WHAT we say and HOW we say it matters:

An analysis of the subjectifying and mathematizing language of mathematics coaches and teachers
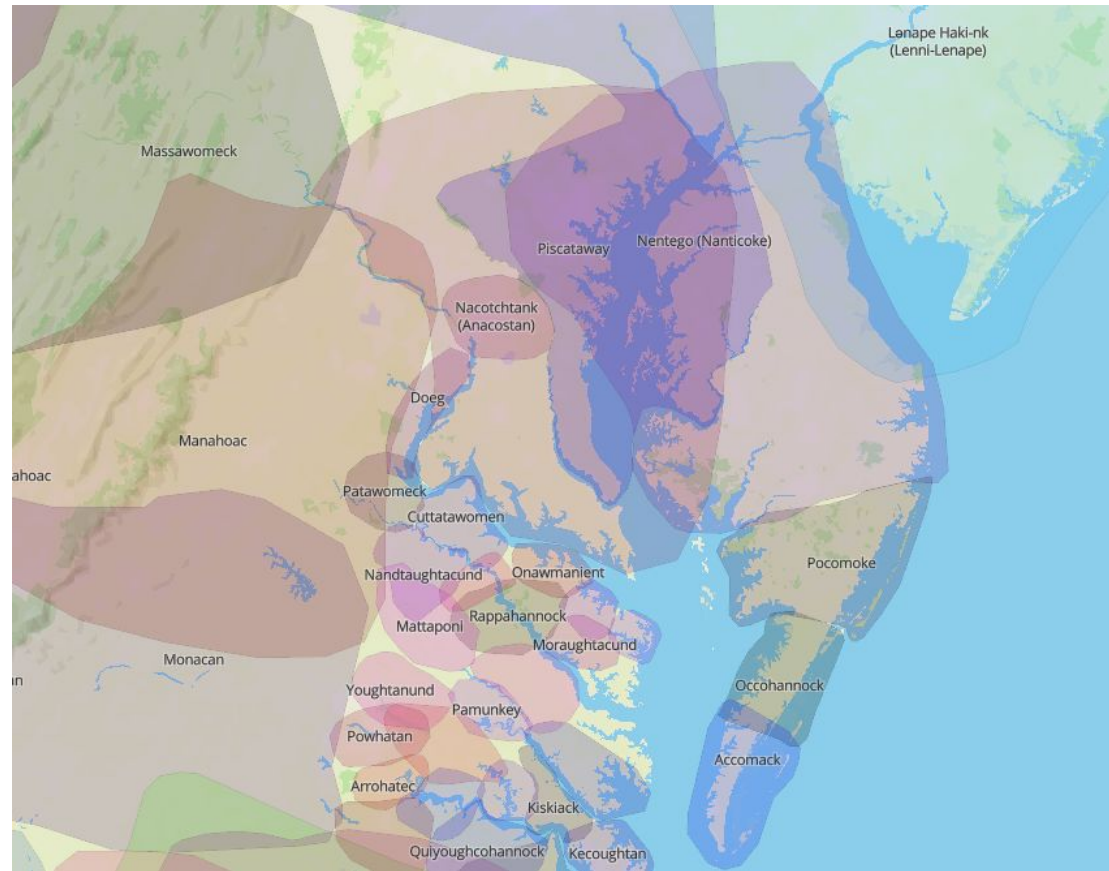
Kimberly Morrow-Leong (she/her)
George Mason University
TODOS 2020/2021

http://bit.ly/WHATWeSayTODOS21

Territories around the Potomac river changed frequently.

https://native-land.ca/

Attending an Online Session

- We will use a **Jamboard** http://bit.ly/WHATWeSayTODOS21 to engage listeners. Please share your participation!

- Access Jamboard and slides at the TODOS conference webpage:

- When you see the pause symbol, please stop to think or respond, particularly if watching with a group.

- Share on Twitter @kmorrowleong @TODOS2021

WHAT we say and HOW we say it matters:

An analysis of the subjectifying and mathematizing language of mathematics coaches and teachers

The movement toward equity and social justice in the mathematics classroom calls for us to challenge deficit views and language in the mathematics classroom. While you may know deficit language when you hear it, can everyone in your community recognize it? In this session we will learn to categorize utterances using a framework, and use the information to formulate strategies for encouraging more asset-focused language that everyone in the school community can recognize.
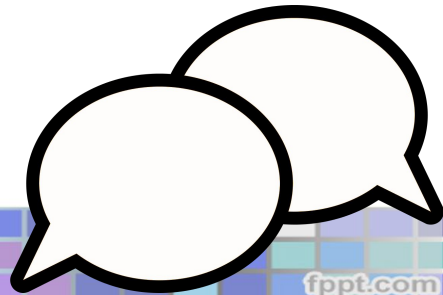
Welcome

What problem are you hoping to solve by attending this session?

Use the **jamboard** (slide 2) to share.

http://bit.ly/WHATWeSayTODOS21

Task

Take a moment to read this task and come up with a solution.

The Sandwich Problem

8 students from Ms. Sandoval's class took a field trip to Washington, D.C. They only packed 6 sandwiches for lunch!

- At the Washington Monument, 5 students shared 2 sandwiches
- At the White House, 3 students shared 4 sandwiches
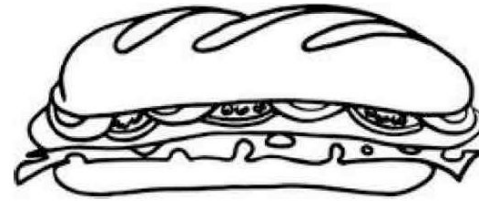
Who got the most food? Who got the least? How do you know?

Explain your thinking using pictures, numbers, and words.

Student work from Morrow-Leong, 2013; Suh, Birkhead, Galanti, et al. 2019; Suh, Birkhead, Farmer, et al., 2019

WHO **ARE** **WE?**

How do you serve your community?

- **School**
- **Central District Leader**
- **Itinerant District Leader**
- **Teacher Educator**
- **Research**
- **Publishing**

Use the **jamboard** (slide 3) to share.

http://bit.ly/WHATWeSayTODOS21

What does deficit thinking/language sound like in your community?

Use the **jamboard** (slide 4) to share.

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Session Goals

- Define deficit thinking.

- Identify where deficit thinking/language is used.

- Learn tools to identify language that focuses on deficits.

- Examine the language of some elementary mathematics specialist coaches for threats of deficit thinking/language.

- Consider a plan to combat deficit thinking in your community

What is deficit thinking?

Deficit thinking posits that the student who fails in school does so because of his/her internal deficits or deficiencies.

(Valencia, 2010, pp.6-7)

Six Characteristics of Deficit Thinking

#1 Blaming the victim	Instead of the system in which they operate
#2 Oppression	The unjust use of power to keep people "in their place"
#3 Pseudoscience	"The process of false persuasion by scientific pretense."
#4 Temporal Changes	The way deficit thinking is manifested in each era.
#5 Educability	(or ineducability) predicts how a student is able to learn
#6 Heterodoxy	Holding unconventional opinions; dissent; (nonconformity)

Valencia, 2010

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What examples of deficit thinking do you hear in your school building(s)?

On the **jamboard** (slides 5 – 10), record an example of each of the six characteristics of deficit thinking that you have heard.

#1 Blaming the victim

#2 Oppression

#3 Pseudoscience

#4 Temporal Changes

#5 Educability

#6 Heterodoxy

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What does deficit thinking sound like?

[I blame the parents] 100%. Not that it's their fault. But it's the culture that they are living in . . . our kids come to us at pre-K, 2 or 3 years below grade level already . . . we are playing catch up from preschool on.

(McKenzie & Scheurich, 2004, p.608, as cited in Valencia, 2010)

What does deficit thinking sound like?

I think that's where the schools are having a hard time is because the parents are not . . . motivating their children to do well. So, the school is hardly going to undo that lack of motivation. And I think that's a sad thing.

(McKenzie & Scheurich, 2004, p.608, as cited in Valencia, 2010)

Six Characteristics of Deficit Thinking

#1 Blaming the victim	"If she would just _____ "
#2 Oppression	"Those kids can't have an elective. They have to _____ "
#3 Pseudoscience	"None of those kids can _____ . They were just born that way."
#4 Temporal Changes	"We will focus our remediation on 'bubble kids.'"
#5 Educability	"Those kids can't be in that class because they can't _____ "
#6 Heterodoxy	"What's important in our school is _____ , not _____ ."

Valencia, 2010

Language and Identity

Language and Identity in a Classroom

- Heyd–Metzuyanim and Sfard (2012) studied affect in the classroom

- *Identifying*: "the activity of talking about properties of persons rather than about what the persons do"

- Identity language is *subjectifying*– it focuses on the student as the doer of mathematics

- Identity language is categorical

(Heyd-Metzuyanim & Sfard, 2012)

Mathematizing and *Subjectifying* Utterances

- Heyd–Metzuyanim and Sfard (2012) distinguished between *subjectifying* and *mathematizing* language

- Classroom learning is an interplay between mathematizing and subjectifying language.

- *Mathematizing* language focuses on mathematical objects, ideas, and tools

- *Subjectifying* utterances focus on individual identity

(Heyd-Metzuyanim & Sfard, 2012)

Subjectifying Utterances

- *Subjectifying* utterances carry emotional import, influencing student affect, impacting participation. *Mathematizing* utterances did not.

- *Subjectifying* language can be described by the degree to which the student is associated with the mathematics performance.

  - **First Level:** refers to a student's specific performance

  - **Second Level:** refers to student's typical performance

  - **Third Level:** identifies student with permanent status

    (Heyd-Metzuyanim & Sfard, 2012)

Examples of *Subjectifying* Utterances

- *Subjectifying* utterances can be made by a teacher, a classmate, or the student themselves.

- *Subjectifying* utterances also carry mathematizing information. Focus on the primary act of the utterance.

Level 1 (often in the past tense)	*"I did that wrong."* *"She got all of them right!"*
Level 2 (often in the present tense)	*"I don't get it."* *"She is struggling with chapter 3."*
Level 3 (reification)	*"I'm just not any good at math."* *"My low group can't do fractions."*

(Heyd-Metzuyanim & Sfard, 2012)

The Study

Setting

- Settings considered:

    - Video club PD format allows reflection. Drawback is the time commitment (Gamoran & van Es, 2008)

    - Live observations often reflect teacher-centric views of mathematics, not student-centered (Liu, 2014)

    - One-on-one captures snapshot in time. Using paper artifacts allowed coaches to focus on student thinking, not instruction.

- One-on-one interview, examining artifacts of student thinking

Participants

- **Participants**: Four school-based mathematics coaches
  - Average 10 years teaching experience
  - Average 13 years coaching experience
  - Elementary mathematics specialists (EMS) experts (McGatha et al., 2017)
  - Coaches have vertical awareness of standards (Gibbons, 2017).
- **Researcher identity**
  - Trained as a mathematics specialist
  - Served as a coach
  - Instructor to local mathematics specialists

Data Collection

- **Before Interview**
  - Demographic survey
  - Survey of materials used to support teachers
  - Coach does math task, with multiple solutions. Sends responses.
- **During Interview**
  - Gather more information about coaching materials
  - Coaches look at student solutions to the task and comment
- **After Interview**
  - Member checking
  - Follow up questions

Task

- 12 samples
  - Ten 4th grade students
  - Two 8th grade students
- Focus on fraction learning trajectory
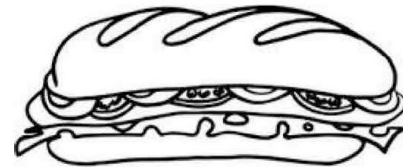- Task inspired by a Fosnot and Dolk (2002) task

The Sandwich Problem

8 students from Ms. Sandoval's class took a field trip to Washington, D.C. They only packed 6 sandwiches for lunch!

- At the Washington Monument, 5 students shared 2 sandwiches
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Who got the most food? Who got the least? How do you know?

Explain your thinking using pictures, numbers, and words.

Student Responses

B

The Sandwich Problem

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- At the Washington Monument, 5 students shared 2 sandwiches
- At the White House, 3 students shared 4 sandwiches

Who got the most food? Who got the least? How do you know?

Explain your thinking using pictures, numbers, and words.

Bob Larry Mike Herbet Person

Noone got the most food
No one got the least food.
Everyone got 2 fifths. That was my strategy.
At the white house

Bob harry Herbet

Everyone got 1⅓ of a sandwich. I used snap cubes. My strategy was making sure everyone got the same amount.

K

The Sandwich Problem

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- At the Washington Monument, 5 students shared 2 sandwiches
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Who got the most food? Who got the least? How do you know?

Explain your thinking using pictures, numbers, and words.

At the Washington Monument they each got ⅖ because there was 5 student but only 2 sandwiches. So they could've split the sandwiches into 5's.

$\frac{1}{5}+\frac{1}{5}=\frac{2}{5}$

The students at the white house has more because 1⅓ or 1⅓ is more than ⅖. The kids at the Washington monument get less because ⅖ 1⅓ or ⅖ is less than 1⅓.

At the white house they each get 1⅓ because there was 3 students and 4 sandwiches. So they could've given 1 sandwich each and split the last one into 3's.

$\frac{1}{3}$

$\frac{1}{3}+\frac{1}{3}+\frac{1}{3}$ is more than ⅖

⅖

J

The Sandwich Problem

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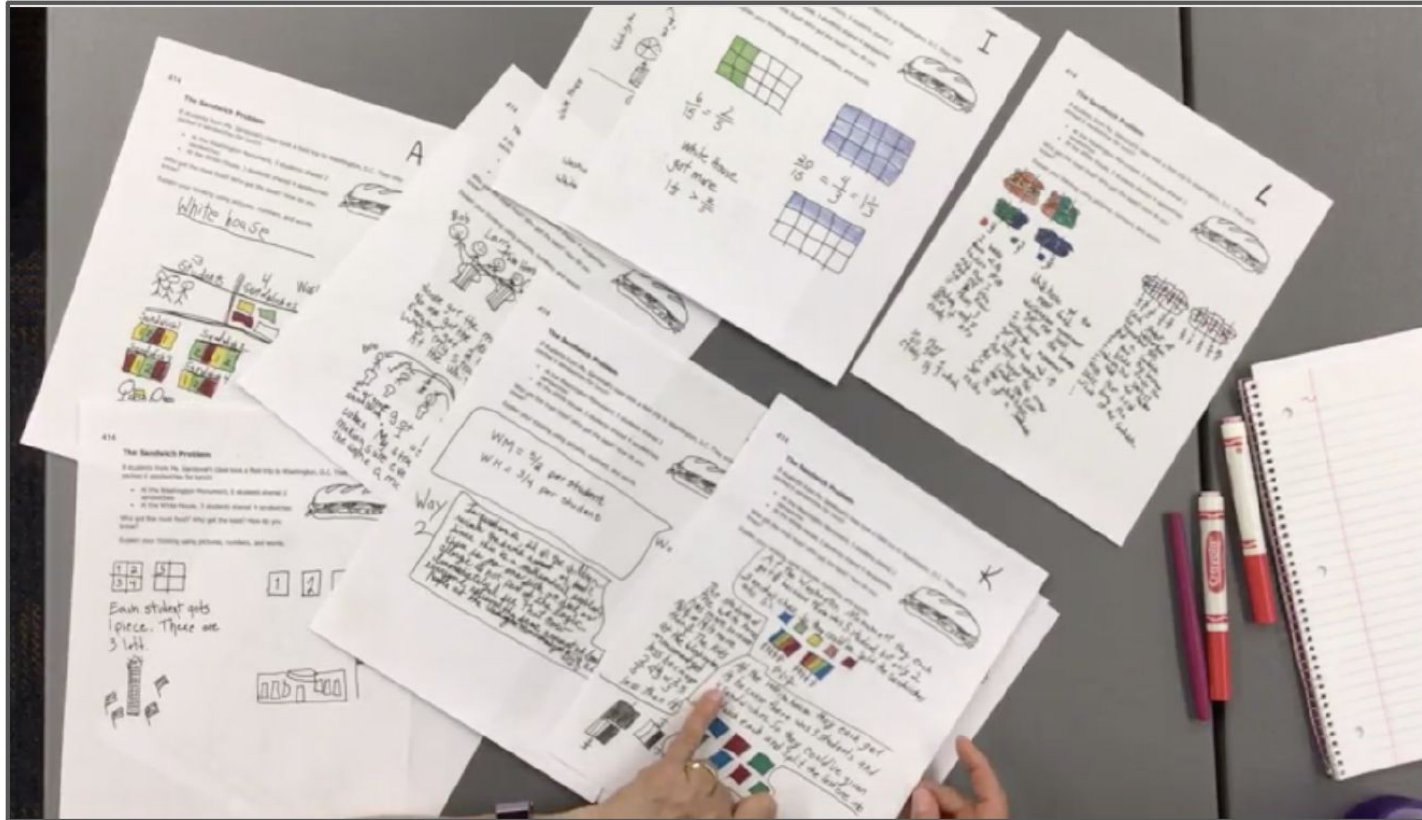
WM = 5/2 per student
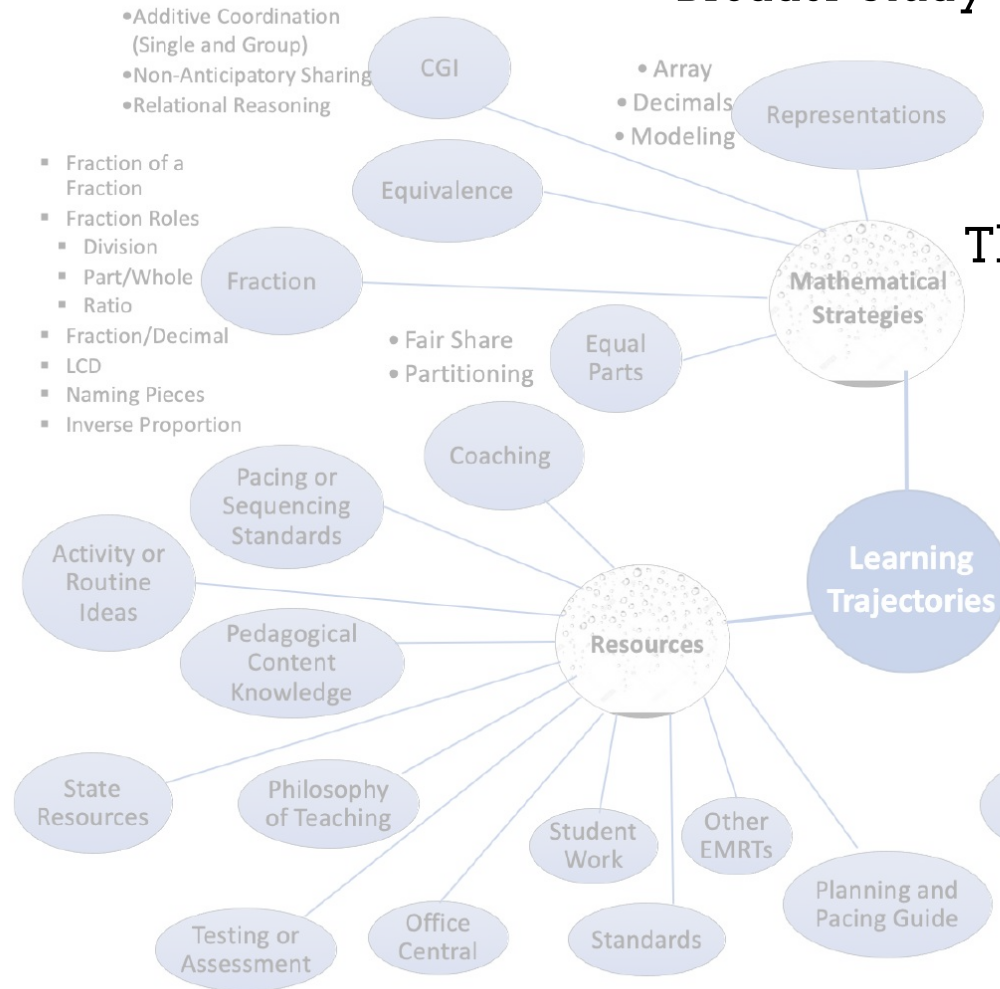WH = 3/4 per student

Way 1

Way 2

The question is, did all the children reciate the same amount of food?, since this is a mathematical problem there is no one sick, on diet, or allergic its not part of the logic. Immediately I see that now everyone recieved the same amount of food. People at the Washington Monument get 5/24 a sub.
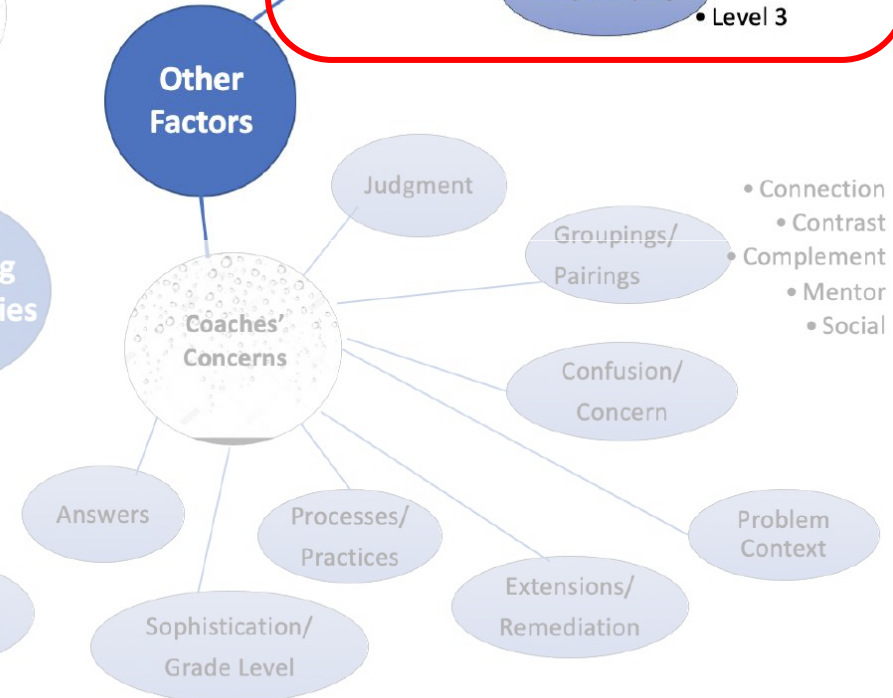
Overhead Camera Set-Up for Interview

Broader Study

This Study

Mathematical Strategies

- Additive Coordination (Single and Group)
- Non-Anticipatory Sharing
- Relational Reasoning

CGI

- Array
- Decimals
- Modeling

Representations

- Fraction of a Fraction
- Fraction Roles
  - Division
  - Part/Whole
  - Ratio
- Fraction/Decimal
- LCD
- Naming Pieces
- Inverse Proportion

Equivalence

Fraction

- Fair Share
- Partitioning

Equal Parts

Coaching

Pacing or Sequencing Standards

Learning Trajectories

Activity or Routine Ideas

Resources

Pedagogical Content Knowledge

State Resources

Philosophy of Teaching

Student Work

Other EMRTs

Planning and Pacing Guide

Testing or Assessment

Office Central

Standards

Other Factors

Emotional Hue/ Language of Identity

Mathematizing

Subjectifying

- Level 1
- Level 2
- Level 3

Coaches' Concerns

Judgment

Groupings/ Pairings

- Connection
- Contrast
- Complement
- Mentor
- Social

Confusion/ Concern

Answers

Processes/ Practices

Problem Context

Sophistication/ Grade Level

Extensions/ Remediation

Analysis

- *a priori* **codes**: utterances related to ...
  - Students or student work samples
  - Curricular materials and resources
  - Activities and work as a coach
- *in vivo* **codes**: utterances related to ...
  - Mathematical content
  - Mathematical standards
  - Mathematical strategies

"I realized that I was looking at cases where the student was the actor or the subject of the discourse, if not the subject of the sentences."

– Researcher Memo (Morrow-Leong, 2019)

Results

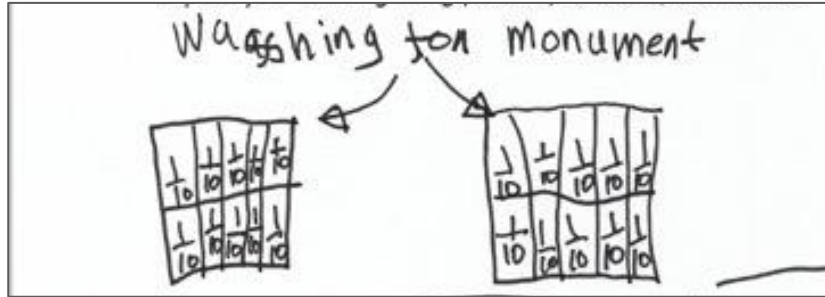**Classification of Utterances Referencing Interpretations of Student Thinking**

- *Mathematizing* utterances related to...
    - Mathematical work on a page
- *Subjectifying* utterances related to...
    - What students actively had done **(Level 1)**
    - What students might normally be able to do, or generalizations about ability **(Level 2)**
    - Students as doers mathematicians. Assignment of identity. **(Level 3)**

Mathematizing Utterances

Sample C

Sample H

Washington Monument! Each person gets .4 of a sandwich

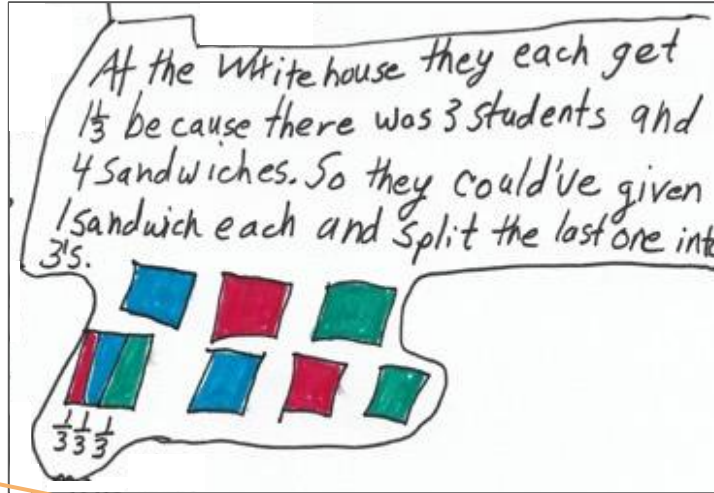White house: Each person gets $1.\overline{3}$ of a sandwich

No they do not get the same.

I'm looking to see if I see some things that are sort of similar. Four tenths (Sample H).

Three, three, three, three, three (Sample C). So, those two (Samples C and H) kind of go together.

Mathematizing Utterances

Sample K

*... and see, is that the same amount? Isn't it? And hopefully here you can see **there's** one whole and one-third, **here's** one whole and one-third (Sample L).*
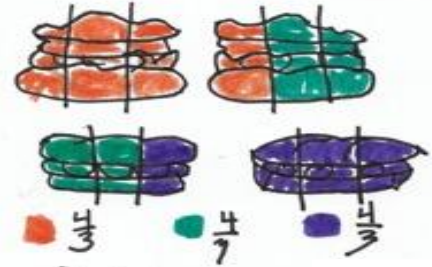
*Oh look, if I put this here, **that's** another whole and one-third which **they** can see here as well (Sample K).*

Here is a switch to *subjectifying* language.

At the White house they each get 1⅓ because there was 3 students and 4 Sandwiches. So they could've given 1 sandwich each and split the last one into 3's.

⅓ ⅓ ⅓

⁴⁄₃   ⁴⁄₇   ⁴⁄₃

I broke down with fraction strips and then I used my brain and I knew if theres 3 students, and I split it into thirds.

so they all got equals 1⅓ ⁴⁄₃ which

fppt.com

Subjectifying Utterances (Level 1)

They (Sample A)... *had some good reasoning here with what was happening. The three-fourths plus one-third for this, because **they** split them into fourths ... And then **they** gave each of them ...*

*I don't know, I'm not sure about **their** model,*

*but **it** IS three-fourths and one-third. No, **it's** not. **It's** four-fourths and one-third ... **It's** one-and-one-third.*

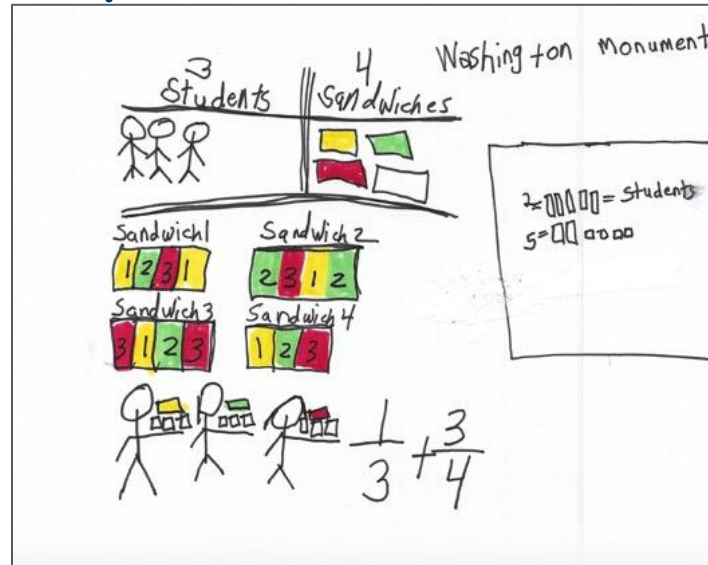Right here is a shift to *mathematizing* language.

Sample A
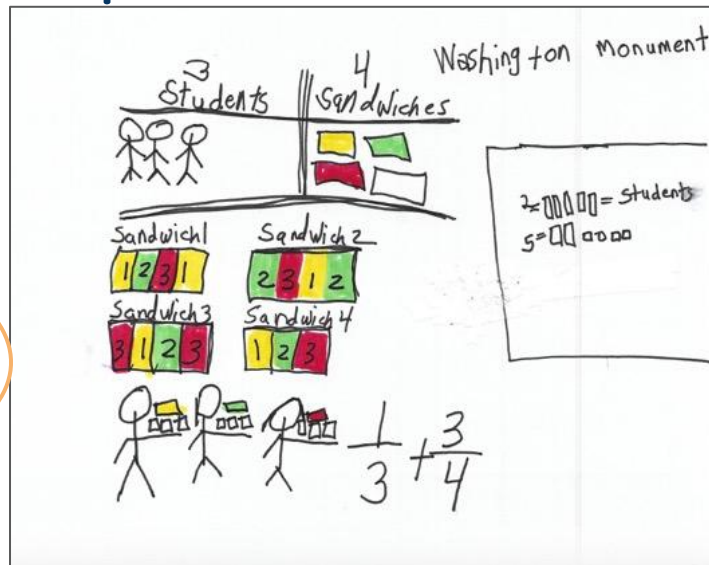
Subjectifying Utterances (Level 2)

I'm not real sure about the one third and three fourths. They haven't quite answered.

Again, **they like to break things apart and see the relationship.**

Subjectifying Utterances (Levels 1 and 2)

They're **able to name** the fraction pieces, **reason through** the pieces of a problem that they are understanding,

Level 2

so, even **if they weren't able to actually answer the problem in the way that it's asking to answer**,

Shift to Level 1

we're going to look at, well **what can they do** and how do we build on what they can do in order to go to those next areas?
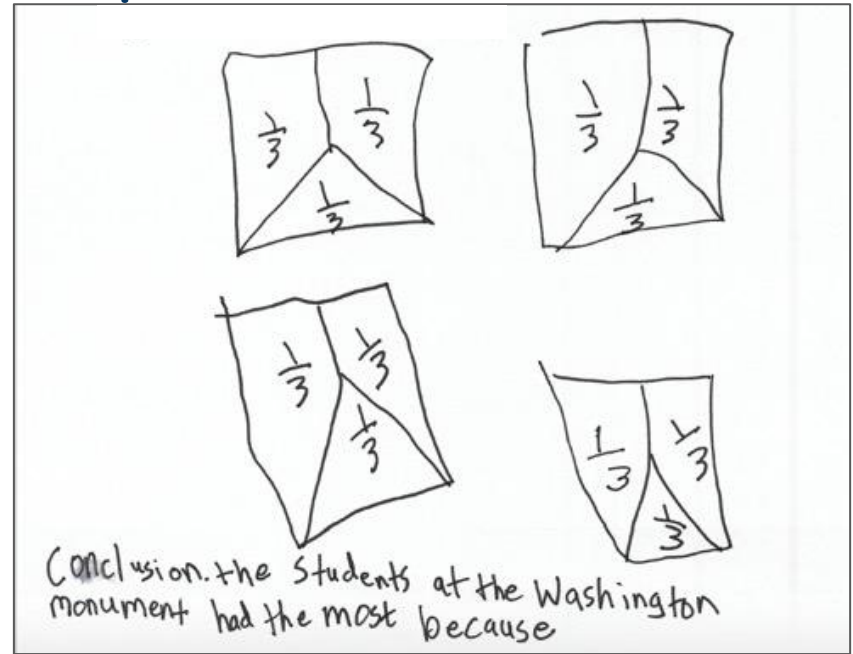
Shift to Level 2

Subjectifying Utterances (Level 3)

*This one (Sample C) might **be** a little younger. ....*

*It looks like **they're basically solving** it like an equal share problem.*

Right here is a shift to level 1 *subjectifying* language.

Sample C

Distribution of Utterances Addressing Student Work

Category of Utterance	# of incidences
Mathematizing	96
Subjectifying *(Level 1)*	40
Subjectifying *(Level 2)*	14
Subjectifying *(Level 3)*	3
Total	**150**

*The sum does not always equal the parts since some utterances were classified in more than one category

Comparison: Mathematizing and Subjectifying Utterances
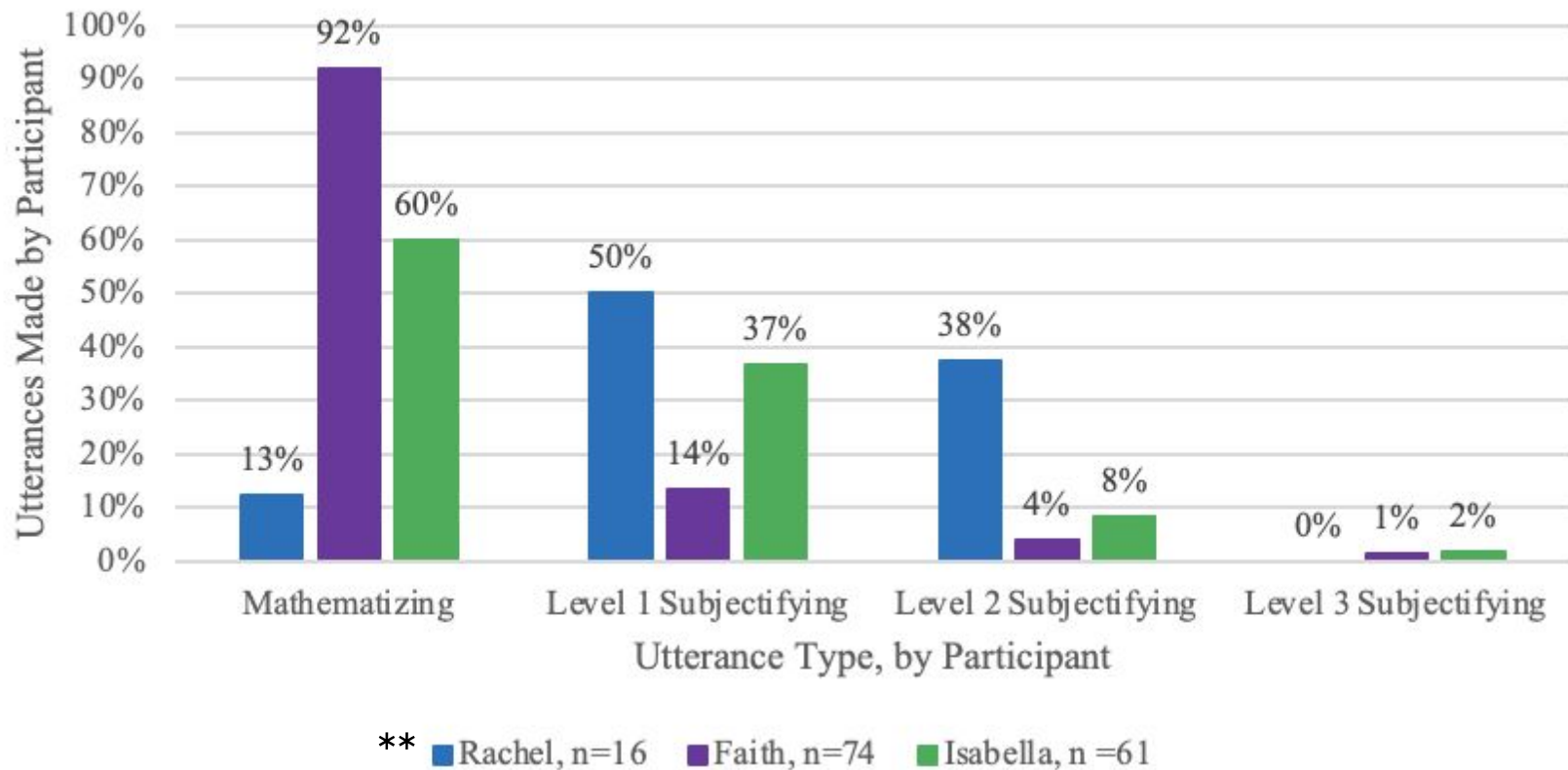
*The sum does not always equal 100% since some utterances were classified in more than one category

**The recording device in Rachel's interview exceeded memory capacity so there are fewer utterances noted than for the other two..

If [the teacher's] major sorting of students is who "gets it," and who has misconceptions, it's not out of reach to start calling kids "good" or "bad" at math. It's a slippery slope towards unwittingly condemning students as deficient, or lacking skills.

(Zavala, 2019)

Discussion

- These three EMS overwhelmingly focused their words on the mathematics displayed on the page (64% of their utterances).

- Level 3 subjectifying language was limited to three utterances, each of which specifically referred to the child's perceived age, not their inherent capability.

- Level 2 subjectifying utterances were more common from one participant than from the other two.

- Participants often switched between levels in succession, which was primarily signaled by a change in pronoun. "It" (the mathematics) might yield to "they," meaning the student.

Limitations

- Classifying utterances does not necessarily identify deficit language.

- With only three participants these results are not generalizable to the population of all elementary mathematics specialist coaches

- Confidence in the classification of utterances is not high. This study would be well-suited to a collaborative formation of criteria for classification and rounds of interrater reliability.

- Repeating this interview with early career and more experienced teachers would shed more light on educator language patterns.

- Repeating this interview with teachers or educators who know the students whose work they are examining may look very different.

Implications

- The language used to speak about student work can be a signal or a warning that deficit language is more likely to arise.

- Language that subjectifies students can categorize the students into groups, which may limit their opportunities. Deficit language comes out of categorical language.

- Language features, such as pronouns, signal a change between mathematizing and subjectifying language.

How will you combat deficit language/thinking after this session?

Use the **jamboard** (slide 11) to share.

http://bit.ly/WHATWeSayTODOS21

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Suh, J.M., Birkhead, S., Galanti, T., Farmer, R., & Seshaiyer, P. (2019). The use of lesson study to unpack learning trajectories and deepen teachers' horizon knowledge (756-781). In R. Huang & Takahashi, A. (Eds.), Theory and Practices of Lesson Study in Mathematics: An International Perspective. Springer. Retrieved from https://drive.google.com/file/d/1E1B1h1GibZgSoZQnSHI66AE3v3tVzhU/view?usp=sharing

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