Math: The New Civil Rights Issue

Sylvia Valdés-Fernández
What is $4 \div \frac{1}{2}$?

How do you know?

*Please discuss with your neighbor.*
Literacy was central to the Civil Rights Movement of the 1960’s

- Robert Moses’ Book: *Radical Equations (2002)*
  - 1960’s Civil Rights Activist, worked for Student Nonviolent Coordinating Committee (SNCC) in Mississippi & later founded the Algebra Project
  - Community organizer worked to register African Americans to vote
  - African Americans closed out of political process since 1890 with barriers such as poll taxes and subjective literacy tests making it nearly impossible for them to vote
  - Most did not bother trying to register; in 1965, only 1/5500 in Amite County was registered to vote
Increasingly the Civil Rights Movement became about economic access, and literacy has been central to this.

• One of the big ideas that came out of this era for the field of education was the importance of literacy for all
• In the 1960’s, there was a big push to wipe out illiteracy
• Less barriers to full citizenship in terms of voting, but more in terms of full economic access
• Full citizenship is derived from full economic access
Today math literacy has become essential to full citizenship, economic access, and access to democracy.

“Today, I want to argue, the most urgent social issue affecting poor people and people of color is economic access. In today’s world, economic access and full citizenship depend crucially on math on math and science literacy.”

Today’s economy is so STEM (science, technology, engineering, mathematics) driven, that math literacy is the new civil rights issue

- 70% of all new jobs created require tech skills; only 22% of young people have these skills
- Non-traditional student disparities are even worse
- The American Electronics Association reports that high tech workers earn 82% more than people in other industries
Percent of first-year undergraduate students attending public institutions who reported taking remedial courses

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>2007-08 Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>19.9%</td>
</tr>
<tr>
<td>Black</td>
<td>37.7%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>29.0%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>27.5%</td>
</tr>
<tr>
<td>Other/Two or more races</td>
<td>27.5%</td>
</tr>
</tbody>
</table>

--Institute of Education Sciences National Center for Education Statistics
Figure 3: Factors Affecting Likelihood of Having a STEM Job by Race and Hispanic Origin, 2009

- White, non-Hispanic
- Asian, non-Hispanic
- Hispanic
- Black, non-Hispanic
- All Other, non-Hispanic

Percent with College Degree (age 16+):
- White, non-Hispanic: 35%
- Asian, non-Hispanic: 14%
- Hispanic: 22%
- Black, non-Hispanic: 25%
- All Other, non-Hispanic: 22%

Percent of College Graduates with STEM Major (age 25+):
- White, non-Hispanic: 43%
- Asian, non-Hispanic: 22%
- Hispanic: 21%
- Black, non-Hispanic: 17%
- All Other, non-Hispanic: 22%

Percent of STEM Majors with STEM Jobs (age 25+):
- White, non-Hispanic: 49%
- Asian, non-Hispanic: 28%
- Hispanic: 28%
- Black, non-Hispanic: 29%
- All Other, non-Hispanic: 28%

Source: ESA calculations from American Community Survey public-use microdata.

Note: Estimates are for employed persons age 16 and over. *AIAN refers to persons who identify as American Indian, Alaska Native alone, not Hispanic.
Poverty and Test Scores In Oregon's Biggest School Districts

A look at Oregon's three biggest school districts — Portland, Beaverton and Salem-Keizer — show performances are higher in schools with lower percentages of students dealing with poverty ... and lower in schools where poverty is more pervasive.
Huge push in math education research for “equity.”
How do we know when we have attained equity?

Equity is when we can’t make predictions on how a student will do based on gender, race, socioeconomic status, etc.

--Rochelle Gutierrez (2002) Enabling the Practice of Mathematics Teachers in Context: Toward a New Equity Research Agenda
What have educational researchers done to address this issue? Focus: curricular arguments.

<table>
<thead>
<tr>
<th>Reform Mathematics</th>
<th>Traditional Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Group work/student centered</td>
<td>• Teacher driven</td>
</tr>
<tr>
<td>• Open ended questions</td>
<td>• Step by step algorithms</td>
</tr>
<tr>
<td>• Shorter homework questions</td>
<td>• Skills emphasized</td>
</tr>
<tr>
<td>• Skills often de-emphasized</td>
<td>• Students tracked by ability level</td>
</tr>
<tr>
<td>• Students grouped heterogeneously</td>
<td></td>
</tr>
</tbody>
</table>
Curricular Arguments: Reform vs. Traditional Mathematics
“In many ways the college prep math curriculum is a moving target. It differs from place to place, and it’s changing...My metaphor is that you’re running to get on board the bus. The bus is moving, and you can’t get on it from a standstill position. As your speed begins to approach the speed of the bus, you have a chance of hopping on.”

- Robert P. Moses, *Radical Equations*
Valdés Math Institute

• Founded: 1989 by José Valdés
• Mission: Equity in Mathematics Education in San José
• Scope: Mid 1990’s participation averaged 1200 students spread over 5-7 college campuses
• Today: Over 25,000 served!!!
José Valdés Summer Math Institute

1. Seven-week program, 5 days per week, 6 hours per day (approx. program 200 hrs)
2. One full year of mathematics covered
3. Nightly homework (100 problems, approximately 2 hours in length)
4. Targeting low SES and students underrepresented in Math-based professions
5. Held on a college campus
6. One teacher and two TAs per class
7. Small class sizes and dependent on course level
8. No cost to students
9. Teacher empowerment and professional development
10. Transportation available to students
11. Lunch provided to all students
12. Parental Involvement
Supporting Data
San Jose Project- Fall, 2002

GPA at Andrew Hill HS (12/02)

<table>
<thead>
<tr>
<th>Year</th>
<th>non-Valdés</th>
<th>Valdés</th>
</tr>
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<tbody>
<tr>
<td>All</td>
<td>2.39</td>
<td>3.31</td>
</tr>
<tr>
<td>9</td>
<td>2.43</td>
<td>3.40</td>
</tr>
<tr>
<td>10</td>
<td>2.38</td>
<td>3.26</td>
</tr>
<tr>
<td>11</td>
<td>2.42</td>
<td>3.33</td>
</tr>
<tr>
<td>12</td>
<td>2.43</td>
<td>3.17</td>
</tr>
</tbody>
</table>
Supporting Data
San Jose Project - Fall, 2002
Real problems hindering achieving equity:

#1) Believing that the problem is unidimensional

- Believing that resolving the issue of equitable access to mathematics can be solved by mere curriculum changes
- Jo Boaler (1997) found that even the highest performing students today are not being treated equitably in that they could receive better mathematics education under reform curriculum.
- Lubienski (2000) suggested that students in poverty may not benefit from open-ended problem solving typical of reform
- Gutierrez (2002) found that the results were mixed
Real problems hindering achieving equity: #2) The debate and tension between excellence and equity

- Opponents of reform curriculum argue that it lacks formality and rigor necessary for high-level STEM careers
- Assumption that it’s an “either/or” situation rather than a “mathematical or” situation
- Ignoring the possibility of a hybrid style of teaching
Real problems hindering achieving equity: #3) An underlying belief that not all students can learn math

- Stevenson and Stigler (1992) Found that in the US we tend to believe that differences in student achievement are due to differences at birth
- A general societal acceptance that it’s OK not to be good at math
The Real Problem: 
#4) Deficit Theory (The Hot Tamale Part A)

• The belief that because students come from a non-dominant background, or are minority students, or first-generation students, or come from low SES that they have too much of a disadvantage to make up for and therefore it is too difficult for them to achieve success in math (*Rebecca Cox, 2009*)

• Educators believe that students show know what they need to do and that it is up to them to use their resources

• Educators “feel sorry” for students and try to make things “easier” → ”dead in the water”
The Real Problem: #4) Deficit Theory (The Hot Tamale Part B)

• The belief that diverse students need math, but math (and STEM for that matter) does need diversity

  • Diane Fossey and her methods of observing and studying mountain gorillas

  • Jackie Robinson and base stealing in baseball
The Real Problem:
#4) Deficit Theory: (The Hot Tamale Part C)

• Recognize that although we are teaching students “the mathematics of dominant society” we want them to keep and value their culture

• Just because we want to have people from the non-dominant culture participate in the mathematics of the dominant society, does not mean that we want anyone to lose their identity

• This may mean a real push to have a more diverse faculty
Returning to the question of “equity.” What equitable access to mathematics and/or higher education?

Equity ≠ Equality

“although equity means justice or fairness it is often blurred with equality which means sameness…to redress past injustices and account for different home resources, student identities, social biases, and other contextual factors, students, in fact, need different (not same) resources”

--Rochelle Gutierrez (2002) Enabling the Practice of Mathematics Teachers in Context: Toward a New Equity Research Agenda
What can be done as faculty and future teachers?

- Do not assume our students come to us with traditional resources, but still recognize what our “disadvantaged” students DO bring with them that perhaps other more “advantaged” students may lack
- Make it our mission to teach these students about available resources and how to “do school”
- Make sure to appropriately value what diversity brings to our respective fields
- Always hold students to the highest standards while offering them as much support as possible
What can be done by math education researchers?

Focus not just on curriculum but also on teaching practices and teacher education

• Discursive practices
• Contextual and organizational factors that allow for teachers to collaborate
• Work with pre-service teachers on how to work the political system with things such as creative insubordination (Rochelle Gutierrez, 2007)
What can be done as students?

• Know that you belong here and that as much as you get out of college, you can bring something unique to your field of study.

• Use your resources: ask questions, go to your advisor, go to your professor’s office hours, go to the math center or the writing center.

• Work hard…it’s not always a meritocracy, but in the long run, it will pay off.
Access to math means access to STEM fields, which creates greater economic access, which in turn leads to full citizenship.

Just as much as underserved groups need math and STEM, if not more so, math and STEM need diverse perspectives.


