THE (IM)POSSIBILITIES OF TEACHING MATHEMATICS

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SCHOOL OF EDUCATION
UNIVERSITY OF MICHIGAN

TeachingWorks
UNIVERSITY OF MICHIGAN
1980s, East Lansing, Michigan
A wonderful international colleagueship and friendship is born.
2,600,000,000 people under the age of 18 in our world.
Our world

January 29, 2018
Dr. Nassar Scandal: USA Gymnastics Board Resigns, Michigan Opens Investigation

Honduras: U.S.-Backed President Hernández Inaugurated Amid Massive Protests

Afghanistan Reels After 103 Killed in Suicide Attack in Kabul

Protesters in Germany & France Demand End to Turkish Offensive in Afrin, Syria

Albania: 10,000 Protesters Demand Prime Minister’s Resignation
(HOW) CAN EDUCATION BE A FORCE FOR A JUST WORLD?

It is a lofty goal.

But it is vital for humanity.
THREE SHORT GLIMPSES OF EDUCATION
MATHEMATICS AND EDUCATION

1. Miah and her classmates
2. Mamadou and his classmates
3. Aniyah and Toni and their classmates

How does education shape mathematics?

How does mathematics shape education?
VIEWING FOCUS

What are the children learning?

- In and for **mathematics**?
- In and for participating in a **democratic society**?
- In and for a more **just world**?
PERMUTATIONS, AND PROOF

Find all the ways to arrange the light green, purple, and yellow rods into three-car trains, using exactly one of each rod.

How are you sure you have found ALL the ways?

Prove that you have all the possible ways to arrange the light green, purple, and yellow rods into three-car trains.
VIDEO: MIAH, DEEDRAH, MICHIO, ARIANNA

When you- I drew the first part, the first colors first- at first, and then I just mixed the bottom next to them, these two.
BLUE-GREEN RECTANGLE PROBLEM

1. What fraction of the whole rectangle is shaded blue?

2. What fraction of the whole rectangle is shaded green?

3. What fraction of the whole rectangle is shaded altogether?
VIDEO: MAMADOU AND DOVAN
What number does the orange arrow point to?
Explain how you figured it out.
VIDEO: ANIYAH, TONI, LAKEYA, DANTE

This video and additional supporting materials are available online [here](#).
TURN AND TALK WITH OTHERS

What are the children learning?
- In and for **mathematics**?
- In and for participating in a **democratic society**?
- In and for a more **just world**?
MATHEMATICS TEACHING AS AN (IM)POSSIBLE PRACTICE
NOT A NEW QUESTION

What is the “impossible” role of the teacher in progressive education?

Joseph J. Schwab (1959)
BUT IN THE WORLD OF THE 21ST CENTURY: THREE ENDEMIC CHALLENGES AND AFFORDANCES

1. Expertise and attunement to others
2. Educating for the individual and the collective
3. Connecting to and intervening on the “real” world
1. EXPERTISE AND ATTUNEMENT TO OTHERS

3! = 3 x 2 x 1

3.NFA.1: Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.

3.NFA.1 and 2: Understand a fraction as a number on the number line; represent fractions on a number line diagram.
KNOWING IN TEACHING IS ABOUT OTHERS

- What is involved in knowing what someone else is thinking?
- Listening and communicating across differences of age, race, culture, gender, language, social class
- Listening with what you know, but also open to others’ ways of thinking and knowing
  1. Miah’s explanation
  2. Mamadou’s answer to a different question
  3. Aniyah’s view of the “whole” and Toni’s and Lakeya’s voices, Dante’s question
2. EDUCATING FOR THE INDIVIDUAL AND THE COLLECTIVE

We saw glimpses of three classrooms.

The crowded setting of classroom teaching (Jackson, 1968)
- Approximately 30 ten-year-olds in each class
- Teaching as responsive to and responsible for each child’s learning.

What about the possibilities?
EDUCATING FOR THE INDIVIDUAL AND THE COLLECTIVE

1. What does each of the children—Miah, DeeDrah, Mamadou, Dovan, Aniyah, Toni, Lakeya, and Dante—know? And what is each learning to do?

2. What are the children who are not speaking in these short clips doing and learning?

3. What are these groups of children learning to do with other people?
3. CONNECTING TO AND INTERVENING ON THE “REAL” WORLD

- Teaching must connect to children’s experiences, worlds, and lives. Often in mathematics education, we think of this as situating problems in the children’s everyday worlds.

- But teaching must also create buffers from and disrupt patterns of the real world: racism, inequities, bias, and more.
THE HEAVY WORK OF TEACHING TO DISRUPT THE “REAL” WORLD

1. Miah
   - Positioning Miah with humanity and agency: “see your face”; “is that right, Miah?”

2. Mamadou
   - Creating space to hear and understand Mamadou’s idea before agreeing or disagreeing: “Let him explain”

3. Aniyah
   - Requiring comments or questions before agreeing or disagreeing
   - Children look at and speak to Aniyah
The (im)possible work of teaching entails:

- Working across and not erasing human differences
- Managing and working with paradoxes
- Using their affordances and managing their challenges
Alice laughed. “There’s no use trying,” she said: “one can’t believe impossible things.”
“I daresay you haven’t had much practice,” said the Queen. “When I was your age, I always did it for half-an-hour a day. Why, sometimes I've believed as many as six impossible things before breakfast.”
Slides will be available on my website
https://deborahloewenbergball.com/
Image on slides 2 and 29:
Photo of Prof. Ruhama Even
Retrieved from: https://wis-wander.weizmann.ac.il/awards-and-appointments/prof-ruhama-even

Image on slide 5:
Protesters Rally at White House to Denounce Trump for Racism, Xenophobia

Image on slide 5:
Afghanistan Reels After 103 Killed in Suicide Attack in Kabul
Image on slide 5:
Protesters in Germany & France Demand End to Turkish Offensive in Afrin, Syria

Image on slide 5:
Floods peak in Paris as France sees worst rains in 50 years
AP Photo/Michel Euler

Image on slide 29: