

## **Mathematizing Representation in Children's Libraries: An Antiracist Math Unit in Elementary Grades**

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### **Abstract**

In this article, educators across schools tell the story of planning, implementing, and reflecting on an elementary antiracist unit focused on mathematizing racial representation in school libraries. Students and teachers engaged in conversations about race, utilized mathematics to visualize erasures of race in literature, and involved parents, administrators and the community in recognizing and taking action to change this injustice. Our team considers tensions and powerful student thinking involved in using mathematics for antiracist learning for second through fifth-grade children.

### **Discussion And Reflection Enhancement (DARE) Pre-Reading Questions**

1. What mathematizing opportunities exist in a school or classroom library?
2. Who chooses the books in your classroom or school library? Whose identities are centered with those choices and whose identities are erased?
3. How would you prepare for initial conversations with elementary students about identity and race?

*Tate, Proffitt, Christensen, Hunter, Stratton, Fleshman, Aguirre, & Suh*

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## **Mathematizing Representation in Children’s Libraries: An Antiracist Math Unit in Elementary Grades**

**Holly Tate, Tracy Proffitt, Amy Christensen, Caitlin Hunter, Diane Stratton, Elicia Fleshman,  
Julia Aguirre, and Jennifer Suh**

*“I think math definitely had an impact, and a lot of people wouldn’t think it took this much math to figure out what we needed and what was missing in our library.” -5th grade student*

Our story begins with two instructional mathematics coaches, Holly and Tracy, on a journey to become antiracist educators. We start by positioning ourselves as white mathematics educators and facilitators of learning. In our ongoing personal learning and growth, we acknowledge our privilege and seek to leverage our leadership roles to build collective communities of antiracist and critically conscious mathematics teachers (Seda & Brown, 2021). As we grappled internally with the pervasiveness of inequities facing the children in our schools in the wake of the pandemic, we knew that moving beyond the state mathematics curriculum was imperative for the communities we served. As TODOS president Linda Fulmore (TODOS: Mathematics for All, 2021, p. 2) stated, “We can no longer believe that a focus on curriculum, instruction, and assessment alone will be enough to prepare our children for survival in the world. We need antiracist conversations for ourselves and for our children.”

The creation and implementation of our mathematics unit, *Mathematizing Representation in Children’s Libraries*, echoes the TODOS antiracist statement and call to action. In particular, the unit addresses Essential Action #4, which commits to “elevating the professional learning of mathematics teachers and leaders with a dual focus on mathematics and social justice” (TODOS: Mathematics for All, 2021, p. 4). Though students have spent close to 2000 hours in school mathematics by the age of 16, Wright (2016) notes that today’s curriculum still adheres to the reproduction of order and unequal power structures in society. The challenge, Wright argues, is for mathematics educators to centralize the role of mathematics schooling as a way for students to access learning that emphasizes societal struggles. Our learning around antiracism with teachers and students worked to

co-construct and interrogate our realities by weaving students’ unique funds of knowledge (Amanti et al., 2005), language, and cultures into the facilitated classroom experiences – experiences that can both empower and heal students (Kokka, 2019). Our unit highlights the importance of using Teaching Mathematics for Social Justice (TMSJ) to empower students of color who have historically faced disparities and oppression (Gutstein, 2003). We define Teaching Mathematics for Social Justice as having two main components: reasoning about mathematics *and* reasoning about fairness and systemic barriers within society through peaceful collaboration about conflict, discussion, and democratic decision-making (Aguirre & Zavala, 2013; Stocker & Wagner, 2007). We want to support students to analyze and change the world with mathematics while developing positive social, cultural, and mathematical identities (Aguirre, 2009; Gutstein, 2003).

Through this collective self-study, (Samaras, 2011; Samaras & Freese, 2006), each individual teacher-author reflects deeply upon and critically examines one’s own practice, then shares unique reflective moments, allowing for the overlap of perspectives and exchange of ideas. The focus for our collective reflections was to document student learning of mathematics for social justice, based on the two components mentioned in the previous paragraph. We hope to continue the multiplier effect of engaging students in TMSJ lessons as readers consider our communities’ cognitive dissonance, engagement, and pride within this antiracist unit.

### **Background**

The inspiration for the *Mathematizing Representation in Children’s Libraries* unit developed from the blatant overrepresentation of white main characters in children’s books. As instructional coaches, Holly and Tracy are both fortunate enough to work in schools with students who identify primarily as BIPOC (Black, Indigenous, People of Color), including one school community composed of

a majority of multilingual and immigrant students. At first, we felt a sense of hopelessness in knowing that erasure of race and culture in children's literature was not a new injustice. Annual newly-published books across the nation reveal disproportionately low representation by race of books with main characters who are BIPOC or who are written by BIPOC authors (Cooperative Children's Book Center, 2021). The goal of our unit was to use mathematics to recognize who might be excluded from our own libraries and invite students to make decisions on how to create more equitable libraries. Two iterations of our project included examining with fourth- and fifth-graders the whole-school library, then having second- and third-graders analyze the libraries in their classrooms.

Our project compelled a collective of cross-school collaborators (Amy, Caitlin, Diane, and Elicia) to plan the lessons for the unit. For instance, in developing a team, coach-teachers (Tracy and Elicia) initiated the project planning with a discussion, which was overheard by a nearby instructional assistant. She enthusiastically joined as a change agent, bringing along the school's Family Engagement Liaison (Diane) to participate also. Other collaborators included vertical grade level teachers and a school librarian. After talking and reflecting with Tracy on the project, Holly invited Amy and Caitlin to try a second iteration of the task with their classrooms of younger students.

We understand that our own identities impact both our participation and perspective, therefore we describe the positionality of collaborating authors here: Diane identifies as a Black family liaison while Amy, Caitlin, and Elicia are white teachers. Julia, a biracial Chicana, and Jennifer, positioned as an Asian American, are BIPOC mathematics educators who served as collaborators and advisors in the writing process. Based on our populations and settings, our processes slightly varied. The project was enacted in three different schools, one reflecting a majority white population and the other two schools comprising mostly multilingual and racially diverse children. This account is a compilation of our experiences.

The lesson planning process included much learning for our collaborative teams, both about antiracism in mathematics education and the best ways to help our students recognize and act on oppressive systems affecting children's literature utilizing mathematics. As we began to plan the unit, we wondered about our students' perceptions of race and racism in our country: How do we have initial conversations about identity and race to prepare them to think through the task of library representation? How do we, the coach facilitators, negotiate our role as white educators working collaboratively with other staff and students of color? How do we facilitate student conversation to help them recognize the problem? How do we support students to mathematize this situation and draw on their mathematical knowledge to investigate it? As we unpacked these wonderings and implemented the unit plan that follows, we regularly reflected on the far-reaching impact that this project could have on our students, our school communities, and our mathematics teaching and learning.

### **Recognizing the Problem: Talking About Race**

We knew the first step in engaging students in the work of antiracist libraries was to learn about race as a part of identity. Across schools, our students had not had experience in conversations about race facilitated within formal, school-based lessons. Identity work is an essential component of TMSJ, as students consider their sense of self inside the mathematics, amongst their peers, and within the community (Gutiérrez, 2013). To initiate conversations about identity and develop background knowledge needed for talking about race, one of the coaches gathered images of people who represented different recognized racial groups such as Black, Indigenous, Latinx, Asian, and white. Students in both schools used "I notice..." and "I wonder..." sentence frames to share their observations about the groups of people (see Figure 1).

**Figure 1**  
*Sample of Image Collection*



\*Note: Citations for these images can be found in the Unit Plan in the Appendix, Lesson 1 “Example Slide”

Further, utilizing books like *Our Skin: A First Conversation About Race* (Madison, Ralli, & Roxas, 2021) helped students conceptualize the idea of race (“What is race?”) and why it is so crucial to our identities (“Why is it important to learn about race?”). This picture book allowed for children to see that racial identity is a difference in people around us, and also that there are times where race may make things unfair for those with Black or brown skin, such as always having to play the “bad guy” at recess.

In order to mathematize representation in our libraries and to recognize the problem, we studied a series of graphs in different ways across the grade levels. The Cooperative Children’s Book Center (2021) published a graph categorizing 3,134 children’s books published in 2018, depicting an overwhelming proportion of white characters as opposed to other races in a non-traditional graph. Using this image as a Numberless Graph (Bushart, 2016) through a Data Talk (Youcubed, n.d.), second- and third-grade students noticed and wondered about what the mathematicians and graphic artists were trying to communicate (see Figure 2). We removed the original numerical percentages from the graph, prompting students to consider the significance of the size and condition of the mirrors.

Much of our students’ interpretations of the graph stood out through this notice and wonder launching of our task. Young children’s statements immediately recognized that this is an issue of fairness, and that there is something wrong with the representation of race in books. They pointed out quantity differences, such as the number and size of the mirrors for the white and animal characters, drawing on the relationship between the graphic design and the number of books available to readers. Seven- and eight-year-olds also felt empathy for these characters in the graph, relating the looks on their faces to what they must be feeling and even acknowledging feeling “shocked,” “sad,” or “angry” themselves.

Also utilizing the graph, fourth and fifth graders considered the causes of the nationwide underrepresentation, their ideas recorded by the teacher as seen in Figure 3. Interesting mathematical ideas emerged in their hypotheses about causes, including a misinformed statement about more white people than Black people in the world. The final comment listed indicates a strong understanding of ratio, a fitting mathematical concept to represent the situation.

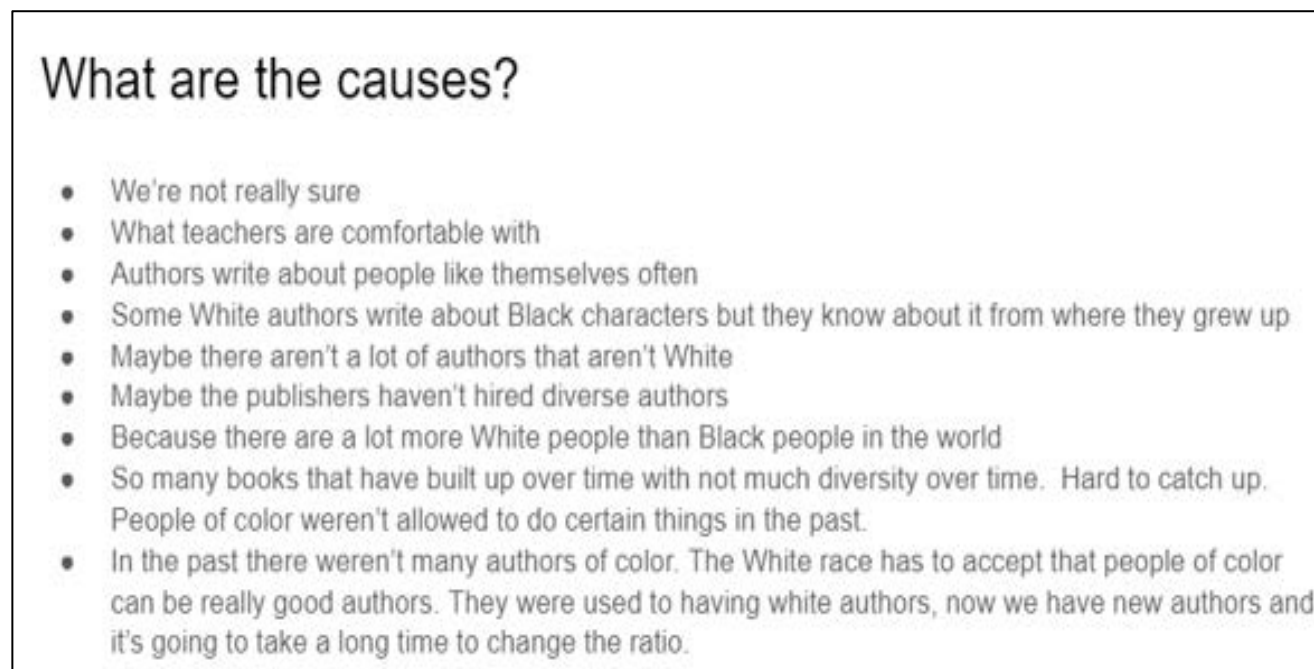
**Figure 2**

*Data Talk with Numberless Graph*



**Figure 3**

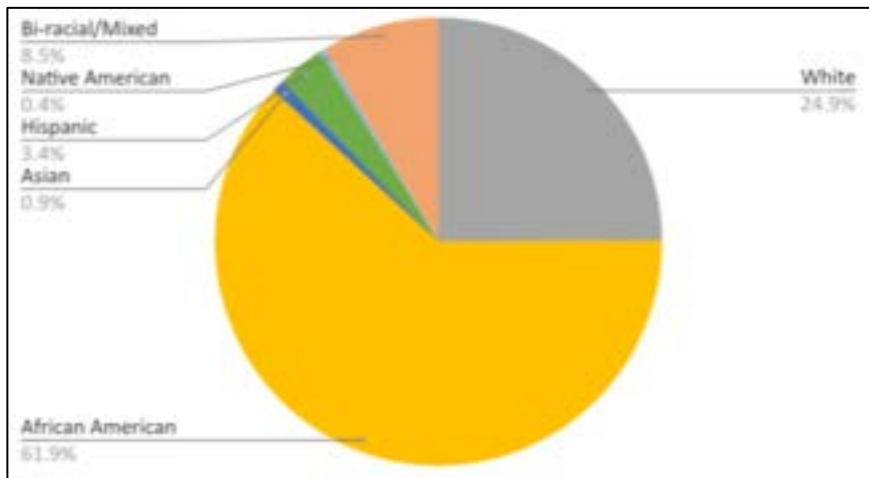
*Student Ideas About Causes of Inequities in Book Representation*



Data analysis continued with the examination of our current school and city demographics, helping us make sense of race representation within our communities (see Figure 4). This data was introduced to prime students in

thinking about the mismatch that exists between the people depicted in books and the students who will read them, drawing on students' innate sensitivity to fairness and the lack thereof.

**Figure 4**  
*Race Representation Within a School Community*



### **Delving into Mathematizing Race and Racism**

These initial conversations about race and identity put our teacher teams in a place of cognitive dissonance and ignited the conversation of “What do we do next?” We recognized the importance of facilitating conversation around race and identity before engaging in the task after the fourth- and fifth-graders attempted to categorize books. Without the background knowledge of racial groups, the scope of student understanding did not allow for them to make inferences about a character’s race. Amy, a second-grade teacher, reflected on discussing race as identity work with her second graders, “I failed to anticipate the level of background knowledge that it would take for students to complete this task independently. My kids needed an understanding of race and racism before we could dive into analyzing our classroom library.” Beginning conversations about the role race plays in one’s identity provided the space for students to feel pride for who they are and their backgrounds. Caitlin, a third-grade teacher, noted, “Some students knew a lot about their own race and were excited to explain their own identity to the group.”

Common in the younger grades was student discussion around discomfort in talking about race, holding the belief that even talking about race is inherently racist. Amy continues by explaining:

Many students were uncertain about talking about race. These students--many of them white--assumed that it was racist to talk about race. I found this simultaneously fascinating, concerning, and not surprising. We know that many forms of racism are prevalent in our country. This fear of talking about race from my white students gave me just as much pause as a child saying something blatantly racist would have.

Equally as jarring to us as facilitators was when students often commented on issues of race and racism as “things of the past.” There were two significant ways this happened, starting with the concept of racism in general. For instance, in the school of a predominantly white population, students noted that racism “happened a long time ago” or used phrases such as “back then” in their discussions. Further, students classified specific races themselves as existing only in history. One student explained when exploring the slides demonstrating various races that Indigenous peoples were “from history.” Conversely, when looking at slides of self-identified white people, there was unanimous agreement across schools that their race was “American,” and words like “normal” described the people in the pictures.

We were struck by these interactions with students after our initial conversations about race. We reflected on the following questions: In what ways are we failing as an educational system if the product of social studies and history lessons include the erasure of entire groups of

people from current history? How do we have groups of privileged students who have restricted systems of oppression into a timeline of hundreds of years ago? What work needs to begin around race and identity starting in kindergarten to decolonize our Euro-centric and white supremacist ideologies and messages of normalcy?

### **Reading the World Through Mathematics: Evaluating our Libraries**

TMSJ allows students to develop a deep understanding of their lives within the classroom walls, their communities, and the sociopolitical complexities of the world (Gutstein, 2003). Friere (2018) describes the type of political awareness created through TMSJ as “*conscientizacao*” (p. 67). He argues that liberation of the oppressed comes from distinguishing their position in society and within history. Our students, developing *conscientizacao*, recognized that a systemic issue was, in fact, affecting the books on the shelves of their own classroom libraries. Across schools and grade levels, students were eager to examine their libraries. Thus, *reading the world through mathematics* describes the part of our unit where students used mathematical thinking as a tool to evaluate humanity and recognize disparity (Gutstein, 2003).

This work was done on two varying scales depending on the grade level. Fourth- and fifth- graders analyzed a sample of the whole-school library, deciding to focus on picture books, chapter books, and graphic novels because these books would more likely portray a main character. A random, stratified sample of 1,190 books was chosen within these genres as an attempt to capture a true snapshot into what was on the shelves of the library. On a smaller scale, second- and third-grade students focused on their classroom libraries. Decisions in this space were made as a collective throughout the entirety of the process, making it a complex and democratic task. Student-driven decisions included defining the categories of the race we would look for in the main characters of books, co-creating the parameters for deciding on the race of the main character, and how to sort the texts in the classroom. Specifically, Amy recalls the complexities of identifying races within the books:

A character with tanned skin might be called Latino, American Indian, or Black. As I guided their thoughts and conversations to look at additional details such as

clothing, setting, names, and languages, I realized that this task was much more nuanced than I originally thought.

Caitlin also considers the impact of providing the space for children to feel empowered through identity work:

I also had many students from Northern African and Middle Eastern countries as well. The first day they sorted I noticed that these students were not finding any books that they related to, and I realized that we did not have almost any books about characters from these countries, and even worse, we did not have a pile. When we first began the project, some of these students had self-described themselves as white, but I noticed we were putting the very few books we had about characters from the Middle East in the Asian pile. Although this caught my attention, I did not make any changes because I wasn't sure what racial term was accurate. However, on day 3 of sorting, one student approached me to let me know that there wasn't a pile of books for “people like him.” I asked “Well, what race do you say you are?” and he confidently responded “Arab.” So immediately this student and I created a new pile with a new label and started sifting through the pre-sorted books to find ones we had mislabeled. Although we found very few, it was inspiring to see this student advocate for himself and have a strong understanding of his own identity. Later on in the project, when it was time to order more books, he enthusiastically researched and calculated which titles would fix this problem in our classroom.

Mathematics, of course, was the imperative sense-making vessel for our students to understand representation oppression within our school walls. Teams worked together to tackle between 500 and 1,200 books, sorting and organizing their data into categories of main character races. Mathematical strategies for counting and keeping track of their data varied among groups of students. Some built larger book piles, spreading out across the room and using Post-it notes to record their counts, often in groups of five or ten. Others chose to record on larger anchor chart paper and work in smaller increments, tackling smaller portions of their books then adding to calculate the total. As second- and third-graders collected and kept track of their data in small groups, they reported on their findings and compiled totals at the end of a day's counting as a whole class. This whole class convergence allowed some space for reflection on the



meaning of the data throughout the process: what are we seeing so far? Is this surprising? What feelings are we having about fairness and the books that we are counting? Conversely, fourth- and fifth-grade students collectively counted and tracked main character race data in a shared spreadsheet.

Once the collection of data was complete and final race categorical numbers were calculated, an important mathematical task was to create and analyze graphs of the findings, aligning with the data and statistics state standards (found at <https://bit.ly/3zD4Mw3>). Children made decisions for which kind of graphic representation to use, and considered graphing components such as scale, title, and organization of the information. Figure 5 shows how a third-grade group decided to represent the data from their entire classroom library in a bar graph. The group found that, like the national 2018 findings, the white (205 books) and non-human (166 books) main character representation dominated the representation of other races, such as more than one race (65 books), Black (48 books), Pacific Islander/Asian (35 books), and

Latinx/Hispanic (26 books). The graph also revealed further erasure or invisibility of race within the classroom library, such as with Native Americans (10 books), mixed race (5 books), and Arab (5 books). The mathematics in student analysis show that students honed in on the blatant overrepresentation and unfairness of white and non-human characters. This investigation led to inferences for which books *not* to purchase, while also questioning the number of books they will be able to purchase for other racial groups within the confines of their budget.

In the fourth- and fifth-grade analysis, students noted that the proportion of books with white main characters is roughly the same as the proportion of Black students in the school (see Figure 6). The left pie chart shows the racial makeup of the school with 62% African American, 25% White, and smaller percentages of other races. In contrast, the right pie chart shows how students categorized books: 68% White, 21% More than One Race, 6% African American, and smaller percentages of other races.

**Figure 5**  
*Third-Grade Group Graph and Analysis*



**Figure 6**  
*Fourth- and Fifth-Grade Data Comparison*



“When we compared the data, there are a lot of African American students, but there are still more books about white people than about African American people in this school. We can probably find some African American books so that Black students wouldn’t feel sad about not having many books where they see themselves.”

Through this mathematical investigation of our libraries, the erasure of race and peoples were made very clear to both our children and participating teachers. Amy reflected on her practice and the cultural responsiveness of her library:

I have a large classroom library of at least two thousand books. I know the importance of having texts that are representative of the global population, as well as my classroom population. I think of myself as a conscious book-buyer. Still, I was surprised by the number of books about animal, non-human, and white characters in the books we analyzed. As I continue to add to my library, I am increasingly conscious about the books I choose. Are they representative of the students in my classroom? Of the people in our community? Of the people whose stories often go untold?

As we embarked on the next segment of our unit, we considered the larger impact of the erasure of race in literature, drawing on empathy and compassion in seeing something from another’s perspective: what might this make people think? About themselves? About others?

Such questions and reflection prompted students to consider the need for action for making more just libraries for all.

### **Writing the World Through Mathematics: Towards More Equitable Representation**

While students’ understanding the systemic inequity in representation was a pivotal moment in their mathematics learning, it was not enough. A goal of TMSJ is that students themselves are part of the solution for injustices (Gutstein, 2003). Moving beyond just understanding inequities, to *write the world through mathematics* is to remedy unjust situations. Across our schools, students’ calls to action came in different forms. Second- and third-grade students wrote letters to the principal through persuasive writing prompts that encouraged the purchase of new books within a defined budget, as seen in Figure 7. The voices reflected in the letter emphasize the power of “we;” the child moves from “I” in describing books that might be “perfect for the library”, to “we” in finding books that will benefit all of the students in the class.

**Figure 7**

*Mathematical Thinking for Book Purchases and Persuasive Letter to Principal*

Team Data																															
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Dear \_\_\_\_\_ In our opinion we think our library isn't fair because it doesn't have many books about different races. So to fix that problem we got some books that I think will be perfect for our library! Hopefully you can get these books because people want to see themselves and others in books. That's why we found these books for all of us. Everyone will be so pleased and happy about the books we recommend buying. Please get the books for us.

**Figure 8**

*Book Talk Screenshot*



Fourth- and fifth-graders, on the other hand, acted as decision-makers in purchasing titles more representative of themselves and their peers, funded through a local grant. In developing their critical consciousness, students presented their findings to the community, including parents, members of the community, and school board members, and recorded book talks advertising the new books to their peers. Figure 8 portrays a screenshot from one child's explanation of the book she chose for her peers.

The impact of “writing the world through mathematics” and being involved in action for change felt monumental for all of us as educators. Diane described the power of this project in connection to her personal experience of having to be a storyteller to help children visualize and understand Black culture:

[My experience includes] telling stories from my grandparents and having the students use their imagination of what the characters looked like or the setting. I now have a collection of books in our library that I can go to and choose whatever topic I want. The children can actually see the characters and settings for themselves.

Diane also revealed a domino effect of the project on teachers across classrooms in her school, “I noticed that our teachers started to pay attention to the culture of the children in their classroom, which made them begin to make sure that they were sharing books with their students that identify with their culture.” Similarly, fifth-grade teacher Elicia, who works within a predominately Black school, noticed a change in her students after purchasing new books and seeing the book talks. She explains, “I

have noticed my students borrowing books from the library with main characters that look like they do.”

Not only did the mathematics and action for social justice affect the racial representation of teacher and student classroom library choices, but our team also noticed broader influences on learning and growing together as we continue our journeys for understanding the role of race, identity, and erasure of peoples. Amy acknowledged a newfound excitement from her white students when seeing characters in a group that they knew to be under-represented in literature, and also recognized, “The project also provided us with language to continue addressing topics that were challenging or typically wrought with misinformation.” Amy’s reflection exposes implications for this task and the determination of a truly “fair” library representation: what would the perfect graph look like? One that reflects the demographics of the students in the school or one that acts as mirrors for students to see themselves but also as windows into the lived experiences of others, particularly for a school or classroom with mostly White children (Bishop, 1990)? On a final note of reflection, Caitlin concluded with this powerful insight:

This project helped me see that although I am the adult in the room, I don’t have to try to be the expert in all topics, especially the cultural, racial, and linguistic identities of my students. This realization has already helped me to facilitate productive and profound conversations with the 8-year-olds in my classroom about tough issues of race, immigration, law enforcement, and language variety.

### Conclusion

TMSJ lessons provide the space for students to use mathematics to critically analyze and take action on current injustices in our world. Our antiracist unit focused on racial representation in literature and poised children as decision-makers, and change agents. Curriculum materials provided to educators should be designed so that our students can see themselves, a mirror for themselves, and a window into their communities (Gutiérrez, 2012; Bishop, 1990). Through this project, our children recognized that this was not the case. They identified the situation as unfair and took steps to change it using mathematics to help them make their case. The educators involved expressed a sense of pride in participating in a

project with such significant impact. Elicia stated, “I feel a great sense of pride and joy because we aided the students in creating change within their learning community where change was definitely needed.” The erasure of race and peoples in libraries is the erasure of our students, a disparity to be attended to nationwide. We learned we can build on this project by examining representation in our libraries in other ways: bilingual books, disabilities in books, gender identity in books, LGBTQ+ characters in books. It is time to normalize conversations around the different identities we hold – our humanity. Our unit demonstrates an antiracist journey of growth not just in teachers, but in children, families, community members and even board members. Mathematics, as shown by our students, is a powerful analytical tool to identify inequities and change them.

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### Discussion And Reflection Enhancement (DARE) Post-Reading Questions

1. A student comment in Figure 3 is: “It’s going to take a long time to change the ratio?” In this context, what would a fair ratio look like?
2. Are the books in your classroom and school libraries mirrors, windows, or both? In what ways could you improve the representation found in your school library?
3. In what ways can you imagine your students *writing the world through mathematics*?
4. What takeaways do you have from these educators’ first conversations about race, racism, and antiracism with elementary students? What would you do the same? What would you do differently?

## Appendix

### Unit Plan

#### Mathematizing Representation in Children’s Libraries

*Created by Tracy Proffitt and Holly Tate*

##### REPRESENTATION

“Data on books by and about Black, Indigenous and People of Color published for children and teens compiled by the Cooperative Children’s Book Center, School of Education, University of Wisconsin-Madison has been collected since 1985” (The Cooperative Children’s Book Center, 2021, para. 1). Their statistics show that while representation of Black, Indigenous and People of Color (BIPOC) in children’s literature is increasing, the overall percentage of new books published with BIPOC main characters is hovering around 30%. Conversely, BIPOC students make up roughly half of the public school population (NCES, 2021). Books can serve as both mirrors and windows, but current classroom and library shelves are full of books that do not reflect the diversity of our student populations. In this unit, students collect data on the racial representation in their classroom or school library collections and compare their findings to their classroom or school population. Students suggest next steps based on their data analysis.

##### DEEP AND RICH MATHEMATICS

This unit provides a relevant and engaging context for students to dig into data standards and practice. Students begin the process of data collection by defining categories and devising a data collection strategy for the racial representation in library books. This could include sorting books into physical stacks, tallies, tables, spreadsheets, etc. Next they represent their findings in a graphical format and analyze them in order to describe trends and needs within the library collection. The project can be extended by providing students a real or imagined budget that they must work within to select new books from categories that they determine the library needs, as well as an opportunity to communicate their findings and learning to a wider audience.

##### ABOUT THE LESSON

This unit uses a variety of instructional strategies (notice & wonder, numberless graph, launch-explore-summarize) and is intended to take approximately six to seven class periods.

Lesson 1: Students notice and wonder about race and identity using picture prompts

Lesson 2: Students explore a numberless graph about racial representation in Children’s books

Lesson 3: Students devise a plan for collecting data on which races are represented in their classroom library or school library

Lesson 4: Students choose a method to represent the data they collected and analyze the data, potentially comparing the book data to their school population statistics

Lesson 5: Students make a plan for action based on their findings. One option could include choosing new books for the library based on a real or imagined budget.

Lesson 6: Students make a plan for sharing their findings, learning, and actions. Options could include a presentation, letter to administrators, book talks, video, etc.

**SOCIAL JUSTICE STANDARDS**

- I can express comfort with people who are both similar to and different from them and engage respectfully with all people. (Diversity 6)
- I can plan and carry out collective action against bias and injustice in the world and will evaluate what strategies are most effective. (Action 20)

**MATHEMATICS ESSENTIAL CONCEPTS**

Virginia State Standards	Common Core State Standards
<p>3.15 The student will a) collect, organize, and represent data in pictographs or bar graphs; and b) read and interpret data represented in pictographs and bar graphs.</p> <p>4.14 The student will a) collect, organize, and represent data in bar graphs and line graphs; b) interpret data represented in bar graphs and line graphs</p> <p>6.10 The student, given a practical situation, will a) represent data in a circle graph; b) make observations and inferences about data represented in a circle graph</p>	<p>CCSS.MATH.CONTENT.2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</p> <p>CCSS.MATH.CONTENT.3.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs.</p> <p>CCSS.MATH.CONTENT.7.SP.A.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.</p> <p>CCSS.MATH.CONTENT.7.SP.A.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.</p>

**MATHEMATICAL PRACTICES**

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Attend to precision.

## RESOURCES AND MATERIALS

- Notice & Wonder slideshow
- Numberless graph image
- Library books
- Chart paper or computers for creating graphs
- Book supplier catalogs

## LESSON 1 FACILITATION

What is Race?

- Interactive Read Aloud of “Our Skin” by Megan Madison, Jessica Ralli, Isabel Roxas (20 minutes)
  - Prior to reading: What is race? Where have you heard the term “race” before?
  - During reading: Stop and pause at the questions embedded in the book to have kids reflect.
  - After reading: Why is it important to learn about this?
- Notice and Wonder (20 minutes)
  - Use slideshow of images that represent different racial groups such as Black, Indigenous, Latinx, Asian, and white for exploration ([Example Slide](#))
  - Remind students that people in the images self-identified their race.
  - For each group of people, show pictures and ask what students notice and wonder. What is the same or different?
  - Reveal the name of the group and open discussion for anyone who might have something to share or ask.
- Wrap Up (2 minutes)
  - Describe that we will be exploring race and working for social justice within our class this week.

## LESSON 2 FACILITATION

Recognizing the Injustice

- Numberless Graph 1 (5 minutes)
  - Show the [2018 Diversity in Children’s Books image](#) (Huyck & Dahlen, 2019) with numbers and labels covered. Have students share what they notice/wonder about the numberless image.
- Numberless Graph 2 (5 minutes)
  - Show a second slide in which the same data is represented in a different way. For younger students, this could be a 10 by 10 grid colored to match the percentages shown in the graph. For older students, this could be a pie chart.
- Synthesize With Additional Questions (10 minutes)
  - Is it okay that there are so many books about white people published and so few about \_\_\_\_ published?
  - What might this make people think? About themselves, or others?
  - What are some of the choices that the mathematicians and graphic designers made in preparing the first image? Why do you think they made those choices?
- Compare Books to School Population (5 minutes)
  - Display the grid or pie chart representing book representation next to a similarly formatted graph of your school population.
  - What do you notice/wonder about the two graphs? What should the graph look like?
- Introduce Project (5 minutes)
  - Introduce project of increasing representation. Write the word “representation” down. What is representation?
  - Explain the goal of figuring out characters in the classroom/school library books and make a decision about what we can do based on our findings.
  - Look at the list of races to look for in books represented in the graph from the Children’s Cooperative. What do you think of this list? Is there anything we need to add or change? Alternatively, students could develop the categories on their own if you have more time. Changes or additions could also be made as students engage in Lesson 3.



## LESSON 3 FACILITATION

### Data Collection

- Launch (20 minutes)
  - Revisit the project goal: figuring out the race of characters represented in the classroom/school library books and making a decision about what we can do based on our findings.
  - Work together to categorize about 20 pre-selected books. This set will serve as a model and an opportunity for further teaching and background building. The collection chosen should represent some of the difficult decisions that students will make, such as needing to use the setting or vocabulary as clues, characters whose race is unclear, books with characters of more than one race, etc.
  - Give any instructions needed about how students will get books and materials that are available. It is suggested that you let students make as many decisions about the data collection process as possible.
- Explore (30+ minutes)
  - Students will work in groups to categorize books and record their data. If time allows, this could be done over multiple days in order to categorize a larger portion (or all) of the collection. The teacher will observe, support, and record notes about data collection strategies to share out at the end of the lesson.
- Summarize (10 minutes)
  - The teacher selects several data collection strategies or decisions to highlight for the class.
  - Work together to compile the data from each small group.

## LESSON 4 FACILITATION

### Data Analysis

- Launch (10 minutes)
  - Explain that students will work in small groups to graphically represent the combined class representation data. Inform students of available materials and any grade-level appropriate requirements.
- Explore (30 minutes)
  - Students will work in small groups to create their graphic representation of the book data. It is suggested that you let students make as many decisions about their graphical representations as possible.
  - Towards the end of the exploration period, allow students to complete a gallery walk in order to look at other teams' graphs. They should be encouraged to begin thinking about what's the same and what's different in the graphs created, and could even leave post-its on their peers' graphs documenting their ideas.
- Summarize (15 minutes)
  - Display graphs in a way that they can be seen by all students.
  - Ask: What do you notice? What do you wonder? Create an anchor chart of student findings about the data set.

## LESSON 5 FACILITATION

### Call to Action

- Launch (15 minutes)
  - Review by asking: If a new student came into our classroom today for the first time, how would you explain what we've done this week and why it's important?
  - Ask: What should we do about it? Record student ideas.
  - Likely students will suggest getting new books to diversify the library collection. Explain that students have a real or imagined budget to purchase new books for this purpose. Provide access to book supplier sites or catalogs, and challenge students to select books while staying within the provided budget. See additional resources list below.
- Explore (30+ minutes)
  - Students will work in small groups to select books and keep track of the cost. Calculators can be provided.
  - If time allows, possibly on additional days, students can develop a system for synthesizing their lists and finalizing selections as a whole class. For example, the lists could be combined and rated by all students, creating an opportunity for average scores to be compared.

- Summarize (10 minutes)
  - The teacher will select decision making strategies or recording strategies to share with the class.

## LESSON 6 FACILITATION

### Communication

- Launch (15 minutes)
  - Ask: Who do you think should know about the injustice that we uncovered and our ideas about how to make change? (Possible answers: students, teachers, administrators, school board members, parents, community members, etc.)
  - Ask: How can we communicate what we've done and what we've learned to some or all of those groups? Why is that important? (Possible answers: plan a presentation, write a letter, make a video, create book talks, etc.)
  - Choose (or allow students to choose) one or more methods of communicating about students' work and set up any necessary parameters, teams, and materials.
- Plan (30+ minutes)
  - Allow students time to plan or create their presentation, letters, videos, book talks, etc. Depending on the scope of the product, this may take more than one class period.
- Present (10+ minutes)
  - Provide time for students to share their products and reflect as needed.

## ADDITIONAL RESOURCES

The following websites may assist teachers and students in choosing books to diversify their libraries:

- Social Justice Books <https://socialjusticebooks.org/booklists/>
- We Need Diverse Books <https://diversebooks.org/>
- Here Wee Read <https://hereweeread.com/>
- Colours of Us <https://coloursofus.com/>

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