TEACHING MATHEMATICS IN WAYS THAT DISRUPT PATTERNS OF INEQUITY PREDOMINANT IN CLASSROOMS

Deborah Loewenberg Ball
@deborah_ball

epiSTEME-7 • Homi Bhaba Centre for Science Education
7 January 2018 • Mumbai, India
OUR WORLD, AND OUR FUTURE

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

Adapted from Maisha Winn, inspired by Ihab Hassan
THE MINICOMPUTER AS A MATHEMATICAL ENVIRONMENT

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

(Papy Minicomputer, CEMREL, 1970s)
REASONING WITH THE MINICOMPUTER

8  4  
2  1  

-4

12

17

7 January 2018
MEET VIRSHAWN, A RISING FIFTH GRADER
THE TWO-CHECKER PROBLEM

What numbers are possible to make on the Minicomputer with exactly two positive checkers?
WHAT IF YOU CAN USE 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.

I think the negative checker is Awesome.
VIDEO: VIRSHAWN

I think the negative checker is awesome.
VIRSHAWN’S EXPERIENCE IN FOURTH GRADE

- He liked to share his ideas in class, and was very clear, and he liked to write
- He was in trouble often
- He was often sent out of the room, to the hall or the principal’s office
- He wasn’t doing well in math
DAY 1 OF THE MINICOMPUTER

Virshawn between
11:19 – 11:25

Paper airplane

Noel (2014, in preparation)
How is Virshawn likely to be read – and what is likely to happen next?
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.”
Over the next minute, Virshawn is raising his hand to answer questions.
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.”
AT 11:28, VIRSHAWN TAKES THE ROLE OF “TEACHER”
WHAT SHAPES HOW HIS TEACHERS MIGHT PERCEIVE VIRSHAWN?

- Decisions about how to “read” him, and actions following those decisions
- Views about what counts as “engagement” or being “off-task”
- Preferences and practices about “control”
- That he is a Black boy
TEACHER PERCEPTIONS

- Many studies that show effects of racial and gender bias in teachers’ perceptions, interpretations, and interactions with students

- These affect: assignment to special education and gifted/talented programs, discipline (including suspensions and expulsions)
(HOW) CAN TEACHING WORK FOR JUSTICE?

INVISIBLE WORK

- Disrupts racist and gendered patterns by:
  - Believing that Black boys are smart; knowing Virshawn’s interest in being a leader
  - Conjecturing that Virshawn is listening
  - Making choices about how to read Virshawn and what not to make an issue of
  - Trusting that Virshawn will take up the invitation to “make a number"
- Uses a routine of giving students the role of teacher to distribute the work
- Chooses a task with multiple entry points (“make a number” – without constraint)

VISIBLE WORK

- Invites Virshawn to “be the teacher” first
- Supports Virshawn to present skillfully at the board (confers about his answer) and moves out of the space
- Oriented other children to Virshawn’s idea
- Expects other children to listen and creates routines (e.g., other students revoice)
- Positions Virshawn with agency to “approve” others’ revoicing of his proof
Teaching can be a force for justice.
WHAT IS TEACHING?

The work of teaching is co-constructed

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

Cohen, Raudenbush, and Ball (2003), Ball & Forzani (2007)
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)
MEET ANIYAH AND TONI, ALSO RISING FIFTH GRADERS

ANIYAH

TONI
What number does the orange arrow point to?
Explain how you figured it out.
VIDEO: WHAT DO ANIYAH AND TONI KNOW AND WHAT CAN EACH DO?
WHAT DO MANY “HEAR” IN ANIYAH AND TONI?

ANIYAH

- She has the wrong answer: 1/7

TONI

- She is playing with her hair and trying to get attention
- She is trying to embarrass Aniyah
All this talk about not focusing on children’s deficits—why does this matter so much? Isn’t our job to figure out what children don’t know and help them grow?

So—focusing on children’s strengths is crucial for effective and equitable instruction and for advancing justice.

1. Learning occurs through a process of building on prior knowledge and experience.
2. Strong academic identities are a means to developing competence. They are also instructional goals.
3. For children of historically marginalized groups, stereotype threat and other biases interfere with and impede children’s performance.
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
(HOW) CAN TEACHING WORK FOR JUSTICE?

**INVISIBLE WORK**
- Purposefully and efficiently reads students’ work while circulating
- Selects a student to present who will push the conceptual understanding forward, and for whom this positioning will be significant
- Disrupts racist and gendered patterns by:
  - Believing that Black girls are smart; knowing Aniyah and Toni and their smartness
  - Trusting the children to think, be engaged, try to learn
  - Making choices about how to read children and what not to make an issue of

**VISIBLE WORK**
- Supports Aniyah to present skillfully at the board, using representations; encourages Toni to ask her on-point question
- Disrupts marginalizing patterns that focus on “error” and focuses instead on concepts and reasoning
- Expects other children to listen and to ask questions and creates structures that support children to listen to others’ ideas
- Models and names “good questions” as an important mathematical practice
- Strategically names and highlights particular children displaying specific forms of competence
(HOW) CAN TEACHING WORK FOR JUSTICE?

INVISIBLE WORK

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MODELING AND EXPLAINING CONTENT

- Eliciting and interpreting students' thinking
- Building respectful relationships with and among students

VISIBLE WORK

- Leading group discussions
- Establishing norms and routines for classroom discourse and work
- Specifying and reinforcing productive student behavior
- Strategic naming and highlighting particular forms of competence
- Disrupts marginalizing patterns that focus on "error" and focuses instead on concepts and reasoning

Establishing norms and routines for classroom discourse and work
- Important for children to listen and to ask questions and engage in collective worthwhile activity
- Establishing open-ended norms and routines that encourage questions, discussion, and the exchange of ideas
- Making choices about how to read students' work and what not to make an issue of

7 January 2018

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WHAT ARE HIGH-LEVERAGE PRACTICES—AND WHAT ARE THEY NOT?

✔

- The integral tasks, moves, and strategies that teachers have to do all the time, and that beginning teachers must be able to do on day one
- Key parts of the work of teaching that put children at risk when they are done badly
- Specific ways in which key commitments and beliefs about equity are enacted in daily practice
- Can be taught, learned, coached, and assessed

✘

- Disconnected from the relational and caring work that is at the heart of teaching
- Content- or context-free
- Natural or obvious
- Separate or atomized technical skills
- Disconnected from the imperative to work for equity and to disrupt racism and marginalization of groups
Teaching **can be** a force for justice.

How?
10 KEY ASKS

OF SOCIETY

1. See and value the power of teaching.
2. Stop taking skillful disruptive equitable teaching for granted.
3. Stop reinforcing conceptions of teachers as individual heroic people who figure this out on their own.

OF OURSELVES AS EDUCATORS

7. Unpack what this sort of teaching entails and have the professional wisdom and agency to stand up for the complexity and learnability of this practice.
8. Radically change how we compose the teaching force to create a diverse resourceful profession.
9. Identify the resources, experiences, and commitments needed to be a successful learner of this complex work.
10. Take responsibility for teaching this complex practice to people who bring the resources to learn to do it.

OF POLICYMAKERS

4. Require people to demonstrate that they have entry-level capability before they teach children.
5. Support teachers to develop and improve their practice over time.
6. Change the economic model for paying for public education, especially for teaching.
7. Unpack what this sort of teaching entails and have the professional wisdom and agency to stand up for the complexity and learnability of this practice.
8. Radically change how we compose the teaching force to create a diverse resourceful profession.
9. Identify the resources, experiences, and commitments needed to be a successful learner of this complex work.
10. Take responsibility for teaching this complex practice to people who bring the resources to learn to do it.
Let’s review the core argument of this talk.
WHAT DOES SUCH A TEACHER, WHO BELIEVES AND HOLDS THESE AIMS, DO?

This is the value of the teacher, who looks at a face and says there’s something behind that and I want to reach that person, I want to influence that person, I want to encourage that person, I want to enrich, I want to call out that person who is behind that face, behind that color, behind that language, behind that tradition, behind that culture. I believe you can do it. I know what was done for me.

Maya Angelou
TEACHING CAN BE A FORCE FOR JUSTICE. . .

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

- To make the teaching profession 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!

dball@umich.edu

Slides will be available on my website

https://deborahloewenbergball.com/

(“Google” Deborah Ball)
Graphic on slides 3–8:

Graphic on slides 20 and 21:


Image on slide 34:
“Maya Angelou visits YCP! 2/4/13” by Flickr user York College ISLGP
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