IS THERE A TEACHER WHO HAD A SIGNIFICANT IMPACT ON YOU?
OUR WORLD, AND OUR FUTURE

How can we teach mathematics so that people stop hating and killing one another?

Adapted from Maisha Winn, inspired by Ihab Hassan
OUR WORLD, AND OUR FUTURE

How can we teach mathematics so that people stop hating and killing one another?

Adapted from Maisha Winn, inspired by Ihab Hassan Gutiérrez & Goffney (2018)
What number does the orange arrow point to? Explain how you figured it out.
LAKEYA

What number does the orange arrow point to? [\frac{3}{4}]

Explain how you know: Because there are equal parts and you are pointing to the second one so I count it \frac{3}{4}.

JAMARI

What number does the orange arrow point to? [\frac{5}{6}]

Explain how you know: First I thought it was 5 because the zero messed me up.

MARIANA

What number does the orange arrow point to? [\frac{1}{2}]

Explain how you know: How I know it is that interval from zero to one there was 2 line between 0 and 1.

LARRY

What number does the orange arrow point to? [\frac{4}{5}]

Explain how you know: I count it by 4 and keep going till I got whole.

Write a complete sentence with one goal for yourself for our math class today. Give an example of what it looks like to do this really well.

Learn more about the number line.
VIDEO: ANIYAH AND TONI
“READING” AND RESPONDING TO TONI

- How might Toni be “read”?
- How might a teacher respond?
- What shapes these ways of seeing and responding to her?

IN THIS MOMENT, A MOVE CAN REPRODUCE PATTERNS OF MARGINALIZATION OF BLACK GIRLS

NORMALIZED NEXT MOVES

1. “Toni, when you’re ready to participate appropriately by not playing with your hair and laughing, and have a question to ask, I will come back to you.”

2. “You need to be a better listener, Toni. Aniyah already explained why she picked one-seventh. Who else has a real question for Aniyah?”

3. “What do others think?”

RESULTS

1. Toni is publicly excluded from the discussion.

2. Toni is judged to not be listening, her question is judged as not good, and she is excluded from the discussion.

3. Toni is excluded and her mathematical point is sidelined.
Teaching is constrained by departmental policies, curriculum, exams, . . .

Teaching is highly idiosyncratic and individual.

Lipsky (1980), Shulman (1983)
THE PARADOX OF CONSTRAINT AND DISCRETION IN INSTRUCTION

CONSTRAINTS CAN:

- Support efforts to disrupt inequity.
- Restrict instructors’ professional freedom through standardization.
- Reproduce racism and other forms of oppression.
- Impede efforts to make classrooms and curricula responsive, contextual, culturally relevant.

DISCRETION CAN:

- Make possible instructors’ efforts to teach in contextually sensitive and culturally responsive ways.
- Enable instructors to connect problems and projects to the world.
- Enable racism and other forms of oppression to flow into our classrooms.

(e.g., Aguirre, Celédon-Pattichis, Civil, Dewey, Gutiérrez, Ladson-Bilings, Paris, Walker, Winn)
### Speaker Talk

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Talk</th>
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| Teacher          | Who would like to try to explain what you think the answer is? And show us your reasoning by coming up to the board. What I'd like to come up to the board and try to tell. And you know, if it isn't right, that's okay because we're learning something new. I'd like someone to come up and sort of be the teacher and explain how you are thinking about it. Who'd like to try that? This matters? | 1. Selecting when to open whole-group discussion  
2. Setting what to do to start discussion  
3. Framing the expectation for presenting  
4. Framing of what it is "coming to the board" entails |
| other             | Playing with hair  
Laying on arms  
Talking to teacher  
Teacher          | When someone's presenting at the board, what should you be doing? | 5. Selecting a student to present  
6. Instructing whether to comment  
7. Instructing whether to comment |
| Students in chairs | Looking at them.  
Teacher          | Looking at that person  
Teacher          | Uh huh?  
Argh?  
Teacher          | You want me to write it?  
Teacher          | You're trying to mark what you think this number is and explain how you figured it out.  
Teacher          | Take a minute to explain what you think this number is and explain how you figured it out.  
Teacher          | Look closely and see what you think about her reasoning and her answer. (Argh?)  
Teacher          | I put one seventh because there's  
Teacher          | Still one day one seven?  
Argh?  
Teacher          | Start to say him (continues to click) Because there's seven equal parts. One, two, three, four, five, six, and seven. (Uses her fingers to count the parts on the number line.)  
Teacher          | Before you agree or disagree, I want you to ask yourself if that's something you don't understand about what she did. No agreeing and disagreeing. Just Ask. (Can you do right now is ask any questions. Who has a question for her?)  
Teacher          | Okay, Tom, what's your question for her?  
Sine              | You did not  
Teacher          | You did not (looks at another student who says something to her from across the room)  
Teacher          | Go ahead, it's your turn.  
Teacher          | Why did you pick one-seventh?  
Teacher          | Why did you pick one-seventh?  
Sine              | You did not  
Teacher          | Left listen to her answer now. That was a very good question.  
Teacher          | Left listen to her answer now. That was a very good question. |

### Diagram

- **Students:**
  - Connect to **Teachers** and **Stuff**
  - Connect to **Environments**

- **Teachers:**
  - Connect to **Students** and **Stuff**
  - Connect to **Environments**

- **Stuff:**
  - Connect to **Students**
  - Connect to **Environments**

**20 in 1:28**
Teacher: Who would like to try to explain what you think the answer is? And show us your reasoning by coming up to the board.

Teacher: Okay, Angie?

Angie: Playing with hair

Teacher: Other children, laying on arms

Teacher: When someone's presenting at the board, what should you be doing?

Students in chorus: Looking at them.

Teacher: Looking at that person.

Angie: Um huh?

Teacher: You want me to write it?

Teacher: You're trying to mark what you think this number is and explain how you figured it out.

Teacher: Listen closely and see what you think about her reasoning and her answer. (Angie writes 1/2 by the orange one.)

Angie: I put one-seventh because there's one.

Teacher: Still the one-seventh?

Angie: Dante's turn, yeah. Continue to count. Because there's seven equal parts, one, two, three, four, five, six, and seven. Use these fingers to count the parts in the number one.

Teacher: Before you agree or disagree, I want you to ask questions if there's something you don't understand about what she did.

No agreeing and disagreeing. Just, all you can do right now is ask Angie questions. Who has a question for her?

Teacher: Okay, Tony, what's your question for her?

Dante: You did not.

Teacher: You did not. (laughs at another student who says something to him from across the room)

Teacher: Go ahead, it's your turn.

Dante: Why did you pick one-seventh?

Teacher: You did not.

Teacher: Let's listen to her answer. That was a very good question.

Teacher: Laying on arms

Teacher: Other children, stuff

Teacher: 20 in 1:28

Teacher: You did not!
TEACHING IS DENSE WITH “DISCRETIONARY SPACES”
WHAT REGULARLY FILLS THE DISCRETIONARY SPACES IN TEACHING?

- Instructors’ experiences in a society filled with racism and oppression.
- Normalized practices in higher education that institutionalize dominant values and habits.

Lortie (1975), Banks, Grant and Koskela, Moll
Anyon (1981), Heath, Martin, Tuck
WHAT REGULARLY FILLS THE DISCRETIONARY SPACES IN TEACHING?

- Instructors’ experiences in a society filled with racism and oppression.
- Normalized practices in higher education that institutionalize dominant values and habits.

Professional education and teaching experience often teach these.

Professional education does not effectively intervene on these.

Lortie (1975), Banks, Grant and Koskela, Moll
Anyon (1981), Heath, Martin, Tuck
VIDEO: TEACHING INVOLVES MAKING DELIBERATE CHOICES
COUNTERING THE PATTERN

Acknowledge publicly the importance of Toni’s question.

RESULT

Toni is trusted, seen, and recognized for her contribution to the mathematical work:

- The mathematical precision of her question
- Asking Aniyah a question instead of disagreeing.
ANIYAH

- Identified the “whole” as 0 to 1 on the number line

TONI

- Modeled at the board a complete explanation of how to understand and identify a fraction on the line

THE OTHER CHILDREN

- Developed a depth of understanding of fractions as numbers on the line and how to explain them
- Saw Black girls’ brilliance
INQUIRY-BASED LEARNING: DOES IT REPRODUCE OR DISRUPT INEQUITY AND OPPRESSION?
SMALL GROUP WORK IN CLASS

The current price of a pizza at a local pizza joint is $8. At this price, 1000 pizzas are sold daily. The manager wonders if she will generate more revenue by increasing the price of the pizza. She knows that for every $1 increase in price, she will lose 100 sales a day. What price will generate the most revenue for the pizza joint?

Instructor: How is this table doing? What are you working on?

Maya: We are figuring out the price per slice that will make the most money.

Instructor: Wait, have you read the problem? [to the small group] This is a harder problem than the ones we worked on all together. Do you want to try to do like problems a and b? [walks off to Table Three]

Maya: So that’s not what this question is saying? [Maya picks up the copy of the problem and begins to read it silently. Maya and Daeshai are looking at their lecture notes.]

Maya: I still think that’s what the question is saying. How much can you raise the cost of pizza before enough people are like “I won’t pay that” and you end up making less money because too many people start going to the place down the street instead.

(Enright, 2017)

25 June 2, 2018
GROUP 4’S WORK ON THEIR OWN AND IN INTERACTION WITH THE INSTRUCTOR

Krystal: (Listening to the end of the conversation between the instructor and the table to the right of her – Table 2) What is he talking for so long to them about?

Instructor moves from Table 2 to Table 5 and all three students at Table 4 pause to listen to the conversation between the instructor and Table 5.

Instructor: What are you doing now?
Krystal: We’re confused.
Instructor: Oh okay.

Krystal: So okay. I’m not sure what the problem is asking. Was our formula right for part a?
Maya: The questions for parts a and b look the same, right? This is frustrating. I thought I understood the math. I don’t know what this problem is asking either. What’s T? How is that different from P?
Krystal: I really don’t know. I wish he would talk to us about the math, like at the other tables.
Daeshai: What do you think we should do next?
Krystal: I don’t know. Change our skin color so he will talk to us? Oh, you mean about the problem...

Instructor: Okay. Sorry to butt in again. How are you doing on a and b? What did you get for a?
Krystal: P equals 8 plus d? But...

Instructor: Okay
I guess it is just usually like a few students like her (Krystal) at the same table when the class is doing group work, they’ll be slightly less engaged. Or, they’ll still be maybe stuck on material that I just talked about in the short lecture, ten minutes or five minutes before. And they’ll be asking their classmates about what happened on the board. What did we just do?

Sometimes they don’t want to work on their own. I mean I guess that’s fine to a certain extent. At some point maybe I want to talk to them and ask them to explain more. Maybe have them explain what they did to one another. Maybe sometimes they are lost but they’re just keeping quiet so it would be good to find out. But yeah, they are struggling.

(Enright, 2017)
BY THE END OF THE SEMESTER

- Krystal and Maya changed their major plans from engineering to fields that did not require additional mathematics courses, and

- Daeshai had stopped coming to class.

(Enright, 2017)
WHERE DOES INQUIRY-BASED LEARNING FIT?

CAN REPRODUCE PATTERNS OF INEQUITY AND OPPRESSION

- Open problems sometimes rely more on outside knowledge and experience
- Opens the classroom work and discourse to broader societal biases and positioning
- Status hierarchies are reproduced in the more open discourse
- Can still reinforce a view of mathematics as predominantly White and male

CAN DISRUPT PATTERNS OF INEQUITY AND OPPRESSION

- Can humanize mathematics and mathematics classrooms
- Creates space for students’ ideas and questions
- Creates more access and openings to the mathematical work
- Supports the development of student agency and voice
DISRUPTING PATTERNS OF OPPRESSION IN THE DISCRETIONARY SPACES PARTICULAR TO INQUIRY-BASED LEARNING

1. Designing and implementing norms and culture of the classroom to deliberately disrupt societal positioning and patterns of interaction

2. Assigning competence to students in ways that disrupt status hierarchies and signals about what being “smart” or “good” at math means (and who is)

3. Consciously choosing mathematics, contexts, representations to disrupt dominant views of the field and its practices
1. CREATING A CLASSROOM CULTURE THAT INCLUDES, RATHER THAN MARGINALIZES, STUDENTS
CLASSROOM CULTURE AND NORMS

- Cultural notions of what it means to be “good at math” are disrupted.
- Create explicit norms for treating one another’s ideas, solutions, questions with respect.
- Students present their thinking in a variety of ways.
- Apparently “wrong” answers are examined closely and with curiosity and regard.
- Students are supported to share solutions and reasoning—including and valuing those that are incomplete or “wrong.”
VIDEO OF MEHJABEEN: DISTINGUISHING BETWEEN ENCOURAGING AND “PICKING ON”
VIDEO: ANIYAH’S EXPLANATION

Aniyah: Yeah. Because there's seven equal parts, like one, two, three, four, five, six, and then seven.
IN THIS MOMENT, A MOVE CAN REPRODUCE PATTERNS OF MARGINALIZATION OF BLACK GIRLS

NORMALIZED NEXT MOVES

- Clarify for Aniyah that the whole is the interval from 0 to 1
- Asking the class to indicate agreement/disagreement
- “What do others think?”

RESULTS

- Aniyah’s answer is signaled to be incorrect and she is positioned as not having contributed to the work.
- Aniyah’s solution is “voted” on by her classmates.
- Aniyah is excluded and her mathematical point is sidelined.
VIDEO: ANIYAH’S EXPLANATION

Teacher: Listen closely and see what you think about her reasoning and her answer.
USING DISCRETION TO DELIBERATELY DISRUPT THE PATTERNS THROUGH WHICH BLACK GIRLS ARE MARGINALIZED

A DIFFERENT TEACHING MOVE

- Ask students to ask questions of the presenter, forestall agreeing/disagreeing.

RESULT

- Maintain Aniyah’s authority and agency and position her and her thinking to advance the key mathematical idea.
WHAT DOES IT TAKE TO DISRUPT THE PATTERNS THROUGH WHICH BLACK GIRLS ARE MARGINALIZED?

- Seeing Aniyah’s solution and Toni’s question as mathematically sophisticated and key to the class’s work
- Taking as axiomatic the brilliance of Black girls, and thus Aniyah and Toni
- . . . And having something different to do

2. ASSIGNING COMPETENCE TO STUDENTS IN WAYS THAT DISRUPT STATUS HIERARCHIES AND SIGNALS ABOUT WHAT BEING "SMART" OR "GOOD" AT MATH MEANS (AND WHO IS)
“ASSIGNING” COMPETENCE

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

1. Broaden and label what being competent in a given area means
2. Intervene to position who (and what) is seen as competent in class
3. Support individual students to develop their 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)
WHAT DOES “ASSIGNING COMPETENCE” REQUIRE IN TEACHING?

IN GENERAL
1. Broaden and label what being competent in a given area means
2. Intervene to position who (and what) is seen as competent in class
3. Support individual students to develop their academic identities and competence

IN MATHEMATICS
1. Be able to see what is “mathematical” and what is “competent”
2. Have techniques for making these moves to intervene in ways that are sensitive to students
3. Strategically using these techniques with particular students in authentic and well-timed ways
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
USING TECHNIQUES AND STRATEGIES FOR ASSIGNING COMPETENCE

Identify the competence to be highlighted. Consider how to disrupt hierarchies of status in class by which student is chosen to be identified for something mathematically important that they have done or contributed.

- Publicly name an individual student’s competent move or contribution ("___ just shared a very important idea")
- Ask a student to explain another student’s contribution that the instructor highlights
- Ask the class to identify things that were part of an important contribution by a student
- Record something publicly that a student or students came up with or contributed that is important
- Accord expertise to students through assigning roles explicitly in a group
PRAISE AND AFFIRMATION: WHAT IS THE DIFFERENCE?

- Praise – verbal feedback with the only purpose of evaluating what a student says or does
- Affirmation – intentional verbal feedback with a purpose of highlighting/affirming what a student says or does
COMPARING PRAISE WITH AFFIRMING STATEMENTS

PRAISE
- “Good work!”
- “You are really good at math”
- “Yes, that’s correct”
- “Yes, that’s the right way”

AFFIRMATION
- “It was really helpful how you used your drawing to explain your thinking.”
- “You are writing such clear and specific mathematical explanations.”
- “You solved that in a really interesting way. Can you tell me more about your thinking?”
- “That’s the right answer. Why does that make sense?”
- “You said that this piece is $\frac{1}{4}$ because it is one of four equal parts in the whole. I agree, that makes sense.”
MAKING THE SHIFT FROM A PREOCCUPATION WITH DEFICITS TO A FOCUS ON STRENGTHS

- Seeing past “distractions” or non-mathematical issues
  - How students talk (as they are learning; and when they are speaking academic language, or in English when that is not their first language)
  - Being preoccupied with and interpreting behavior in negative ways

- Pausing on “apparently incorrect” answers
  - Actually not incorrect
  - Answer to a different (and reasonable) question
  - More correct than incorrect
DILEMMAS OF LEARNING TO SEE AND HEAR STUDENTS’ RESOURCES

1. Feeling committed to students as sense-makers who bring many strengths but also feeling pressure or desire to make sure children 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 students’ talk, representations, etc. while also not letting your own mathematical knowledge overtake your capacity to see and hear what they are saying or showing
WHAT IS INVOLVED FOR INSTRUCTORS IN SEEING AND BUILDING ON STUDENT STRENGTHS?

- Listening carefully to what they say, reading attentively what they write
- Making deliberate choices about how to see and interpret
- Both of these involve using what you know, but also suspending what you assume (knowing mathematics for teaching)
THE WORK OF JUSTICE LIVES INSIDE THE WORK OF TEACHING

- By understanding one’s identity and role as part of a broader system of oppression that is historical and persistent
- By knowing what “normally” happens and how these patterns reproduce oppression, and by deliberately doing things that counter those patterns
- By seeing and affirming each student—their strengths and their mathematical work
- By opening up “content” and possibilities for students to connect with and do mathematical work

Mann, Willis, Hickman, Ball, Goffney, (2017)
DISRUPTING PATTERNS OF OPPRESSION IN THE
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INQUIRY-BASED LEARNING APPROACHES CAN DISRUPT RACISM AND OPPRESSION. . .

. . . if, and only if, we ACT courageously and relentlessly:

- To make the profession and our faculty diverse and reflective of our society
- To see, challenge, and disrupt “normalized” ideas and practices
- To work together in creating, developing, and learning to enact practices and policies that change that “normal”
THANK YOU!

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Slides will be available on my website
https://deborahloewenberngball.com/
(“Google” Deborah Ball)