DO?

ANIYAH

- Uses the definition for a fraction to explain
  - She identifies the “whole”
  - She makes sure the intervals are equal
  - She counts intervals and not tick marks
  - She knows how to write “one-seventh”
- Produces a mathematically well-structured explanation
- Presents her ideas clearly

TONI

- Listens closely to a classmate’s presentation
- Uses the definition for a fraction to ask
  - How Aniyah decided on 7 parts
- Asks a pointed mathematical question

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USING TECHNIQUES AND STRATEGIES FOR ASSIGNING COMPETENCE

Identify the competence to be highlighted. Consider how to disrupt hierarchies of status in class by who is to be "called out" as competent.

- Call out an individual's competent move or contribution publicly ("___ just shared a very important idea")
- Ask a student to explain another student's contribution that the teacher highlights
- Ask the class to identify things that were part of an important contribution by one of the students
- Write something publicly that a studentor students came up with or contributed that is important
- Accord expertise to students through assigning roles explicitly in a group

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MAKING THE SHIFT FROM A PREOCCUPATION WITH DEFICITS TO A FOCUS ON STRENGTHS

- Pausing on “apparently incorrect” answers
  - Actually not incorrect
  - Answer to a different (and reasonable) question
  - More correct than incorrect
- Seeing past “distractions” or non-mathematical issues
  - Behavior that distracts the teacher, but not the child or the other children (Noel, 2014)
  - How children talk (as they are learning; and when they are speaking academic language, or in English when that is not their first language)

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DILEMMAS OF LEARNING TO SEE AND HEAR STUDENTS' RESOURCES

1. Feeling committed to students as sensemakers who bring many strengths and feeling pressure to make sure students get it "right"
2. Using yourself yet also suspending assumptions based on what you would mean or feel
3. Knowing mathematics well enough to see "mathematics" in young people's talk, representations, etc. while also not letting your own mathematical knowledge overtake your capacity to see and hear what they are saying or showing

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WHAT IS INVOLVED FOR THE TEACHER IN SEEING AND BUILDING ON STUDENTS' STRENGTHS?

- Listening carefully to what they say, reading attentively what they write
- Making deliberate choices about how to see and interpret students
- Both of these involve using what you know, but also suspending what you assume

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OPPORTUNITIES TO LEARN TO BUILD SKILLS IN SEEING, HEARING, AND BUILDING ON STUDENTS' RESOURCES

- Examining challenging video clips with others
- Looking at students' written work
- Doing the mathematics that children are doing
- Seeing children outside of school, in community settings: look not just for mathematical content but also practices

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THANK YOU!

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Slides will be available on my website

(deborahloewenbergball.com)

NEW! AVAILABLE 8/12/16!

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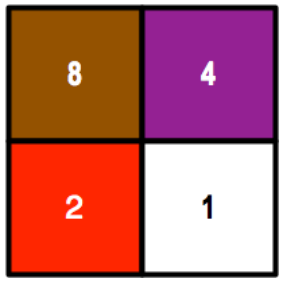
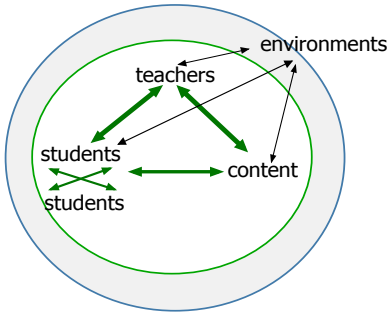


Graphic on slides 7, 8, 14, 15, and 16:
Papy, F. (1970). Papy's mincomputer. *Mathematics Teaching*, *50*, 40–45.



Graphic on slides 21 and 22:
Cohen, D. K., Raudenbusch, S., & Ball, D. L. (2003). Resources, instruction, and research. *Educational Evaluation and Policy Analysis*, 25 (2), 119-142.

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