



That's Not Fair and Why: Developing Social Justice Mathematics Activists in Pre-K

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Abstract

Prekindergarten mathematics can be filled with rich, complex mathematical talk that moves beyond traditional counting and cardinality. When paired with issues of fairness, mathematics becomes a social justice tool that empowers prekindergarteners to mathematically recognize and address oppression they see in their own world. We profile the critical mathematics details in two Black history-based activities in which children use mathematics to describe and confront the unfairness they notice within Rosa Parks and Harriet Tubman skirts. Through these activities, children learn how to communicate and address the unfairness they see using mathematics. We also share instructional considerations and extensions for implementing these activities in the classroom.

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Today the classroom is a bus. Chairs are arranged in four rows of six seats, three seats on the left, three seats on the right. A large gap exists between the front two rows and the back two rows. A group of 20 children huddle in a group on the rug, just outside the entrance of the bus. Their formerly gentle prekindergarten teacher wears a bus driver outfit complete with bus driver cap and sits menacingly in a chair at the front of the bus, arms and back hunched over a pretend steering wheel.

One by one the children enter the bus and put a coin into a small metal bank. The bus driver looks each child up and down, sizing each up before barking, "Good morning. Please go to the back of the bus." One by one, each child hurries to the back of the bus and sits down in one of the back two rows.

After the twelfth child boards the bus, the back two rows are filled. As the bus driver growls, "Please go to the back of the bus", the thirteenth child looks to see that no seats are available in the back and timidly takes a seat in the second row of the bus, the furthest-back row in the front section. The bus driver turns around, staring down the child, "You can't sit there. Move to the back of the bus." The child stands up, walks to the back of the bus, and awkwardly stands in the narrow row between the back two rows of seats. As the rest of the children board the bus, they fill in this standing area, each child looking at the rows of empty seats in front of them as the bus driver angrily drives through the make-believe town.

After a few minutes, the bus driver removes her cap and suddenly, the prekindergarten teacher is back. "How does this feel?" she asks, "Is this fair?" Children raise their hands to share about how this bus ride is scary, how it is not fair that there are so many empty seats. One child states that because he gave the bus driver a coin, he should be able to sit down. Another child observes, "There are twelve empty seats. And eight of us do not have seats." Another child shouts, "Yes, we can all sit down and it would be fair!"

The prekindergarten teacher asks for a volunteer who can be really, really brave—someone

who can put on a big, brave face. One girl timidly stands up to volunteer. The teacher asks the girl to get on the bus again, and this time, to be brave and sit in the front of the bus. The girl is Rosa Parks.

The prekindergarten teacher puts on her hat and disappears; the angry bus driver emerges again. The bus stops. Rosa Parks puts her coin into the slot and gets on the bus. Once again, the bus driver looks the girl up and down, growling, "Good morning. Please go to the back of the bus." This time, the girl takes a seat in the front row. "You can't sit there," the bus driver says. The girl doesn't budge. The bus comes to a halt. The bus driver rises up, walks to the girl and says, "You can't sit there. Move to the back of the bus."

"No," says the girl. The rest of the children giggle.

"Move to the back of the bus!" shouts the bus driver. Somehow the bus driver has grown bigger, a giant of an adult hulking over this brave, small child.

"No," says the girl. The children giggle again.

"Let's go, I'm taking you to the back of the bus," says the bus driver, grabbing the girl and pulling her to the back.

"No," says the girl, clinging onto her seat and refusing to budge.

Exasperated, the bus driver returns to the front of the bus and pulls out a radio. "We've got a situation here." The bus driver turns off the bus, stands up, and walks out.

The Montgomery Bus Boycott has begun.

Social Justice in Mathematics Education

Much of the early work in teaching mathematics for social justice evolved from lessons on activism from the Civil Rights era. For instance, the Algebra Project work from the 1980's emphasized how enrolling in Algebra in the 8th-grade was a civil right denied to countless Black students to keep them out of college matriculation (Moses & Cobb, 2001). Likewise, work in the 1990's focused on

empowering mathematics learners to recognize and resist oppressive and racist norms, such as helping Black families fight back against tracking their students into remedial mathematics classes or learning to see the racist implications of seemingly neutral statistics reported in mainstream media sources (Frankenstein, 1992, 1994; Martin, 2000). Teaching mathematics for social justice also connected to global movements, notably Paulo Freire's (1970) work with Brazilian literacy educators detailing how critical education builds *conscientização*, a critical consciousness in students and teachers (Gutstein, 2006). This idea of using mathematics as a means to help children read and write the world through real world examples of oppression is prevalent in the popular social justice mathematics resource *Rethinking Mathematics: Teaching Social Justice by the Numbers*, edited by Gutstein and Peterson (2013), a book of lessons, activities, and commentary focused on upper-elementary through secondary teaching.

These examples show how social justice-oriented mathematics lessons can connect to secondary curriculum. But what about early childhood mathematics? How do teachers develop early numeracy concepts that connect to children's lived experiences? How do teachers introduce complex, real-world situations of oppression in age-appropriate ways that will not terrify young children? Working with young children requires a shift in focusing not only on mathematical concepts and appropriate representations of real-world situations, but also understanding children's identities and prior knowledge. We refer to a children's mathematics identities as the dispositions and beliefs children develops around their ability to participate and perform in mathematics (Aguirre, Mayfield-Ingram, & Martin, 2013, p. 14). Recent scholarship on teaching elementary mathematics for social justice reveals the importance of helping children develop identities in which they powerfully use mathematics in their lives (Aguirre & del Rosario Zavala, 2013; Aguirre et al., 2013). Mathematics teaching for social justice also involves the development of *critical mathematics agency*, in which children learn to view their world with a critical mindset and imagine how to make their world a better and more equitable place (Tan, Barton, Turner, & Gutiérrez, 2012; Turner, 2003).

At the elementary and early childhood level, mathematics teaching for social justice must also connect formalized mathematics to the complex and sophisticated mathematics already present in children's histories and communities (Civil, 2007, 2009; Turner, Gutiérrez, Simic-Muller, & Díez-Palomar, 2009). Finally, mathematics for young children must involve play in order to open up opportunities for non-routine problem solving, practicing perseverance, and connecting mathematical ideas (Parks, 2015; Wager, 2013). Therefore, we situate social justice mathematics at the prekindergarten level as developing powerful mathematical identities, developing critical mathematics agency, honoring and connecting to children's family and cultural histories, and centered around play.

Our Context

DeAndrea has been teaching prekindergarten for almost 15 years. She teaches in a Pre-K through 5th-grade elementary school that serves a historically Black population in a low-income, city environment. DeAndrea engages her children in activities and skits every day, helping them articulate their emotions, resolve conflicts with one another, and appreciate the joy of creating, whether composing songs, cooking lunch, or building graphs to document how they feel. DeAndrea views her teaching as helping her children build "Thrive-al" skills: activist skills that help them survive, thrive, and potentially transform the world around them. Thrive-al skills involve recognizing the oppression of racism and poverty permeating their communities along with developing confidence to fight this oppression. Additionally, DeAndrea wants her children to always laugh and find joy in their world.

In this article, DeAndrea, pre-K teacher of mathematics, and Theodore, a critical elementary mathematics teacher educator, detail how we expanded upon two of DeAndrea's activities so that the mathematics instruction connected authentically to social justice. Both activities came from a self-created unit on classroom diversity with roots in literacy that DeAndrea developed over her career to integrate Black history into her teaching. We augmented these activities for children to understand the complexity of Black history through literacy and

role-play, as well as how to use mathematics to develop these Thrive-al skills.

Rosa Parks and the Montgomery Bus Boycott

The Rosa Parks and the Montgomery Bus Boycott activity described earlier introduces children to the context surrounding a key moment of civil disobedience in the Civil Rights struggle. DeAndrea enacted this activity for years as part of a diversity and Black History unit, which emphasized recognizing modern racism and developing activist dispositions.

We noticed a wealth of resources in this activity to connect to children's sophisticated mathematical thinking. First, the simplest mathematical aspects for young children was in counting the number of empty seats, counting the number of children who did not have a seat, and comparing these numbers. We noticed that all the children knew something was not right in how certain students had seats while others did not (i.e., "That's not fair!"). All the children were able to count that eight children were standing up in the bus without a seat. Most children were able to count that the bus had twelve empty seats in the two front rows (i.e., "*There are twelve empty seats*"). And some children were able to articulate how the situation was not fair because eight children did not have seats, yet there were more than enough seats for every child (i.e., "Yes, we can all sit down and it would be fair!"). When children discussed their mathematical observations, they displayed evidence of counting, one-to-one correspondence, and comparison of two distinct amounts. These explanations showed mathematically sophisticated reasoning, particularly for three and four-year old children (Clements & Sarama, 2007; Wager, 2013). This sophistication is a result of young children challenged to use mathematics to describe the unfairness of a situation they were role-playing, a situation empowering their voice to describe the racism they already felt in their own worlds.

Extensions and Connections

Our example activity is designed for a prekindergarten classroom. One way to introduce the activity is through interior drawings of the bus in which students count and add up the seats,

documenting the number of filled and empty seats in various situations. Another extension involves counting the amount of money each bus ride costs. Making each bus ride costs 10 cents is a simple way to incorporate base-ten fluency and 1-to-1 correspondence between coins and people on the bus. Children can generate strategies to figure out how much money the bus collected from all the riders in the class. To use this same activity for older children, we recommend expanding the activity to incorporate larger numbers (that are historically accurate) and the concepts of money and time. Possible extension questions include: 1) If it costs 10 cents to ride the bus, how much money did our bus lose when all the Black people stopped riding the bus? 2) If 40,000 of the daily Montgomery bus riders are Black, how much money did the Montgomery Bus system lose every day of the boycott? 3) The Montgomery Bus boycott lasted 381 days, how much did the system lose during the entire boycott?

Additionally, the activity could incorporate more historical accuracy, such as arranging the classroom bus to look exactly like the bus that Rosa Parks boarded, having the boycott occur when Rosa Parks refuses to go to the back of the bus when a white man boards the bus (as opposed to when she first boards the bus), and discussing the role of teenager Claudette Colvin in the civil rights struggle ("Before Rosa Parks, A Teenager Defied Segregation On An Alabama Bus," 2015). Colvin was a teenage NAACP member arrested for not giving up her seat on a bus nine months earlier, but her arrest was ignored by NAACP leadership because they felt that as a defiant, dark-skinned teenager without civil rights training, the general public might not rally behind her (Hoose, 2009). Studying how Claudette Colvin, a brave student-activist inspired by Harriet Tubman, fought back against the racist bus segregation practices before Rosa Parks, helps children see how they can also enact thrive-al skills when they see something wrong in their own lives.

When doing this activity in your own classroom, remember that even though the bus driver is acting scary, the children should never be truly frightened. Remind your children this is make-believe and keep the skit silly so that children are giggling, laughing, and having fun. Additionally, resist taking control of the discussion that happens when the bus boycott

begins. Children have fascinating questions or points to make. Listen to what the children say and follow their lead. Also, incorporate costumes and allow children to dress up or make their own costumes. Having a realistic bus driver uniform and allowing children to wear period costumes adds to the authenticity of the skit. Finally, incorporate picture books into the lesson, such as *Rosa* (2007) by Nikki Giovanni and Bryan Collier and *If a Bus Could Talk* (2009) by Faith Ringgold.

In order to connect the historical events from this activity to modern racism and oppression, allow conversations to materialize naturally about how children feel on the bus. DeAndrea's children often notice how friends on the bus are not allowed to sit next to each other if their skin color is different. This leads to discussions about other places in their lives in which they feel they or a loved one are not allowed to do certain things because of skin color. It also allows children a template to reflect upon when they encounter racism in their future. Again, our experience has shown us that it is not necessary to push on these questions, as children will come up with these observations on their own.

Harriet Tubman and the Underground Railroad

Another activity DeAndrea honed through the years explores Harriet Tubman and the Underground Railroad. In this activity, children learn about Harriet Tubman and how the Underground Railroad helped escaping slaves travel north to freedom. DeAndrea introduces songs used by the Underground Railroad to help escaping slaves navigate and evade danger. Students discuss the history of slavery in the United States of America, how it might feel to be owned by someone else, the fairness of slavery based on the color of one's skin, and how slaves escaped to freedom. Through this activity, children experience the importance of music, coded speaking, and strategy sharing, particularly within the Black experience. The skit follows the song, *Follow the Drinking Gourd* (Texas Folklore Society, 1928), which on the surface refers to a hollowed-out gourd used for drinking, but is actually code for the Big Dipper constellation that points North.

For this skit, divide the classroom into four sections. In each section, a different child plays Harriet

Tubman, who must clandestinely lead the rest of the class through a pathway of escape (e.g. under tables, behind bookshelves, through tunnels) to freedom. Harriet Tubman draws a visual map to devise a pathway to freedom and notes the dangers surrounding that pathway. Since the other children will not have access to the visual map, Harriet Tubman then uses mathematical language, spatial thinking, and measurement to construct a verbal description of the pathway, making sure to emphasize order, sequencing, and precision. For example, Harriet Tubman might say, "First, take five steps to the circular table. Second, crawl under the table. Third, as you get out, stay to the right side and creep along the wall for ten steps. Fourth, slip behind the rectangular file cabinet." Harriet Tubman must field test these directions first, noting the importance of making sure the directions are accurate and detailed. Remember, an inaccurate map results in friends being re-captured into slavery. Children then convert these steps into a structured song, creating verses for each step. For example, the children restructured a song such as "Heads, Shoulders, Knees, and Toes" to "Step, Crawl, Creep, and Slip" to match Harriet Tubman's direction. The songs use coded terms that children understand but "adults", in the roles of slave catchers, would not. Children then sing this song as they navigate the path to freedom.

Through this activity, children create sophisticated mathematical songs using coded language to describe these sequenced pathways to freedom. Children use mathematics to engage with and find power within a historically oppressive situation. This lesson also allows children to develop critical mathematics agency (Tan et al., 2012; Turner, 2003), in which their maps and songs are mathematically accurate and creative while still deliberately disguising the path to freedom. Children learn how to use mathematics to create a tool of resistance and liberation in fighting against the brutal system of slavery.

Extensions and Connections

An extension for older children would be to connect to Freedom Quilts, quilt patterns used to signal directions along the Underground Railroad. Neumann's (2005) *Freedom Quilts: Mathematics of*

the *Underground Railroad* article is a good resource for an activity in which children devise quilt patterns to represent specific parts of the pathway to freedom. Another way to make this lesson more historically accurate would be to include actual maps of the Underground Railroad (for teacher resources, see Houghton Mifflin Company, 2004; Scholastic, 2016). Extension questions to ask include: 1) How can you use non-standard units and coded language to describe parts of the pathway that slave-catchers would not understand? 2) What are different ways that you can measure aspects of your pathway? What units can you use? 3) What are ways you can use mathematics and coded language in your own world to deliberately hide something in plain sight?

When doing this activity in your own classroom, remember to emphasize the fun of song creation, which helps children connect the step-by-step pathway to music, rhythm, and cadence. This skit works well when older children are invited to participate either as role-play participants or helpers so that they either try to interpret the songs or are the “slave catchers” who should not understand the songs. Emphasize measurement with non-standard and standard units, helping students see that non-standard units make the pathways harder to understand for some people but easier for other people. For historical accuracy, emphasize the pathways follow a south to north progression. Finally, incorporate picture books into the lesson, such as *Moses: When Harriet Tubman Led Her People to Freedom* (2008) by Carole Boston Weatherford and Kadir Nelson, *Follow the Drinking Gourd* (2014) by Jeannette Winter, *Aunt Harriet's Underground Railroad in the Sky* (1995) by Faith Ringgold, *Sweet Clara and the Freedom Quilt* (2008) by Deborah Hopkinson, *The Patchwork Path: A Quilt Map to Freedom* (2005) by Bettye Stroud and Erin Susanne Bennett, and *Henry's Freedom Box: A True Story from the Underground Railroad* (2007) by Ellen Levin and Kadir Nelson.

Enacting Social Justice Mathematics Activities in your Prekindergarten Classroom

We hope our enactment of social justice-oriented mathematics in these two prekindergarten activities illuminates ways you can do this work in your own teaching. We end with tips we have learned from

doing this work. First, always let the children lead the activity, particularly the discussion. Much of mathematics teaching is listening to children's thinking, so allow the children's questions and thoughts to drive the discussion. Second, remember to keep the activities fun and silly. For young children, play provides children with genuine opportunities to engage in mathematical thinking (Parks, 2015; Wager, 2013). Skits, songs, and creativity are also crucial for allowing young children to feel safe when engaged in scary topics such as slavery and segregation. When a skit involves a potentially terrifying situation or character, such as the bus driver from the Rosa Parks skit, emphasize that this is a make-believe situation. Third, involve older children in the activities. All children will benefit from working with each other, and the older children get to play specific roles in the skits and add insight or guidance. Finally, in terms of emphasizing the mathematical component of each activity, focus on children's conception of fairness and how they can use mathematics to explain why a situation is unfair. Start discussions by asking children whether they think a situation is fair and why or why not. Fourth, open dialogue about skin color and different cultures is a major norm in DeAndrea's classroom. This openness to talking about diversity and culture is a pre-requisite to conversations about unfairness and social justice in a prekindergarten classroom. This allows us to connect these skits to discussions about how children see and experience racism in their own worlds and how to use mathematics as part of their thrive-al skills to point out and actively resist injustice.

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