



NATIONAL COUNCIL OF  
TEACHERS OF MATHEMATICS  
CELEBRATING 100 YEARS

# **Building Agency, Fostering Identities, and Promoting Social Change via Social Justice Contexts (Grades 6–8)**

Marilyn Strutchens, Ph.D.  
Professor, Auburn University  
June 9, 2020



# My Communities

*Humankind*

Mentors

Relatives

Black Americans

Women

Spouses

Advocates

Researchers

Southerners

Crocheters

Seamstresses

Daughters

Friends

Peloton Subscribers

Dancers

Aunts

Mathematics Teacher Educators

Voters

Christians

Sisters

Professors

**The Lesson of GRACE: Your accomplishments are NOT what make you a worthy human being. You learn this lesson when someone shows you GRACE: good things you didn't earn or deserve, but you're getting them anyway.**

(Su, F. <http://mathyawp.blogspot.com/2013/01/the-lesson-of-grace-in-teaching.html>)



# Agenda

- Share how youth across age groups have served as change agents.
- Share the definitions that I am using for social justice and social justice pedagogy.
- Share sample social justice lessons.



“And finally, build a community. No one does big things by themselves. Right now, when people are scared, it’s easy to be cynical and say let me just look out for myself, or my family, or people who look or think or pray like me. But if we’re going to get through these difficult times; if we’re going to create a world where everybody has the opportunity to find a job, and afford college; if we’re going to save the environment and defeat future pandemics, then we’re going to have to do it together. So be alive to one another’s struggles. Stand up for one another’s rights. Leave behind all the old ways of thinking that divide us — sexism, racial prejudice, status, greed — and set the world on a different path.”

*Excerpt from Former President Barack Obama’s 2020 High School Commencement Address, New York Times, May 16, 2020*





## O'Fallon, Mo., police chief marches with protesters



O'Fallon police chief Tim Clothier, center, marches arm-in-arm with Ryan Staples, to his left, and Jalen Thompson, to his right, at the front of a march for George Floyd in O'Fallon, Mo., on Monday, June 1, 2020. Thompson and some friends organized the march with the help of the police. About 1,500 -2,000 people showed up to march. Clothier said he took part in the demonstration to show solidarity with the marchers and he condemned the officer's actions in Minneapolis as an "embarrassment to our profession." Photo by David Carson, [dcarson@post-dispatch.com](mailto:dcarson@post-dispatch.com)

# Coco Gauff posts powerful video on George Floyd's death: 'Am I next?'

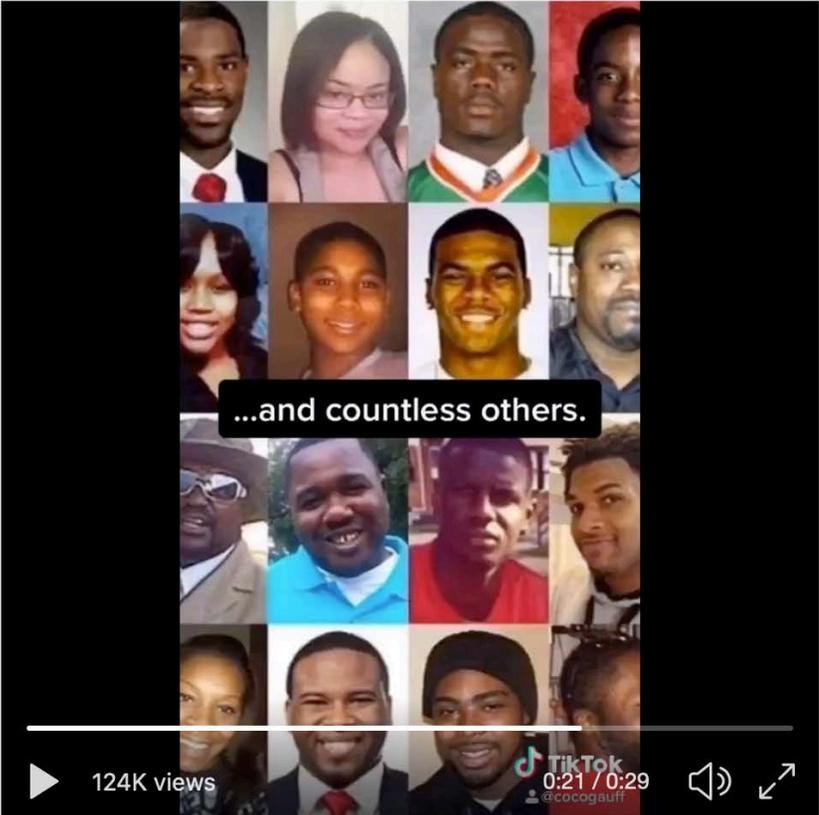
By Paula Froelich

May 30, 2020 | 2:17pm



**Coco Gauff**   
@CocoGauff 

#blacklivesmatter



...and countless others.

124K views

TikTok  
0:21 / 0:29  
@cocogauff

# THANK YOU HEALTHCARE COMMUNITY FROM KIDS

Healthcare workers are going above and beyond during the coronavirus pandemic. These kids want to say, "Thank you."

The image shows a YouTube video player interface. At the top left is the 'SAFE KIDS WORLDWIDE' logo. The video title is 'Healthcare Worker Appreciation: COVID-19'. On the right side, there are icons for 'Watch later' and 'Share'. The video content features a young girl with a long braid, wearing a pink top, sitting in a room with a plant and a window. A subtitle at the bottom of the video reads: 'There's a lot going on in the world right now.' The YouTube player controls at the bottom include a play button, a volume icon, a progress bar showing '0:00 / 0:59', a Creative Commons license icon, a settings gear, the YouTube logo, a chat icon, and a full-screen icon.



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# How covid-19 has laid bare the vast inequities in U.S. public education.



Hundreds of high school students and other supporters participate in the March to Close the Gap in Montgomery County, Md., on April 27, 2014. (Sarah L. Voisin/The Washington Post)



By **Valerie Strauss**

Reporter



## FSU WR joins middle schooler with autism who had been sitting by himself at lunch.



Andrew Joseph, August 30, 2016, *USA Today*





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## 8-Year-Old Flint Girl Who Wrote Letter to Obama: 'I Wanted Him to Know What Was Going On'



APRIL 27, 2016 , *Time*

# Unaccompanied Immigrant Children Find Foster Homes in Alabama

Virginia MacDonald, June 28, 2018

Share this story: [f](#) [t](#) [✉](#)



© Karla Ann Coté

Children marched in a New York City demonstration protesting Trump's immigration policies. (Source: Karla Cote. Used under [Creative Commons license 2.0.](#))

Federal officials have placed 2,729 unaccompanied immigrant children in Alabama since 2015, with most finding foster homes in Jefferson, Marshall, Morgan and Tuscaloosa counties.

Of those, 453 found foster homes in Alabama this year through April, according to the Office of Refugee Resettlement of the U.S. Health and Human Services Department. Information on how many children have been settled in the state since April – including during the recent separation of families as part of a zero-tolerance

policy – is not yet available.





**I raise up my voice not so  
I can shout, but so that  
those without a voice can  
be heard. We cannot  
succeed when half of us  
are held back.**



**From 12 Powerful And Inspiring  
Quotes From Malala Yousafzai:  
The 18-year-old Nobel Peace  
Prize winner who's changing  
the world.**

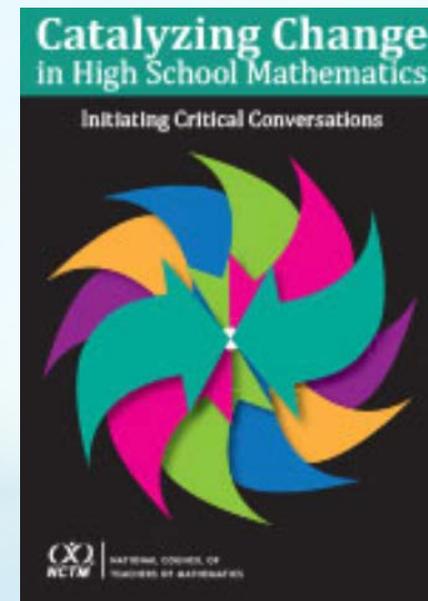
**by Kristin Harris**

BuzzFeed Staff



# Key Recommendation

- Each and every student should learn the Essential Concepts in **order to expand professional opportunities, understand and critique the world, and experience the joy, wonder, and beauty of mathematics.**





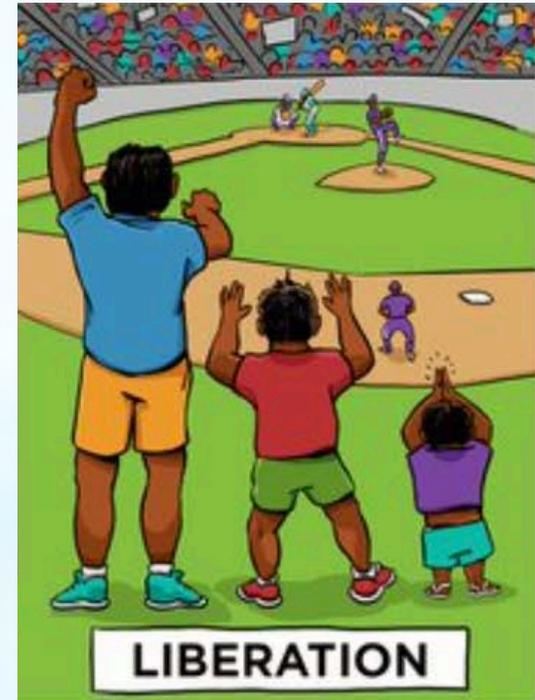
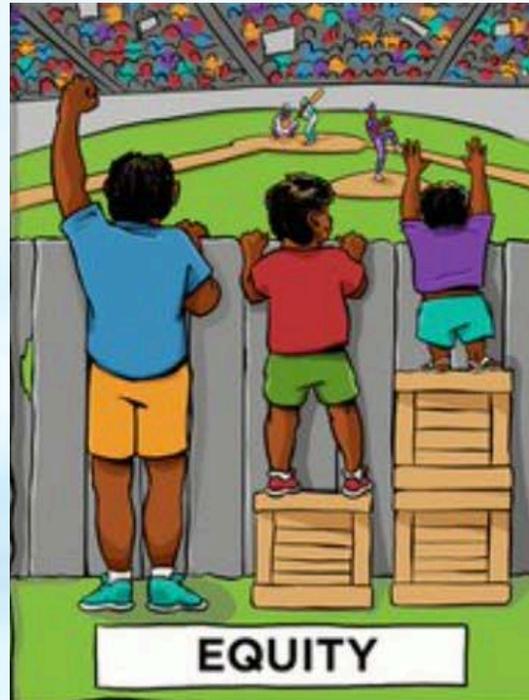
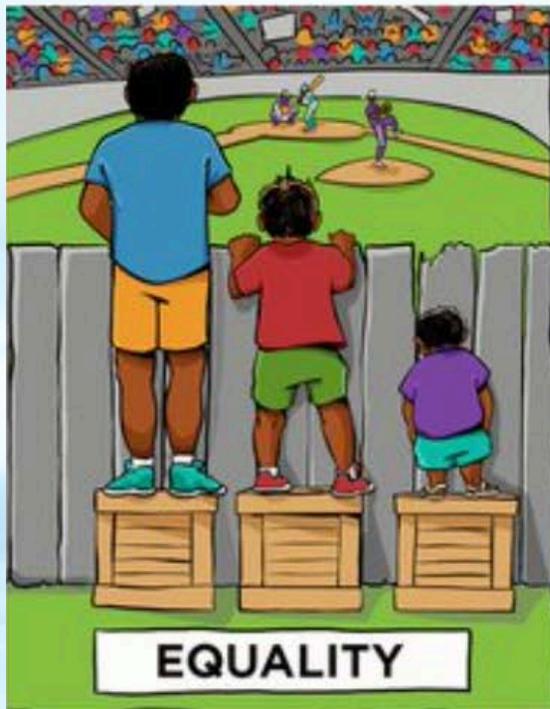
In August 2017, **Larson and Berry** made several calls to the mathematics education community in their response to the unrest in Charlottesville, Virginia. On June 1, in *A Statement on George Floyd, Breonna Taylor, and Ahmaud Arbery*, **Wilkerson and Berry** renewed these calls.

As educators, teachers of mathematics, and a Council, we reiterate our position:

- We support the use of mathematics as an analytic tool to challenge power, privilege, and oppression.
- We encourage all educators to challenge systems of oppression that privilege some while disadvantaging others.
- We encourage all educators to create socially and emotionally safe spaces for themselves, their students, and colleagues.



Aguirre and Civil (2016) contend that work with a social justice perspective has explicitly disrupted institutional structures, policies and practices to advocate for and advance children, historically underrepresented in STEM fields, in learning rich, rigorous and relevant mathematics; **transforming mathematics from a tool of systemic oppression to one of liberation that engages all of us: students, families, and educators in experiencing mathematics in a more just and humanizing way (p.6).**



<http://www.storybasedstrategy.org/blog/the4thbox>



## Teaching Mathematics for Social Justice

### *Social Justice Pedagogical Goals*

- Reading the world with mathematics
- Writing the world with mathematics
- Developing positive cultural and social identities

### *Mathematics Pedagogical Goals*

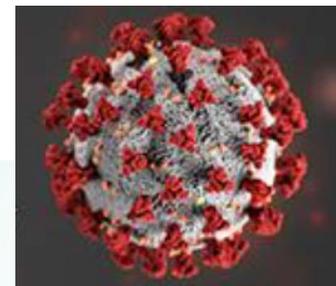
- Reading the mathematical world
- Succeeding academically in the traditional sense
- Changing one's orientation to mathematics

(Gutstein, 2006, p.23)



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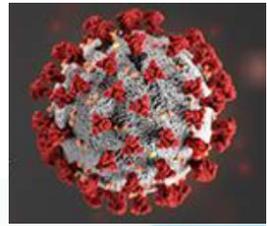
# Sample Lessons



# Using Math to Make Sense of Our World: Pandemics, Viruses, and Our Actions

Speaker: David Barnes, Beth Kobett, Jeff Shih, Sarah Bush, and Dan Teague (April 2, 2020)

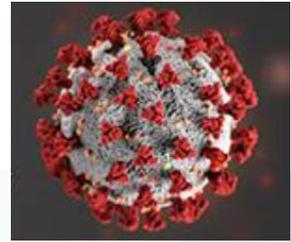
- Social Distancing- Slides, Teacher Guide, Excel File, Student Pages (By Siddhi Desai)
- Proportional Reasoning- Slides and Teacher Guide
- Number of cases- Slides and handout, Student pages (Aline Abassian)-
  - A Pandemic Notice and Wonder
  - How Many More Cases Does the U.S Really Have?
  - Which State, Proportional to its Population, has the Most Cases?



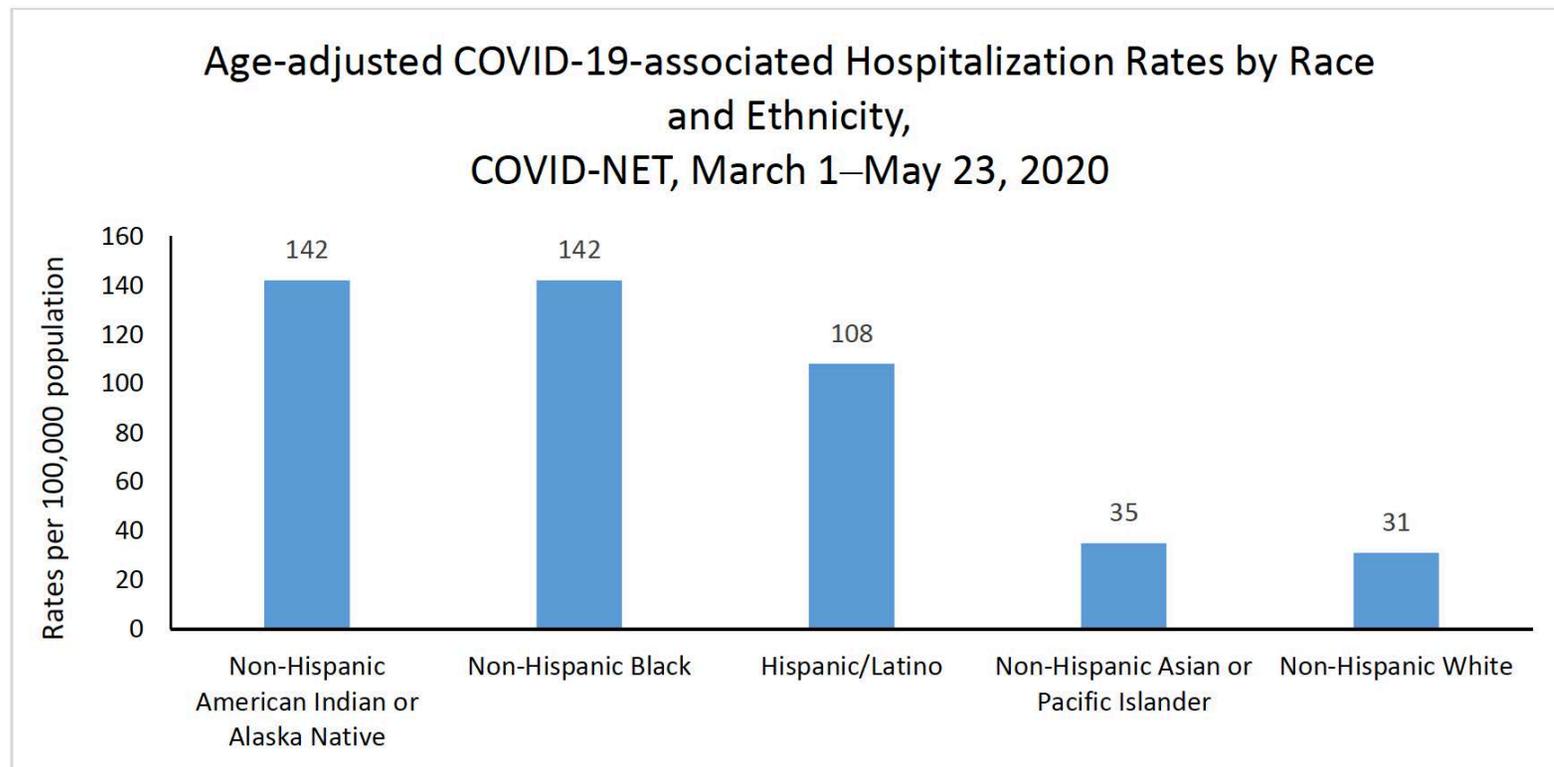
# Social Justice Related Tasks

During the pandemic, our way of life has been altered. How might this further perpetuate or be a catalyst to resolve limited access and inequities in our society? Discuss the role of mathematics in acknowledging, analyzing, and addressing the variety of needs (such as social, emotional, physical, medical, economic, political) of communities.

A Pandemic Notice and Wonder, By Aline Abassian

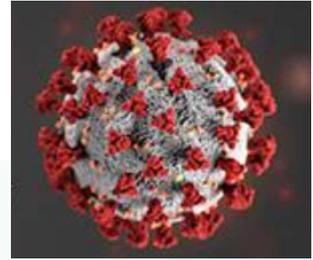


## Ask students to write mathematical questions related to the graph.



Among 5,187 hospitalized adults with information on underlying medical conditions, 91.7% had at least one reported underlying medical condition, the most commonly reported were hypertension, obesity, chronic metabolic disease, and cardiovascular disease.

[https://www.cdc.gov/coronavirus/2019-ncov/covid\\_data/covidview/index.html#hospitalizations](https://www.cdc.gov/coronavirus/2019-ncov/covid_data/covidview/index.html#hospitalizations)



# Questions

- What lessons might you implement related to Covid-19?
- What social justice issues would you discuss?



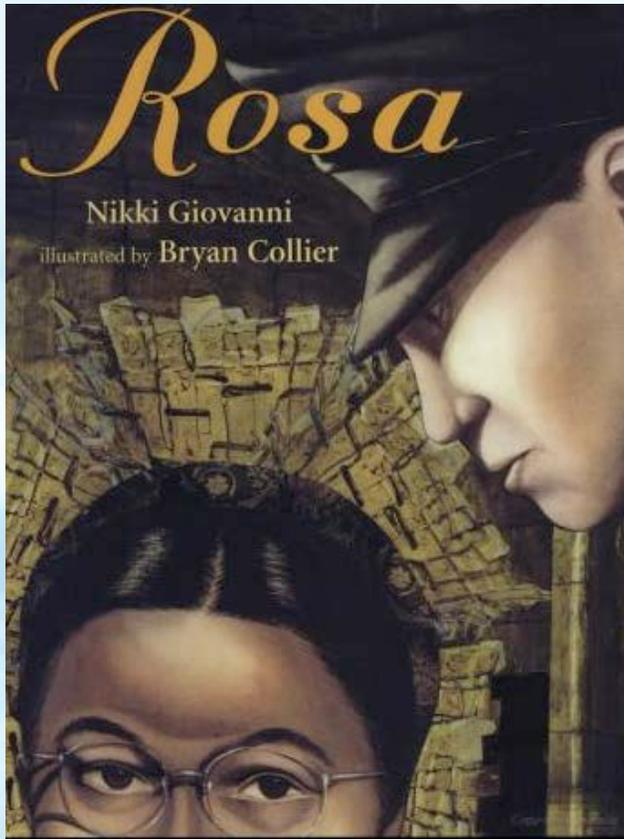


# Multicultural Literature as a Context

- Because mathematical situations are often embedded in the social and cultural contexts provided by literature, children's multicultural literature is the perfect medium for including culture-related activities in mathematics lessons.
- Further, multicultural literature offers a context in which readers can celebrate their personal cultures and learn about those of others.
- Banks (1993) contends that education in a diverse society should affirm and help students understand their home and community cultures and free them from cultural boundaries.



# Children's Literature and Current Events

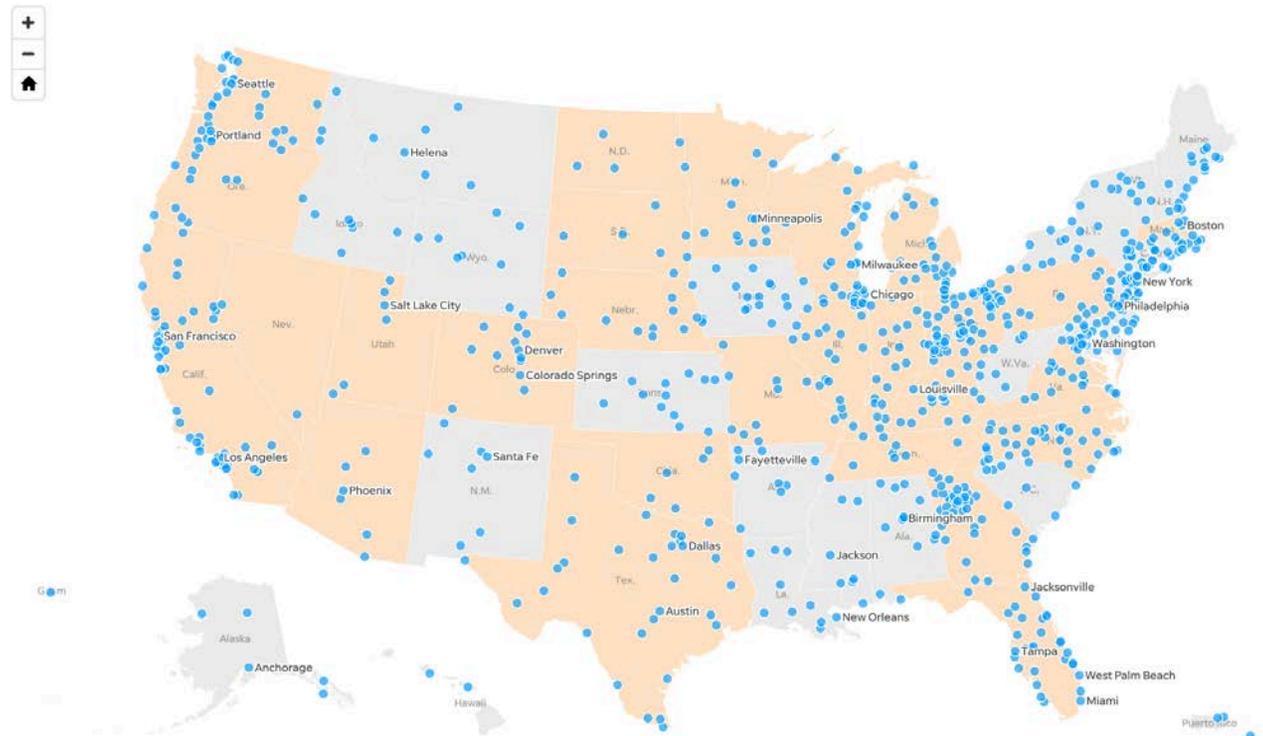


Janie Haseaman, Karina Zaiets, and Mitchell Thorson, USA TODAY  
Updated 10:05 p.m. CDT June 5, 2020

## Map of protests across the United States

What cities have protested police violence against black people? Click or tap the map below to find local coverage of protests and demonstrations near you.

■ Site of protest ■ National Guard activated





## Context Questions

### Civil Rights Movement

1. What was Rosa Parks' occupation?
2. Why did Rosa Parks' supervisor let her go home early?
3. Why did Rosa Parks refuse to give up her bus seat?
4. Why was it important for others to protest against the Jim Crow Laws?
5. Who led the march against the Jim Crow Laws?
6. Why did the laws change?
7. Why is it important to stand up for what is right?

### Black Lives Matter Movement

1. What sparked the marches against police violence?
2. Why is it important for all people to speak out against the police violence of Black Americans?
3. What other injustices should people stand against?
4. What immediate actions were taken as a result of the protests?
5. What other actions can people take to effect long term change?



## Problem Solving (Rosa)

1. Rosa Parks rode the bus everyday to and from work. If she paid 10 cents each time that she rode the bus: How much did she spend per day. How much did she spend per week? How much did she spend per month if she only worked six days per week? How much did she spend per year?
2. The boycott lasted from December 5, 1955 to December 20, 1956. How much money did the city transit system lose if 200 people who would normally ride the bus six days a week refused to ride the buses during this time? What about 1000 people?
3. Black taxi drivers charged ten cents per ride, a fare equal to the cost to ride the bus, in support of the boycott. When word of this reached city officials on December 8, 1955, the order went out to fine any cab driver who charged a rider less than 45 cents. How much money were the cab drivers sacrificing for the cause per fare if they were only charging 10 cents? Compare what they would have made for 10 fares at 10 cents to 10 fares at 45 cents.



## Problem Solving (Protests Against Police Violence)

1. In what states were protests held? What is the percentage of US states in which protests were held?
2. In *Rosa*, bus boycotting was used to impact change. What might people do today that will impact the economy and bring about change? State why what you are proposing will bring about positive change.

**What other questions might we ask students?**





# Racial Profiling Headlines

Sitting While Black? Crowds protest arrest of 2 Black men sitting in Starbucks

A black Yale graduate student took a nap in her dorm's common room. So a white student called police

Two Americans were detained by a Border Patrol agent after he heard them speaking Spanish

**BLACK VOICES** 05/11/2018 10:24 am ET | Updated 6 days ago  
**Woman Calls Police On Black Family For BBQing At A Lake In Oakland**  
Their crime? Using the wrong type of grill in a barbecue-designated zone.

Jogging While Black  
Another killing raises concerns about persistent racial inequalities.  
Posted May 14, 2020



**“Driving while Black or Brown,”** encouraged students to use statistics related to racial profiling to determine whether injustices had occurred and then suggest what steps should be taken next.



# Definition

"Driving While Black" is word play on the name of a real U.S. crime, driving while intoxicated. The phrase implies that a motorist may be pulled over by a police officer simply because he or she is black, and then questioned, searched, and/or charged with a trivial offense. This concept stems from a long history of racism in the United States, United Kingdom, and other countries. The term refers to racial profiling, which is said to be used by police and other law enforcement officials ([http://en.wikipedia.org/wiki/Driving\\_While\\_Black](http://en.wikipedia.org/wiki/Driving_While_Black)).

Racial profiling in general is defined as any police-initiated action that relies on the race, ethnicity, or national origin rather than the behavior of an individual or information that leads the police to a particular individual who has been identified as being, or having been, engaged in criminal activity (Ramirez, McDevitt, & Farrell, 2000).

**What are other situations in which racial profiling occurs?**





## Information related to the Task

This is a sample of Illinois data based on police reports from 1987-1997. In an area of about 1,000,000 motorists, approximately 28,000 were Latinx. Over a certain period of time, state police made 14,750 discretionary traffic stops (e.g. if a driver changes lanes without signaling, or drives 1-5 mph over the speed limit, police may stop the driver but do not have to). Of these stops 3,100 were of Latinx drivers.

(Gutstein, 2006)



## Questions Related to the Driving While Black or Brown

1. What percentage of the motorists discussed in the data were Latinx?
2. What percentage of the discretionary traffic stops made by police were Latinx drivers?
3. How could you simulate the number of possible stops that might occur based on the population by drawing cubes from a bag? What portion and color would represent the rest of the population and what portion and color would represent Latinx drivers?
4. Do your results from the simulation experiment support the claim of racial profiling? Why or why not?

(Gutstein, 2006)



## Mathematics Involved

- Law of large numbers
- Expected value
- Theoretical and empirical probability
- Probability simulations



## Action Steps

We cannot depend on the police to police themselves. Police departments gather an inordinate amount of data on traffic stops, arrests, and use of force that they often do not analyze and present to the public. Some projects have done some of this work for them including the Stanford Open Policing Project ([openpolicing.stanford.edu](https://openpolicing.stanford.edu)) and Mapping Police Violence ([mappingpoliceviolence.org](https://mappingpoliceviolence.org)).

But we can do some of this work in our own communities with students inside and outside of schools through gaining access to public records. These are the same records reporters access when investigating specific incidents. Public record requests can focus on traffic stops within a department for a month or year or focus on a specific use of force incident. They can include body camera videos, arrest reports, or data summaries. By learning to access these records, we can use them in lessons, but possibly more importantly to use them for changes in practices and policy at the local, county, and state level.

(Daniel Battey, June 8, 2020, Personal Communication)



# Discussion Questions

- What would students gain from completing these types of lessons?
- What challenges might teachers encounter when implementing these lessons?
- What other data can be collected around racial profiling?





# Fair Housing Wages

The purpose of this lesson was to introduce students to the concept of “fair” wages and how this impacts the ability to afford fair housing. Students used graphs, tables, and equations to determine whether families were subjected to unfair wages and explored the gender pay gap.

Implemented by Hammonds, 2019 as Adapted from Francis Harper’s Fair Living Wages <https://francesharper.com/linear-equations-and-graphs-fair-living-wages/>



Use this data about the fair housing rental *prices for monthly rent*:

Studio	1 Bedroom	2 Bedroom	3 Bedroom	4 Bedroom
\$677	\$699	\$874	\$1161	\$1288

### Sample Family information

#### Red Family 1 adult

You are a male who just graduated from high school and need to move out on your own. You found a job at a restaurant in OWA making minimum wage (\$7.25 per hour) for non-tipped employees as a line cook. You work 40 hours per week.

#### Green Family 1 adult; 1 child

You are a single mom with one child working as a server at a restaurant in Airport Boulevard. Minimum wage is different if you receive tips--\$5.12 per hour. You make minimum wage and you average about \$180 per week in tips. You work 40 hours per week.



# Sample Student Responses

**What do you need to know? As a team, decide what information is needed to solve the problem.**

**Team #1 Response:** What job, How much they get payed, where they live, how many people live with them.

**Team #2 Response:** You need to know how much the job pays. How big is the family. Pet fee

Implemented by Hammonds, 2019 as Adapted from Francis Harper's Fair Living Wages  
<https://francesharper.com/linear-equations-and-graphs-fair-living-wages/>



# Sample Student Responses

**Financial advisors recommend that you only use 30% of your monthly income to pay rent. Do you think the families in Mobile are paid fair wages? Justify your answer.**

**Team #1 Response:** It's not fair because most of these people have families and they can't really even afford to keep that roof over their head just because of how much they make you pay for it all.

**Team #2 Response:** It's not fair because these places should lower their pricing. These people have children & they can't even afford studios to live in. Get a good job!



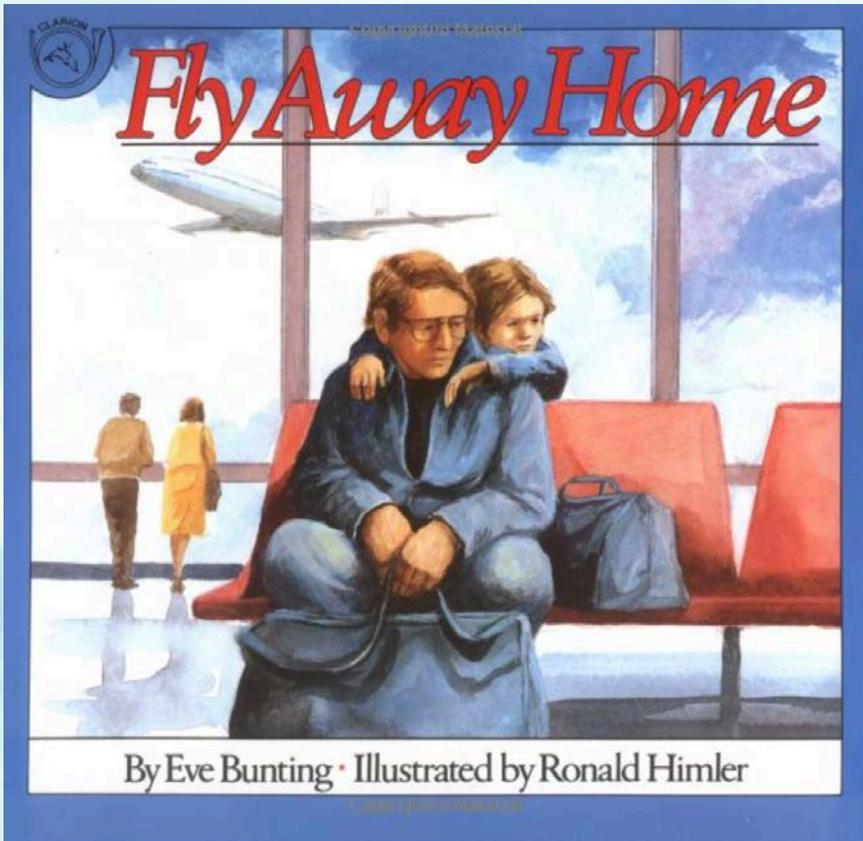
## Results

- Students were engaged and the coach had fun.
- Teacher reported that she had heard a few students talk more during this lesson/class than she had all year.
- A few students thanked the coach for coming, said they had fun, or that it was different than their “normal” math class.
- The teacher indicated that she would like more of these kinds of lessons--lessons connected to worldly inequities.
- Some students could not wrap their minds around the fact that someone would be paid differently based on race or gender. Several students kept saying “maybe they work harder/better, set themselves up for a better degree, went to college”
- Social Justice lessons should be built over a couple of classes or several days in order to get all students “bought-in” or engaged in the problem.

Implemented by Hammonds, 2019 as Adapted from Francis Harper’s Fair Living Wages <https://francesharper.com/linear-equations-and-graphs-fair-living-wages/>



# Discussion Questions

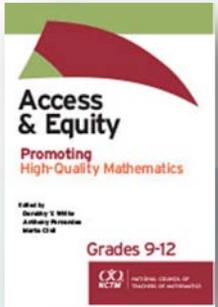


1. Have you ever been to an airport? What was it like?
2. Why do you think Andrew and his father chose to live in an airport rather than a shelter?
3. What do you think about their routine for not being noticed?
4. What do you think about Andrew's attitudes toward airline passengers?
5. Why do you think Andrew identified with the bird?
6. How would you feel if you and your family suddenly became homeless?



# Problem Solving

1. On the weekends, Andrew's dad takes a bus to work in the city. The bus fare is a dollar each way.
  - How much does he spend each day?
  - How much does he spend per month?
  - How much does he spend per year?
2. Andrew's father makes \$12.50 per hour on his weekend job. He works 8 hours each day of the weekend.
  - How much does he make in one day?
  - How much money does he make in one weekend?
  - How many weekends would he have to work to save \$1200.00?
3. Andrew and his friend Denny collect rented luggage carts that people have left outside and return them for fifty cents each. Suppose that Andrew returned 10 carts on Monday, 8 carts on Tuesday, 6 carts on Wednesday, 8 carts on Thursday, and 13 on Friday.
  - How much money did he make each day?
  - How much money did he earn by the end of the week?
  - What was the average amount of carts returned daily?
4. How many carts would Andrew have to return to earn \$36.00?



## Disability, Accessibility, and the Pythagorean Theorem: One Teacher's Approach to Teaching for Equity and Social Justice

- **Tasks and questions given to students:**
  - Write down everything you know about the Pythagorean theorem.
  - Define disability.
  - Define accessibility.
  - How can we increase accessibility at our school?
  - **How many students come to our school in a wheelchair?**
  - How is the Pythagorean Theorem useful in everyday life?
- **Developed into a social justice lesson related to disabilities and access**

(Maloney, Murray, & Rudin, 2018)



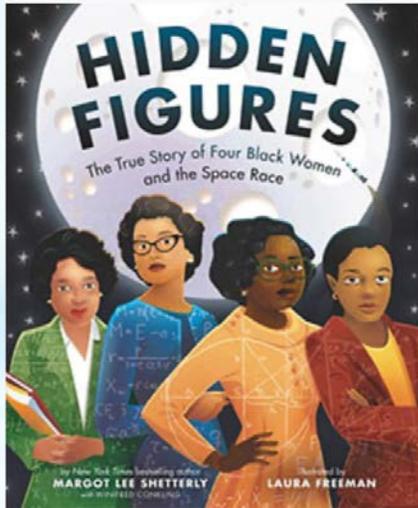
# Using Ethnomathematics to Foster Positive Identities

- **Ethnomathematics** is the mathematics which is practiced among identifiable cultural groups, such as national-tribal societies, labor groups, children of a certain age bracket, professional classes, and so on. Its identity depends largely on focuses of interest, on motivation, and on certain codes and jargons which do not belong to the realm of academic mathematics (D'Ambrosio, 1997, p. 16).
- An important component of ethnomathematics is to reaffirm the individuality and identity of students through education (D'Ambrosio, 2001 as cited in Furuto, 2014).
- **The voyages of the canoe Hōkūleʻa** are internationally renowned for their role in rekindling the Pacific Island tradition of non-instrument, traditional wayfinding techniques that include celestial navigation (i.e., sun, moon, stars, winds, currents, etc.) based in mathematics principles.
- **Hōkūleʻa** embodies the message of mālama honua, “to care for Island Earth,” and is a powerful vehicle to explore real-world applications of mathematics in local and global communities by representing and demonstrating resourcefulness, inventiveness, wisdom, respect for the past, and hope for the future.

(Furuto, 2014)



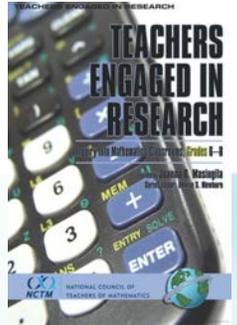
# Using Biographies to Foster Positive Mathematics Identities



- Showcases the careers of Dorothy Vaughan, Mary Jackson, Katherine Johnson, and Christine Darden and their contributions to the Space Race.

## American Mathematical Society: Mathematical Moments Poster

- Discusses the ladies' careers and shares podcasts.
- [http://www.ams.org/public\\_outreach/mathmoments/mm140-hidden-figures.pdf](http://www.ams.org/public_outreach/mathmoments/mm140-hidden-figures.pdf)



# Implementing Social Justice Pedagogy

1. Start slowly and be patient with yourself and students.
2. Engage students in critical mathematics through a pedagogy of questioning.
3. Incorporate students' life experiences directly into the curriculum.
4. See and encourage students to see mathematics in life daily.
5. Help students to develop sociopolitical consciousness.
6. Facilitate student's development of mathematical power.
7. Use problems that motivate students to study and use mathematics.
8. Cultivate students' development of a sense of agency.



**(Gutstein, 2006 & 2012)**



## Thus, teaching with a social justice stance promotes two types of agencies:

- **Mathematical Problem-Solving Agency (NCTM Principles to Action Tool Kit)**
  - Students with a high sense of agency make decisions about their participation in mathematics.
  - Make sense of problems and persevere in solving them.
  - Reason abstractly and quantitatively.
  - Construct viable arguments and critique the reasoning of others.
- **A Sense of Social Agency (Gutstein, 2006)**
  - A view of themselves as people able to effect change in the world
  - Mathematics can be used as a tool to read the world.



- How are you going to incorporate social justice pedagogy in your teaching practice?
- How are you going to advocate for each and everyone of your students?
- How are you going to serve as a change agent?

