Culturally Responsive STEM Lesson Plan:

NATIONAL MAGLAB
Research Experiences FOR TEACHERS

Examining Racial Diversity across School Districts in US States

[Note: You will need access to the Washington Post as the data set is only available there]

Lesson Objectives:

- Students will be able to analyze and interpret data.
- Students will be able to represent data usring tables of equivalent ratios, tape diagrams, or double number line diagrams.
- Students will be able to describe and define ratios, percentage, and unit rate by reasoning about culturally responsive, real world scenarios.

Next Generation Science Standards:

NGSS Science & Engineering Practices

1. Planning and carrying out investigations
2. Analyzing and interpreting data
3. Using mathematics and computational thinking
4. Obtaining, evaluating, and communicating information

Common Core Florida State Standards:

CCSS.MATH.CONTENT.6.RP.A.1

Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

STEM Rationale for Lesson:

This lesson is important for student's understanding because it positions students to…

- question the idea that science/STEM is objective.
- examine how racial disparities in school settings factor into students' identities as scientists or mathematicians.

Culturally responsive connection:

This lesson in and of itself is not culturally responsive because of its content connection to racial disparities. Instead, teachers can facilitate this lesson through a culturally responsive approach by considering the following:

1. Who are the students being serviced in this lesson?
2. What relationships have been established between the teacher and students?

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3. In what ways, can the teacher leverage their knowledge of/understanding of students' identities, cultural backgrounds, values, practices, and funds of knowledge as resources and tools throughout this lesson?
4. How is collaboration leveraged during the lesson?
5. Whose voice (student or teacher) is centered as authoritative/powerful in this lesson?
6. Are there opportunities for students to share, learn and communicate in forms familiar and acceptable to them?

Materials Needed:

Provided by Teacher:

1. An article or story that decribes diversity metrics for school districts. Example providedin Appendix A: Washington Post Article, How the nation's growing racial diversity is changing our schools, published September 12, 2019
    - https://www.washingtonpost.com/graphics/2019/local/school-diversity-data/
2. PowerPoint Template, provided in Appendix B

Additional Examples for Materials:

1. American Association of Physics Teachers, YouTube intervies with Women in Physics, https://www.youtube.com/watch?v=ofE-mJFJR5w: *HERstory: Women in Physics Tell Their Stories*
2. Appendix C: Neil deGrasse Tyson: Reflections on the color of my skin
3. Apendix D: How Does Race Affect a Student's Math Education?

Activate Prior Knowledge:

Engage students through a discussion, table chat, think pair share, etc to make connections to students' prior understanding of the concepts of fractions and part to whole.

Note: To be culturally responsive, allow students to share examples of fractions or parts to whole that are relevant to them. Prompt them to share their reasoning.

Lesson Introduction:

In a whole group structure, have students answer/discuss a few or all of following questions.

1. What do statisticians look like? ...what do statisticians do?
2. What do scientists look like?...what do scientists do?
3. Do you think statistics is subjective (definition: based on or influenced by personal feelings, tastes, or opinions) or objective (definition: not influenced by personal feelings or opinions in considering and representing facts)? Why?
4. Do you think racial diversity in statistics is important? Why or why not?
5. Do you think science is subjective (definition: based on or influenced by personal feelings, tastes, or opinions) or objective (definition: not influenced by personal feelings or opinions in considering and representing facts)? Why?

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6. Do you think racial diversity in physics is important? Why or why not?

Lesson Activity:

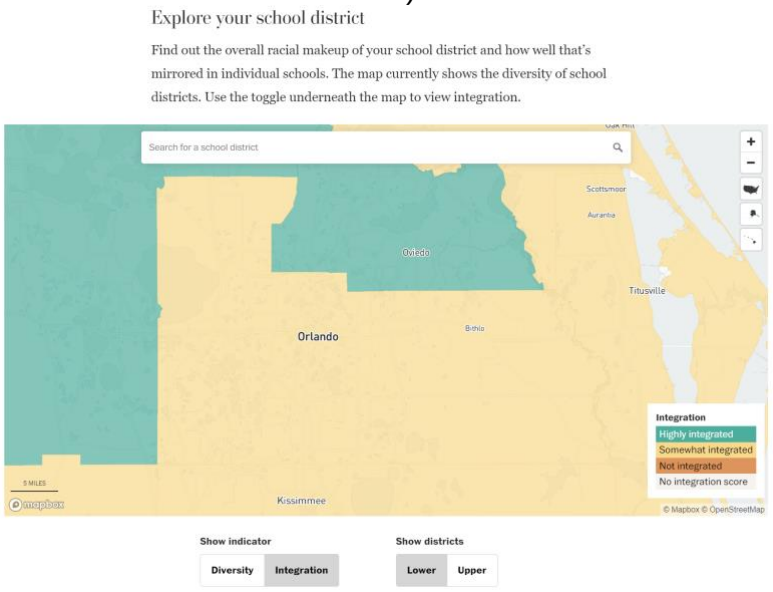
Teacher Facilitated Activity

- Show clip or show example of Ratios: Part to Whole.
  - Youtube Example: https://www.youtube.com/watch?v=G3BO6rrKhzo
- Show clip or example of Ratios: Part to Part.
  - Youtube Example: https://www.youtube.com/watch?v=7PFniZ8XoQ0
- Show clip or example of Part-Part-Whole Ratio.
  - Youtube Example: https://www.youtube.com/watch?v=FB1D1K3Pgo8

Small Group Activity

In groups of 3 to 4 students:

1. Have students read Washington Post article https://www.washingtonpost.com/graphics/2019/local/school-diversity-data/
2. As a small group, have students create and establish a definition for ”diversity”.
   - Record work/response on slide(s) provided.
3. Using the **Explore your School District** tool at the end of the article, students should be provided time to ”play” with the tool by exploring data for 4 schools districts. (If possible, students should be sure to explore their school district or a neighboring school district if their school district is not available in the tool.)



4. Explore Activity 1:
   1. Choose two school districts.
   2. Find the following ratios for both school districts in the year 1995.
      a. ratio of black to white students
      b. ratio of hispanic to white students
      c. ratio of asian to white students

    d. ratio of native to white students
    e. ratio of multiracial to white students
3. Use a ratio, fraction, or percentage to represent ratios found in part 2 above. (Must use each representation form at least once.)
4. Record work/response on slide(s) provided.

5. Explore Activity 2:
    1. Choose two school districts.
    2. Find the following ratios for both school districts in the year 1997.
        a. ratio of black to white students
        b. ratio of hispanic to white students
        c. ratio of asian to white students
        d. ratio of native to white students
        e. ratio of multiracial to white students
    3. Use a ratio, fraction,or percentage to represent ratios found in part 2 above. (Must use each representation form at least once.)
    4. Record work/response on slide(s) provided.
6. Explore Activity 3:
    1. Choose one of the school districts from Explore Activity 1 or 2.
    2. Share a ration that represents each of the following scenarios.
        a. Part to part
        b. Part to whole
    3. Record work/response on slide(s) provided.
7. Explore Activity 4:
    As a group, respond to the following prompt.
    Do you think racial diversity is important in school districts? Why or why not?

Lesson Assessment

Mathematics Assessment Samples

James has 3 blue marbles and 8 red marbles. What is the ratio of blue marbles to red marbles?
A. 3: 3 B. 3: 5 C. 3: 8 D. 3: 11

Racial Diversity Lesson Continuation

In the 2016 Fisher vs UT Austin Supreme Court case regarding affirmative action policies for admission into college, Chief Justice John Roberts asked, “What unique perspective does a minority student bring to a physics class?” Multiple responses to Justice Roberts’ question have been linked below.

Read the first one (from Physicists) and any two other responses.
i. Response: What unique perspective do white students bring? - Physicists (Direct link: https://eblur.github.io/scotus/)
ii. Response: What minority students bring - UT Physics professor (Direct link: https://www.tribtalk.org/2015/12/10/what-minority-students-bring-to-my-physics-classes/)

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iii. Response: Statement on Diversity in Physics - American Physical Society (Direct link: https://www.aps.org/about/governance/letters/scotus.cfm)
iv. Response: Statement on Fisher vs UT Austin - American Association of Physics Teachers (Direct link: https://www.aapt.org/aboutaapt/organization/fishervsUTAustin.cfm)

Lesson by: Treshonda Rutledge
Adapted from: **https://underrep.com/lessons/1-WhyDoesRepMatter.pdf**

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Appendix A: Excerpts from Washington Post Article

How the nation's growing racial diversity is changing our schools

By Kate Rabinowitz, Armand Emamdjomeh and Laura Meckler Sept. 12, 2019

More students attend schools with children of different races than ever before, a Washington Post analysis has found. Over the past couple of decades, integration took hold across the country in smaller school districts whose student bodies had been predominantly white.

But in many big cities and across the South, students remain in districts that are deeply segregated.

This comes as the nation reaches a demographic tipping point: In 2020, there will be more children of color than white children in America, according to Census Bureau projections.

To explore the changing makeup of the nation's school districts, The Post measured diversity and integration using student race data from two years: 1995 and 2017. Diversity is a measure of the overall racial makeup of a school district. A district is considered diverse when no one race constitutes more than 75 percent of the school system's student body overall.

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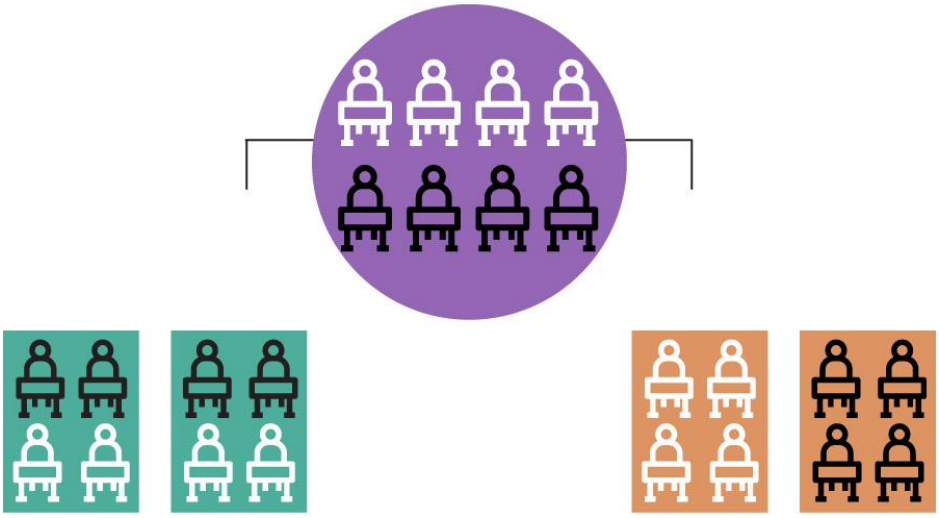

Integration determines how well that diversity is reflected across the individual schools. An integrated school leads to better academic performance for students of color without affecting white students' performance, according to decades of research analyzing test scores and graduation rates. And it offers an array of cultural and social benefits to all students, regardless of race.

The Post looked at the racial makeup of each of the country's public school districts in 1995 and 2017 to see how the growing diversity of children was reflected in their schools. Private and charter schools were excluded from this analysis.

In 1995, 45 percent of students went to school in a district. These districts tended to be in large cities and the South.

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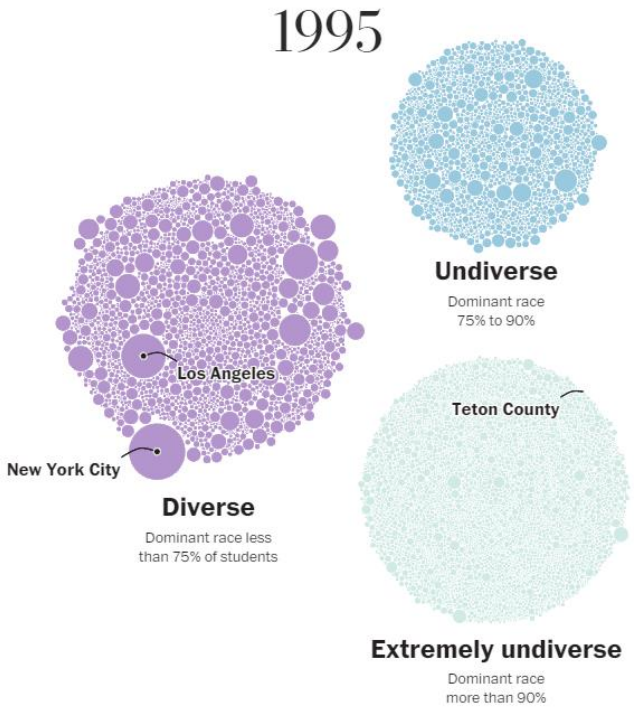

The rest attended schools in districts that were undiverse or extremely undiverse. Nearly a third of all students were in these extremely undiverse districts, which are made up almost entirely of one race. These districts were typically more rural, sparsely populated and almost uniformly white.

By 2017, there was a dramatic movement of districts toward diversity. More than 2,400 districts became diverse after being undiverse or extremely undiverse in 1995.

These newly diverse districts were typically in smaller cities and suburbs that had been predominantly white but experienced an influx of students of color, particularly Hispanics.

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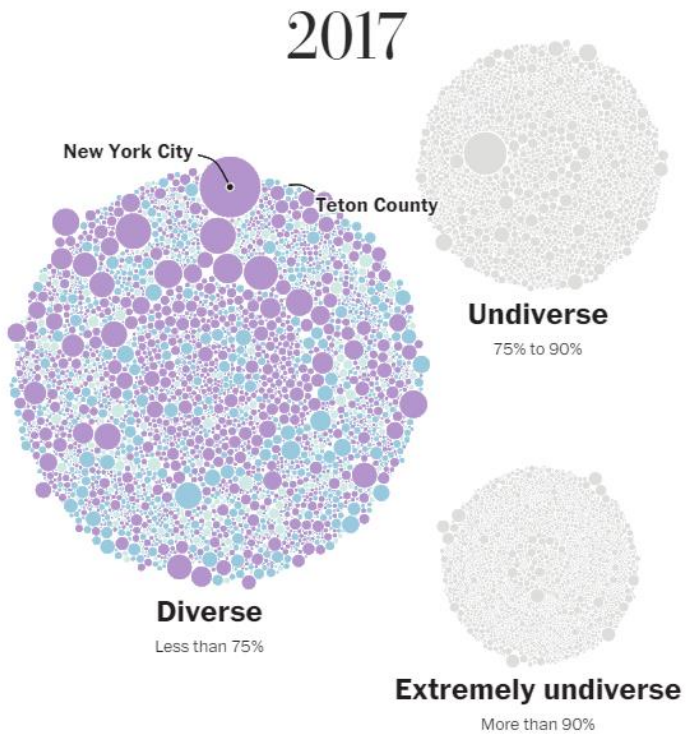
Offering students an opportunity to identify as multiracial also has reduced the dominance of a single race in districts.



A small number of districts that were in 1995 no longer were in 2017. These districts disproportionately serve students of color. Many, such as Los Angeles, have become almost uniformly Hispanic.

In 2017, 66 percent of students attended schools in districts, up from 45 percent in 1995. There was a nearly parallel decline in students in extremely undiverse districts.

The number of students in undiverse districts stayed about the same.

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Districts that lack diversity cannot be integrated. So to measure integration, The Post looked only at districts that were in 2017. Districts also needed to have at least 1,000 students and more than five schools.

Integration evaluates how evenly a district's diversity is spread across its schools. District diversity is less meaningful if children are not encountering that diversity at school.

The Post used the variance ratio to calculate an integration score for each district. Districts were grouped based on their score into highly, somewhat and not integrated.

In 2017, nearly 11 million children — the most ever — were in districts with schools. That is nearly double the 5.8 million students in districts with schools that are not integrated.

The remaining 10.3 million students were in districts with somewhat integrated schools.

It makes a difference how long a district has been diverse. Districts that became diverse after 1995 have more schools compared with districts that were already diverse in 1995.

In these historically diverse districts, students are more likely to learn in schools that are not integrated.

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Persistent lack of integration in many big cities

A 1971 Supreme Court ruling established an era of forced busing as part of court desegregation orders. Over the next 20 years, integration steadily grew in places where courts interceded. Transporting students of color to majority-white schools, and vice versa, broke the powerful link between segregation in housing and schools.

However, in the early 1990s, Supreme Court decisions eased a path out of desegregation orders. Many school systems previously under court orders — such as Charleston, S.C.; Tuscaloosa, Ala.; and Denver — saw reversals in integration gains. By 2017, Denver ranked among the bottom 2 percent of integrated school districts. That marked a dramatic drop from 1995 — the year the court order was lifted — when it was in the bottom third of integrated districts.

Chicago, which was not released from court-ordered desegregation until 2009, continues to be among the least integrated school districts in the country. Spring Branch, Tex., was never under a court order but has grown even less integrated in the 22-year period.

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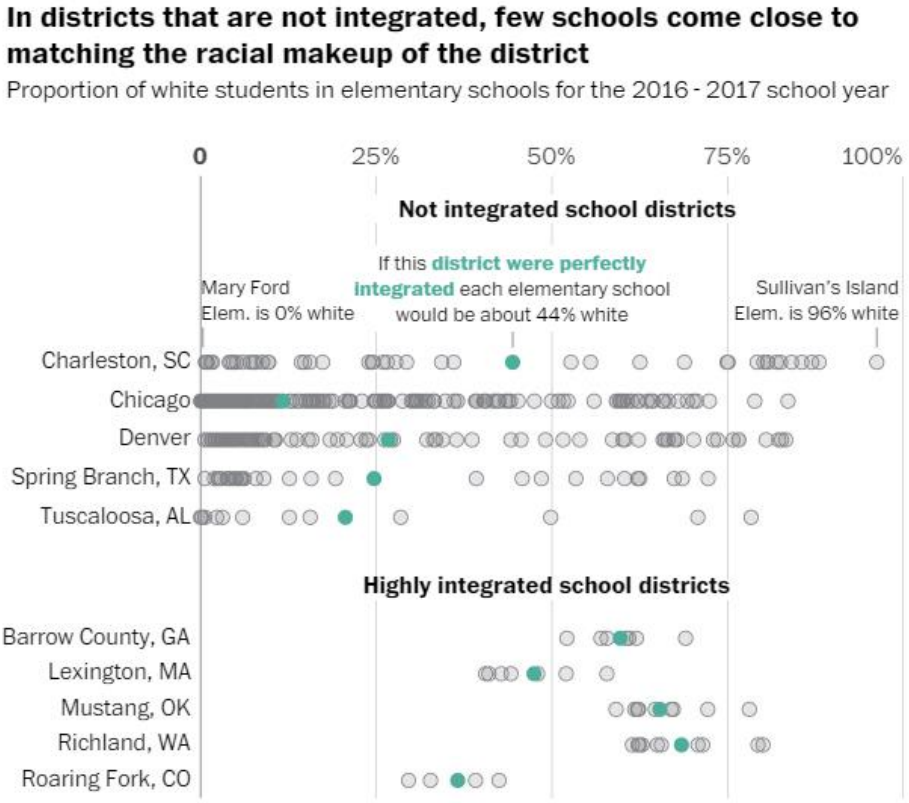

In newly diverse districts, more integrated systems

Newly diverse districts are spread across the country: from small cities such as Richmond, Wash., to the outer suburbs of Oklahoma City and Atlanta.

In Colorado's Roaring Fork Valley, across the Rocky Mountains from Denver, Hispanics grew from 12 percent of students in 1995 to 56 percent in 2017. Racially integrated housing and thoughtful school boundary assignments have produced schools that largely reflect the small district's growing diversity.

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Newly diverse districts are diversifying at a time when the overtly discriminatory housing and mortgage practices that set housing patterns in big cities are no longer in place. Research also suggests that whites hold less racial animus toward Hispanics than blacks.

Most newly diverse communities remain majority white, and research suggests whites may be more comfortable with diversity as long as they remain the largest group. Once that flips, whites may start to leave.

As these communities continue to grow more diverse, it's an open question if integration will grow with them or if they will come to look more like their historically diverse and not integrated peers.

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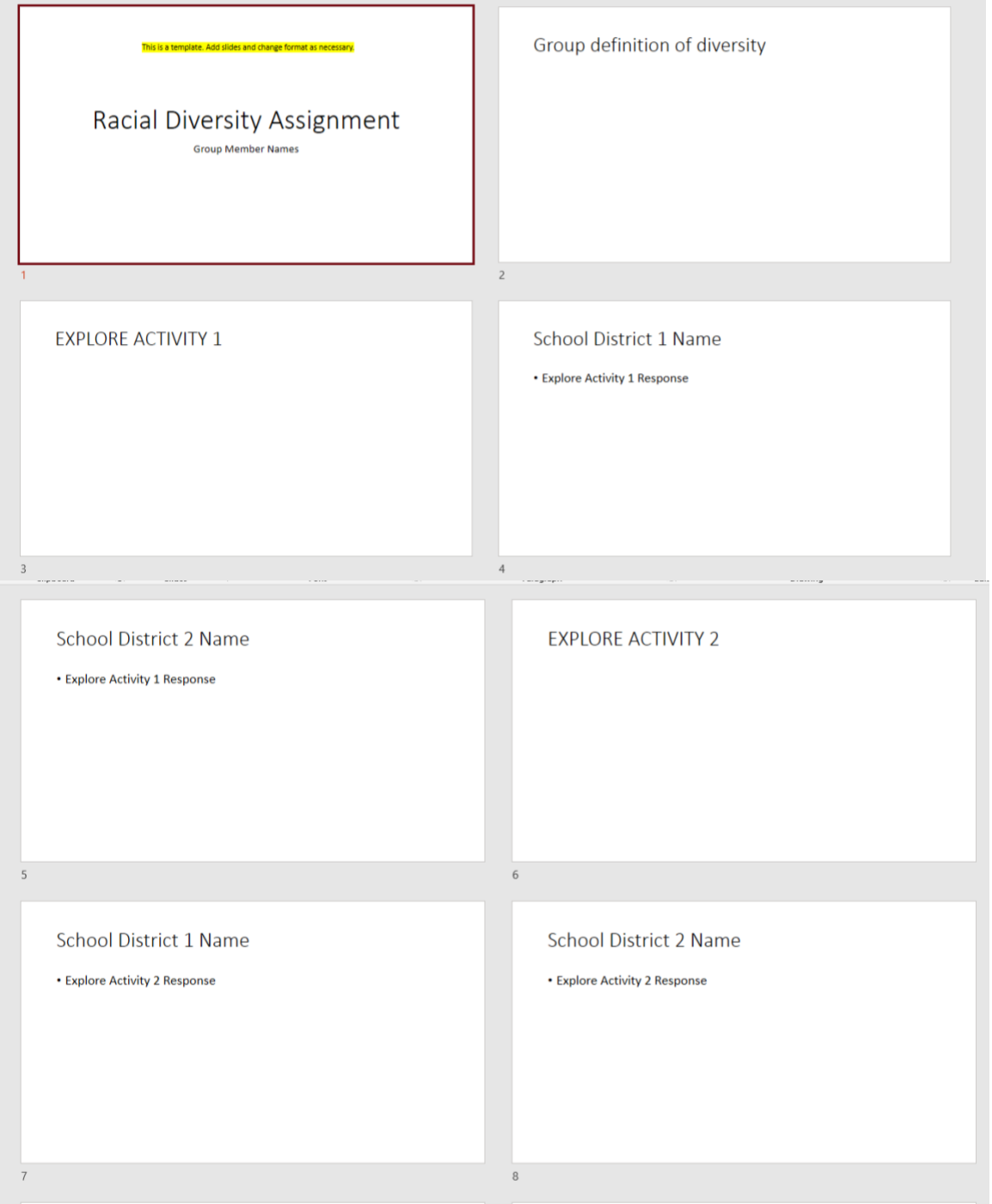
Appendix B: Slide Templates



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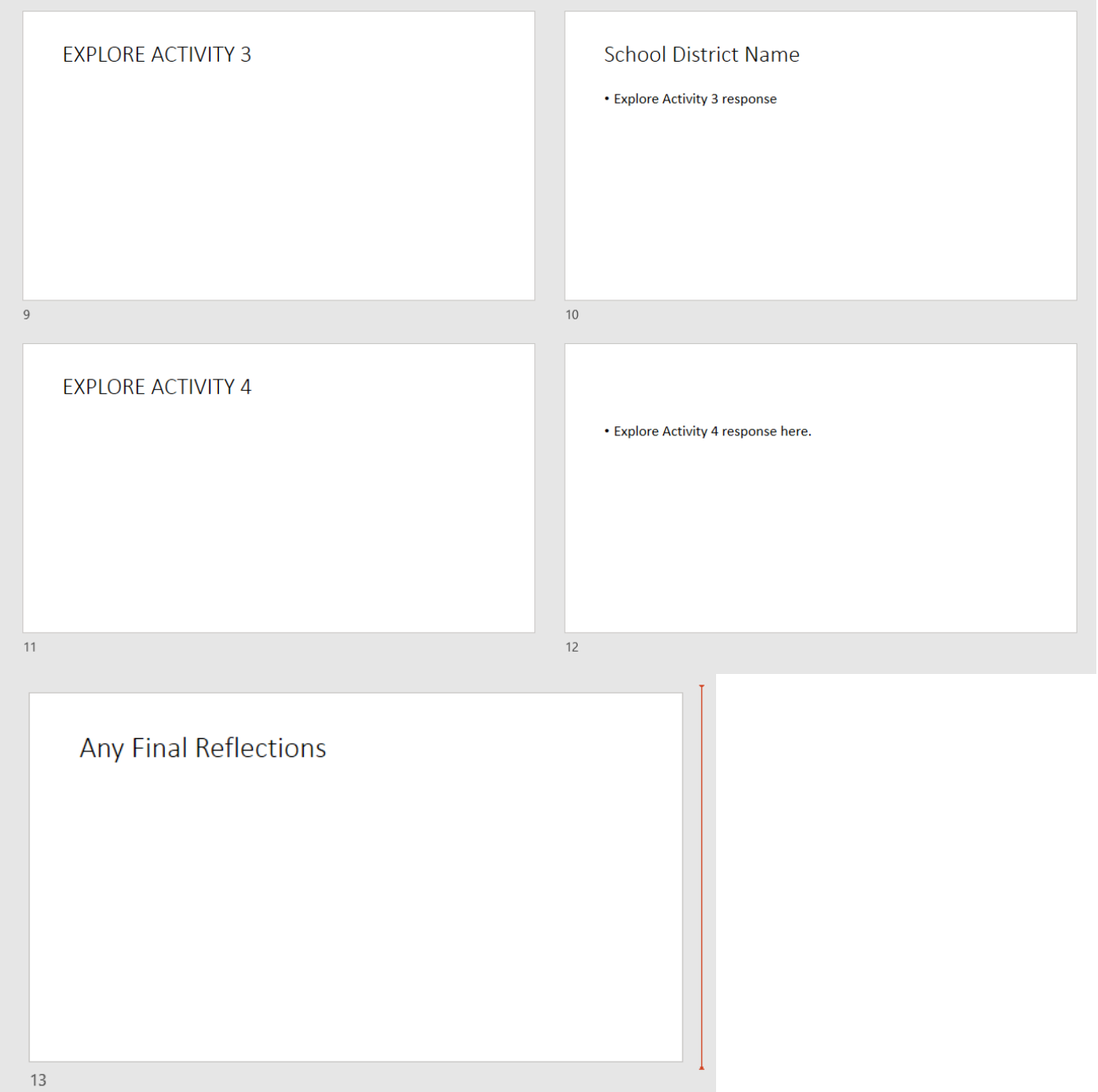

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Appendix C: Reflections on the Color of My Skin

By Neil deGrasse Tyson

Wednesday, June 3, 2020

https://www.haydenplanetarium.org/tyson/commentary/2020-06-03-reflections-on-color-of-my-skin.php

At a physics conference I attended long ago, while sipping wine left over from the final dinner, a dozen of us peeled off and started arguing about fun geeky things. Why does Superman need a cape? And why do cans of Diet Pepsi float while cans of regular Pepsi sink? And how would the Star Trek transporter actually work? As the evening progressed, just after a discussion of momentum transfer in car accidents, one of us mentioned a time when the police stopped him while driving. The officer ordered him from his sports car and conducted a thorough search of his body, the car's cabin, and the trunk before sending him on his way with a hefty ticket. The charge for stopping him? Driving twenty miles per hour over the local speed limit. Try as we did, we could not muster sympathy for his case.

My colleague had other encounters with the law that he shared later that night, but his first story started a chain reaction among us. One by one we each recalled multiple incidents of being stopped by the police. None of the accounts were particularly violent or life-threatening, although it was easy to extrapolate to highly publicized cases that were. One of my colleagues had been stopped for driving too slowly. He was admiring the local flora as he drove through a New England town in the autumn. Another had been stopped because he was speeding, but only by five miles per hour. He was questioned and then released without getting a ticket. Still another colleague had been stopped and questioned for jogging down the street late at night.

As for me, I had a dozen different encounters to draw from. There was the time I was stopped late at night at an underpass on an empty road in New Jersey for having changed lanes without signaling. The officer told me to get out of my car and questioned me for ten minutes around back with the headlights of his squad car brightly illuminating my face. Is this your car? Yes. Who is the woman in the passenger seat? My wife. Where are you coming from? My parent's house. Where are you going? Home. What do you do for a living? I am an astrophysicist at Princeton University. What's in your trunk? A spare tire, and a lot of other greasy junk. He went on to say that the "real reason" why he stopped me was because my car's license plates were much newer and shinier than the 17-year-old Ford that I was driving. The officer was just making sure that neither the car nor the plates were stolen.

Among my other stories, I had been stopped by campus police while transporting my home supply of physics textbooks into my newly assigned office in graduate school. They had stopped

me at the entrance to the physics building where they asked accusatory questions about what I was doing. It was 11:30 p.m. Open-topped boxes of graduate math and physics textbooks filled the trunk. And I was transporting them into the building, which left me wondering how often that scenario shows up in police training videos.

We went on for two more hours. But before we retired for the night we searched for common denominators among the stories. We had all driven different cars—some were old, others were new, some were undistinguished, others were high performance imports. Some police stops were in the daytime, others were at night. Taken one-by-one, each encounter with the law could be explained as an isolated incident where, in modern times, we all must forfeit some freedoms to ensure a safer society for us all. Taken collectively, however, you would think the cops had a vendetta against physicists because that was the only profile we all had in common. In this parade of automotive stop-and-frisks, one thing was for sure, the stories were not singular, novel moments playfully recounted. They were common, recurring episodes. How could this assembly of highly educated scientists, each in possession of the PhD—the highest academic degree in the land—be so vulnerable to police inquiry in their lives? Maybe the police cued on something else. Maybe it was the color of our skin. The conference I had been attending was the 23rd meeting of the National Society of Black Physicists. We were guilty not of DWI (Driving While Intoxicated), but of other violations none of us knew were on the books: DWB (Driving While Black), WWB (Walking While Black), and of course, JBB (Just Being Black).

None of us were beaten senseless. None of us were shot. But what does it take for a police encounter to turn lethal? On average, police in America kill more than 100 unarmed black people per year. Who never made it to our circle? I suspect our multi-hour conversation would be rare among most groups of law-abiding people.

As I compose this, about 10,000 chanting protestors are filing past my window in Manhattan. And because of the intermittent looting and related violence, the curfew for this evening has been pushed earlier, to 8 p.m., from 11 p.m. in the preceding days. The most common placard was “Black Lives Matter.” Many others simply displayed the name George Floyd, who was handcuffed face-down on the street with a police officer’s knee on the back of his neck, applied with a force of at least half the officer’s body weight, resulting in his death. Curious irony that NFL star Colin Kaepernick offered a simple demonstration of care and concern for the fate of black people in the custody of police officers. He simply took a knee during the Star Spangled Banner before football games. (One media outlet mangled the moment by describing him as protesting the national anthem itself.) The outrage against his silent act of concern for a national problem persisted through the 2017 season when, as a free agent, he went unsigned by any team to continue his livelihood.

So, we went from a peaceful knee on the ground to a fatal knee on the neck.

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The way peaceful protesters and the press are being shoved, maced, tear-gassed, pepper-sprayed, and tackled in the streets of our cities (when the police should have focused on arresting the looters) you would think the protestors were doing something illegal or un-American. But, of course, the U.S. Constitution has something to say about it:

Congress shall make no law ... abridging the freedom ... of the press; or the right of the people peaceably to assemble, and to petition the government for a redress of grievances.

Which amendment was that? The First Amendment. So, the founders of this nation felt quite strongly about it. As such, protesting for redress of grievances is one of the most American things you can do. If you are the police, pause and reflect how great is the country whose Constitution endorses peaceful protests.

What do we actually expect from our police officers? To protect the peace and arrest the bad guys, I presume. But also, to be armed with lethal force that they can use when necessary. That part clearly requires training on how and when to use (and not use) the power of your weapons. The rigorous Minneapolis Police Academy training lasts 4 months. The slightly more rigorous NYC Police Academy lasts 6 months.

Yet to become a certified pastry chef at a prestigious culinary academy requires 8 months. The perfect croissant needs it. So maybe, just maybe, police recruits could benefit from a bit more training before becoming officers.

In 1991, Rodney King (age 25) was struck dozens of times, while on the ground, by four LAPD officers, with their batons, after being tased. The grainy 1990s video of that went media-viral, inducing shock and dismay to any viewer.

But I wasn't shocked at all.

Based on what I already knew of the world, my first thought was, "We finally got one of those on tape." Followed by, "Maybe justice will be served this time." Yes, that's precisely my first thought. Why? Since childhood my parents instilled in me and my siblings, via monthly, sometimes weekly lessons, rules of conduct to avoid getting shot by the police. "Make sure that when you get stopped, the officer can always see both of your hands." "No sudden movements." "Don't reach into your pockets for anything without announcing this in advance." "When you move at all, tell the officer what you are about to do." At the time, I am a budding scientist in middle school, just trying to learn all I can about the universe. I hardly ever think about the color of my skin. It never comes up when contemplating the cosmos. Yet when I exit my front door, I'm a crime suspect. Add to this the recently coined "White Caller Crime," where scared White people call the police because they think an innocent black person is doing something non-innocent, and it's a marvel that any of us achieve at all.

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The rate of abuse? Between one and five skin-color-instigated incidents per week, for every week of my life. White people must have known explicitly if not implicitly of this struggle. Why else would the infamous phrase, "I'm free, white, and 21" even exist? Here is a compilation of that line used in films across the decades. Yes, it's offensive. But in America, it's also truthful. Today's often-denied "white privilege" accusation was, back then, often-declared.

The deadly LA riots associated with the Rodney King incident are often remembered as a response to the beating. But no. Los Angeles was quiet for 13 months afterward. Everyone had confidence, as did I, that the video was just the kind of evidence needed to finally bring about a conviction in the abuse of power. But that's not what came to pass. The riots were a response to the acquittal of the four officers in the incident, and not to the incident itself. And what is a riot if not the last act of helpless desperation.

The 1989 film by Spike Lee "Do the Right Thing," which explored 1980s black-white-police tensions in Brooklyn, New York, ends with a dedication to the families of six people. Eleanor Bumpers (age 66), Michael Griffith (age 23), Arthur Miller (age 30), Edmund Perry (age 17), Yvonne Smallwood (age 28), and Michael Stewart (age 25). All are black. One was killed by a white mob. The rest were unarmed and shot by police or otherwise died while in police custody. All deaths occurred within the 10 years preceding film, and all occurred in New York City. None of the police-induced deaths resulted in convictions, as continues to be true for 99% of all police killings.

We know of these events because they each ended in death. But even so, back then, it was just local news. Was this just NYC's problem? I asked myself. But for every police-related death anywhere, how many unarmed victims are shot by police and don't die, or are wrongfully maimed or injured? Most of those cases didn't even make the local news. But if you lived in those neighborhoods, you knew. We all knew. For what it's worth, NYC now has the lowest police-caused death rate per capita among the sixty largest cities in the US. Could it be those extra two months in the New York Police Academy?

The corrosion and ultimate erosion of our confidence in the legal system in cases such as these, even in the face of video evidence, has spawned a tsunami of protests. With sympathetic demonstrations across the United States and around the world. If the threat of prison time for this behavior does not exist—acting as a possible deterrent—then the behavior must somehow stop on its own.

Some studies show that the risk of death for an unarmed person at the hands of the police is approximately the same no matter the demographics of who gets arrested. Okay. But if your demographic gets stopped ten times more than others, then your demographic will die at ten times the rate. But even after we get the bias factor down to zero, there's still the matter of police killing unarmed suspects, white people included.

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I talk a lot. But I don't talk much about any of this, or the events along this path-of-most-resistance that have shaped me. Why? Because throughout my life I've used these occasions as launch-points to succeed even more. Yes, I parlayed the persistent rejections of society, which today might be called micro-aggressions, into reservoirs of energy to achieve. I learned that from my father, himself active in the Civil Rights Movement during the 1950s and 1960s.

In a way, I am who I am precisely because countless people, by their actions or inactions, said I would never be what I became. But what becomes of you if you don't posses this deep supply of fuel? Who from historically disenfranchised communities, including women, LGBTQ+, and anybody of color, is missing—falling shy of their full potential, because they ran out of energy and gave up trying.

Are things better today than yesterday? Yes. But one measure of this truth is a bit perverse. Decades ago, unarmed black people getting beaten or killed by the police barely merited the local news. But now it's national news—even breaking news—no matter where in the country it occurs.

So how to change all this? Organizations have surely put forth demands for police departments. Here, I offer a list of my own, for policy experts to consider:

1. Extend police academies to include months of cultural awareness and sensitivity training that also includes how not to use lethal force.
2. All police officers should be tested for any implicit bias they carry, with established thresholds of acceptance and rejection from the police academy. We all carry bias. But most of us do not hold the breathing lives of others in our hands when influenced by it.
3. During protests, protect property. Protect lives. If you attack nonviolent protesters you are being un-American. And we wouldn't need draconian curfews if police arrested looters instead of protesters.
4. If fellow officers are behaving in a way that is clearly unethical or excessively violent, and you witness this, please stop them. Someone will get that on video, offering the rest of us confidence that you can police yourselves. In these cases, our trust in you matters more to a civil society than how much you stick up for each other.
5. And here's a radical idea for the Minneapolis Police Department—why not give George Floyd the kind of full-dress funeral you give each other for dying in the line of duty? And vow that such a death will never happen again.
6. Lastly, when you see black kids in the street, think of what they can be rather than what you think they are.

Respectfully Submitted,

Neil deGrasse Tyson — trying hard to keep looking up.
New York City

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Culturally Responsive STEM Lesson Plan:

Appendix D: How Does Race Affect a Student's Math Education?
By Melinda D. Anderson in The Atlantic
April 25, 2017

How Does Race Affect a Student's Math Education?

A new paper examines the ways "whiteness" reproduces racial advantages and disadvantages.

By Melinda D. Anderson

Kassie Benjamin-Ficken, a teacher in Minneapolis, discovered her love of math in elementary school. One of her earliest memories is begging her mother to come to school so her teachers could share how she excelled in math class. While earning average scores in reading, she was consistently above average for math—which instilled her with a sense of accomplishment. That continued into middle school, where she recalls asking her math teachers to move her into a higher grade for more advanced content. But she remained in the same middle-school class. Then in high school, her excitement for math slowly turned to disappointment. Benjamin-Ficken, a citizen of the Mille Lacs Band of Ojibwe (a tribal nation in Minnesota), was one of two students of color in her 11th-grade pre-calculus class. When her study partner was absent for a series of days, Benjamin-Ficken began to struggle with the material and barely passed the class with a D-minus. Her senior year in AP Calculus repeated the pattern—lacking support and feeling ignored in the class, she passed with a D.

"I didn't have a math teacher that I could go and get help from, [and] I didn't feel comfortable at all approaching my own math teacher," she said. Recognizing the undercurrent—how her feelings of isolation were

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related to her race—she admits "those two [classes] really made me question: Do I consider myself good at math anymore?"

Lately, much of the discussion of race in math education has centered on the persistent underperformance of certain student groups, particularly black, Latino, and indigenous youth, and their disparate access to honors, gifted, and advanced mathematics courses. Yet a new paper disrupts those narratives by examining an unaddressed element of the equation—namely, the ways in which "whiteness" in math education reproduces racial advantages for white students and disadvantages historically marginalized students of color.

Dan Battey, an associate math professor at the Rutgers University Graduate School of Education, said he set out to synthesize for math educators the research literature from sociology, history, and other disciplines on whiteness—defined in the paper as "the ideology that maintains white supremacy, valuing one racial group over others." He also sought to expose how whiteness operates in classrooms and schools, leaving black, Latino, and indigenous students disenfranchised mathematically.

According to Battey, there are ways in which math teachers, math educators, and math researchers "are perpetuating racism in schools"—which is shaping the expectations, interactions, and kinds of mathematics that students experience. And the lack of attention to whiteness as the fundamental cause leaves it invisible and neutral. "Naming white institutional spaces, as well as identifying the mechanisms that oppress and privilege students, can give those who work in the field of mathematics education specific ideas of how to better combat racist

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structures," writes Battey and his co-author Luis Leyva, of Vanderbilt University's Peabody College of Education.

One example of whiteness explored in the paper is how the relentless drumbeat from researchers about racial differences in math achievement is linked to racially differential treatment in math classrooms. The concept of racial hierarchy of mathematical ability—a term coined by Danny Martin, education professor at the University of Illinois at Chicago—basically says constantly reading and hearing about underperforming black, Latino, and indigenous students begins to embed itself into how math teachers view these students, attributing achievement differences to their innate ability to succeed in math.

As the theory goes, with white and Asian students consistently at the top of math-achievement rankings—and black and other nonwhite students continuously trailing behind—teachers start to expect worse performance from certain students, start to teach lower content, and start to use lower-level math instructional practices. By contrast, white and Asian students are given the benefit of the doubt and automatically afforded the opportunity to do more sophisticated and substantive mathematics. The consequences are classrooms where Asian students not excelling in math are seen as an oddity, and black students excelling in math are seen as an outlier.

Battey pointed to whiteness to help explain the roots of the widely reported racial inequality in gifted-education programs. He cited data from an undisclosed metropolitan area where 18 percent of white students were identified for gifted programs, compared to 1 percent of black students, signaling that "we're not looking for gifted [students] within predominantly black settings, and we're constantly looking for giftedness in white settings … whiteness is impacting how and where we see mathematics ability." The opposite also holds true, he added, with more targeted interventions for white students who are struggling in

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math and fewer for black students "possibly because we expect [them to struggle.]"

Another instance of whiteness is seen in how math "achievement gaps" are commonly defined. Even though research shows Asian students on average outperform white students in math, this underachievement receives scant attention—and when discussed, is seldom characterized in a negative light. "A lot of times in whiteness literature, we talk about the refusal to pathologize whiteness, and this is a case," Battey explained. "For African Americans, for Native Americans, for Latinos in mathematics, we attribute something internally to the child or internally to the culture that's making them achieve lower. We don't do that for white students … producing some deficit idea about who whites are."

In practice, whiteness can create a self-fulfilling prophecy, Battey said, where some children receive rote, basic mathematics—counting apples and brownies, and completing worksheets—while other children are given rich problem-solving tasks. "You could just reinforce that certain students are bad at math by giving them poorer and poorer quality of instruction," he said, "and they'll start to look poorer and poorer at math [by default]."

For non-Asian students of color in math classrooms, one response to whiteness is to dis-identify with mathematics—telling themselves "I don't care about math. Math isn't important to me." Similarly, students can begin to internalize the racial stereotypes surrounding math performance. A 2014 study published in the ***Journal of Research on Adolescence*** found that children as early as the fifth grade were acutely aware of the label that "Asians are good at math." The report cautioned

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about "the pernicious nature" of this belief, and its effect on how students of all races view themselves as individual learners.

Benjamin-Ficken, whose high-school experience challenged her confidence as a math student, is now a math specialist at Anishinabe Academy, a Minneapolis public school focused on using Native language and culture to support academics for urban indigenous students. A self-described math nerd, her teaching philosophy is grounded in breaking down the negative thoughts and ideas her students hold about mathematics. "If they want to choose this as a career, it's possible, [and] even if they don't … they can still think mathematically. A huge goal of mine is to build up that identity."
But she's also constrained by the institutional aspects of whiteness in her classroom that exist outside her teaching methods—not simply the how of teaching, but what the state standards value. She and her students share a culture that isn't reflected in the way she's expected to teach math. Required to rely on what she calls a "western white lens," other sources of math knowledge that would be relevant to her students remain untapped. "What are the theorems that we have known here in America before colonization? What indigenous mathematicians have we had? We're not a written society, so we don't have these books that say, 'Here's this Ojibwe person's knowledge.' It's not the fact that I'm teaching this theorem … it's what else can we highlight in our own community, in our own history here in Minnesota?"

Echoing this observation, Erika Bullock, an assistant professor of math education at University of Wisconsin-Madison, welcomed the whiteness paper's framing of racism in institutional terms. She stressed the importance of this emphasis in moving the discussion away from looking at race and racism in math education solely at the interpersonal level.

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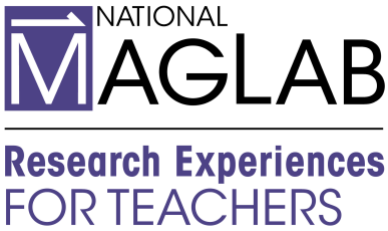

"We usually don't talk about math education from an institutional perspective. We tend to very much focus at the classroom-teacher-student level," she said. "We don't zoom out very much to talk about it institutionally."

While acknowledging its contributions, Bullock still questioned a core principle: In scrutinizing whiteness, had the paper skirted the idea of anti-blackness? By definition, she said, whiteness and anti-blackness might appear to mean the same thing. But the terms can mask distinctions, she noted. To illustrate, Bullock applied a critical race-theory lens to the paper's findings—for example, how the conclusions on racial stereotypes might be viewed differently if the measure wasn't the dominant positioning of white students (whiteness) but how the test is racially biased (anti-blackness). "I think it centers white [people] in a way, even as you're thinking about interrogating whiteness," she said. "A framework for whiteness necessitates a discussion of anti-blackness. To operate in anti-blackness [is] a very different thing."
Still, both Bullock and Battey agreed that school systems ought to support math educators in deconstructing and discarding the white frame of mathematics education. "Hopefully this starts to attune people to what to look for in classrooms [and how to] provide more opportunities for students to engage more openly in mathematics," Battey said.

Melinda D. Anderson is an education journalist based in Washington, DC. She has written for ***The Atlantic***, ***The Washington Post***, ***Slate***, and more.

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