

Invited Lecture

Seeking Social Justice in Mathematics Teaching and Learning

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ABSTRACT This session article unpacks mathematics teaching and learning focused on racial equity and social justice. Specifically, the session will explore the intersection of mathematics teaching and learning with racial equity and social justice across four critical reasons: a) Building an informed society; b) Connecting mathematics to cultural and community histories as valuable resources; c) Confronting and solving real-world mathematics as a tool to confront inequitable and unjust contexts; d) Use mathematics as a tool for democracy and creating a more just society.

Keywords: Social Justice; Mathematics; Pedagogy.

1. Teaching Mathematics for Social Justice

1.1. *Four critical reasons to teach mathematics for social justice*

Teaching mathematics for social justice supports situating mathematics content and concepts in contexts that allow students to use their cultural, social, and contextual resources to deepen their understanding of mathematics. By deepening students' understanding of mathematics, teaching mathematics for social justice provides opportunities to use mathematics to critique the world, understand the connections between social and cultural issues that impact people's lives, and advocate for social changes (Berry et al., 2020). To teach mathematics for social justice, teachers must first appreciate students' cultures, understand the development of knowledge within students' cultural frameworks, and recognize that the interpretation of information and mathematics happens within students' cultural and experiential frameworks (Rubel, 2017). Teaching mathematics for social justice goes beyond stating the importance of connecting mathematics to lived experiences and interests; it positions students as actors in their world. Teaching mathematics for social justice is critical for four reasons:

- *Builds an informed society.* To build an informed society, students must become better informed about their lives and the lives of others who may be

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different from their own. Mathematics serves a role to inform teachers and students about people's lives, contexts, and conditions that may be different from their own (Ladson-Billings and Tate,1995).

- *Connects mathematics with students' cultural and community histories.* Too often, students' mathematics experiences in school are detached from meaningful contexts. Teaching mathematics for social justice creates opportunities for deepening mathematical knowledge by connecting mathematics teaching and learning to cultural and communal histories (Ladson-Billings and Tate,1995).
- *Empowers students to confront and solve real-world challenges they face.* Empowering students requires identifying unjust issues and using mathematics as a tool to analyze, critique, and confront unjust issues (Ladson-Billings and Tate,1995).
- *Helps students learn to use mathematics as a tool for social change.* The potential for education is to support students to better their lives and better society. When we use mathematics to explore, understand, and respond to social injustices, we learn to use mathematics as a tool to transform inequities and create social change (Ladson-Billings and Tate,1995).

1.2. *Creating lessons for teaching mathematics about social justice*

Teaching mathematics for social justice includes the National Council of Teachers of Mathematics (2014) eight effective mathematics teaching practices and requires educators to understand and demonstrate pedagogies associated with four bodies of work associated with equitable teaching practices in a nested relationship (Picha, 2019). Figure 1 demonstrates the nested relationship of equity-driven mathematics teaching frameworks: Standards-Based Mathematics Instruction (NCTM, 2014), Complex Instruction (Featherstone et al., 2011; Horn, 2012), Culturally Relevant Pedagogy (Ladson-Billings, 1994), and Critical Mathematics Education (Frankenstein, 1983; Freire, 2000; Powell, 1995; Skovsmose, 1995).



Fig. 1. Equity-driven mathematics teaching frameworks — a nested relationship (picha, 2019)

- Standards-Based Mathematics Instruction emphasizes learning mathematics for understanding over attending primarily to fluency with algorithms and facts (NCTM, 2014)
- Complex Instruction values many different ways of being mathematically “smart” (Featherstone et al., 2011)

- Culturally Relevant Pedagogy ensures that equitable instruction draws on students’ cultural practices, experiences, and assets to build academic excellence and critical consciousness (Ladson-Billings, 1994).
- Critical Mathematics Education extends the tenet of critical consciousness from CRP to explicitly attend to power, fairness, and social justice (Freire, 2000).

The teacher plays a critical role in students’ educational experience by bringing forward important mathematics and social issues to be learned. Student voices are elevated in the classroom are critical to implementing a social justice mathematics lesson. The intersection of these experiences and questions begins a social justice mathematics lesson (Fig. 2). Often, the “challenging social and mathematical question or concern” generated by students, along with the “action and public product”, extends outside the classroom into the school community and continues to evolve based on previous actions and students’ power to respond to social justice issues. However, during the classroom teaching episode, the teacher can create opportunities that deepen students’ mathematical and social understanding through purposeful investigations that encourage reflection to develop their critical consciousness.

As students complete a social justice mathematics lesson, it is important to note that three inner elements seen in Fig. 2 are not mutually exclusive, likely realized throughout a lesson at different points for different students. Allowing students to grapple with the lesson’s social and mathematical goals should be handled carefully. While some students may be wrestling to make sense of data or understand a mathematical analysis, others may be confronted with data or mathematics that dispels a former belief. Teachers should be attentive to the intersection of mathematics and social injustice and establish and attend to goals specific to each domain — math and social justice (Teaching Tolerance, 2016).

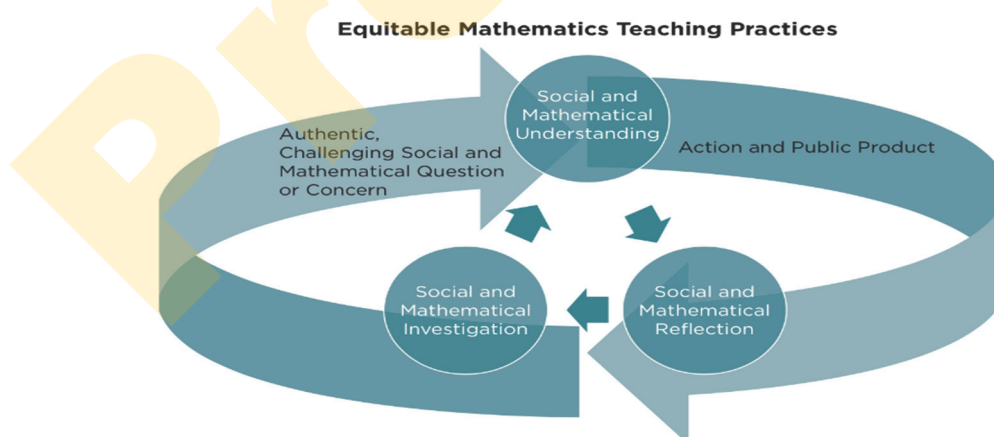


Fig. 2. Equitable Mathematics Teaching Practices (Berry et al., 2020)

- **Authentic, Challenging Social and Mathematical question or concern:** A social justice mathematics lesson must be grounded in a question or concern that could arise from students, allowing for authentic and challenging learning. Examples of social justice topics include civil rights, laws, environmental rights, identity issues, health, immigration, and racism. These contexts can help students observe patterns, critique information, ask questions, and reflect.
- **Social and Mathematical Understanding:** A social justice mathematics lesson must identify what students need to know and understand mathematically and socially. A social justice mathematics lesson identify and provide opportunities to assess three goals: a) students' understanding mathematics content, b) engaging in mathematics practice for students to show what they know and can do, and c) social justice for students to demonstrate their understanding of and response to social justice issues.
- **Social and Mathematical Investigation:** Because tasks emerge from students' questions or concerns, a social justice mathematics lesson needs to be grounded in a mathematically driven investigation of a social justice issue.
- **Social and Mathematical Reflection:** A social justice mathematics lesson should promote reflection about the mathematics, social justice issue, and how the two inform one another.
- **Action and Public Product:** A social justice mathematics lesson must include an opportunity for students to take action or develop a public product.

1.3. Enacting a vision of teaching mathematics for social justice

Incorporating social justice in the mathematics classroom points to students' need to design and take action on what they have learned. A teacher's practices and students' responses are "founded on the belief that mathematics is the tool to be used to challenge the status quo that is adversely impacted by the lack of social justice" (Berry et al., 2020; p. 1). This can and should be the natural cycle for teaching mathematics for social justice, a process launched by student's authentic and rich questions or concerns about their school, community, world, and lives that through mathematization — investigation, understanding, and reflection — they are compelled to take action or create a public product (Fig. 2; Berry et al., 2020). Once students have mathematized and investigated a social justice issue, more in-depth understanding and awareness is a personal growth outcome that might be expressed in the way an individual interacts with others through deeper learning about identity, diversity, and justice (Berry et al., 2020):

- *Identity* — how we view ourselves;
- *Diversity* — how we view others and their perspectives; and
- *Justice* — how we view fairness and unfairness, unequal power relations, and the impact of bias.

However, unless some form of action is included in a lesson, the work to teach mathematics for social justice misses a key component — for students to see

themselves as able to have an impact on their world, as both “an actor and author of history” (Garcia, 1974, p. 16). The Social Justice standards developed by Teaching Tolerance (2016) provide age-appropriate learning outcomes in four domains — identity, diversity, justice, and action. Below is an overview of the anchoring standards for learning outcomes for the action domain.

- Students will express empathy when excluded or mistreated because of their identities and concerns when they experience bias.
- Students will recognize their responsibility to stand up to exclusion, prejudice, and injustice.
- Students will speak with courage and respect when they or someone else has been hurt or wronged by bias.
- Students will make principled decisions about when and how to stand against bias and injustice in their everyday lives and do so despite negative peer or group pressure.
- Students will plan and carry out collective action against bias and injustice globally and evaluate the most effective strategies.

These anchor standards can help teachers provide some framework and guidance to students’ ideas about what to do with their mathematical analysis and a more in-depth understanding of the social injustice being studied.

Examples of actions identified in social justice mathematics lessons are (Berry et al., 2020):

- Develop and present an infographic.
- Design and post informative social media posts.
- Begin an informational campaign, including a variety of public service announcements (posters, flyers, other creative media).
- Organize a letter-writing campaign.
- Present to a school council meeting or school board meeting.
- Invite a panel of community members to discuss the topic in a public forum.
- Start a community-based reading club.
- Conduct a household inventory/analysis.
- Arrange a meeting with a local, county, or state government representative.

A social justice mathematics lesson must ensure the opportunity for reflection and action. As you design your lesson, consider what options you might provide for students to reflect on what they’ve learned and to discuss possible actions they can take to make the first steps toward addressing an injustice. In addition, the lesson must consider ways students share what they have learned about social injustice and ways they use mathematics to bring greater insight into the issue. Mathematics has great potential to empower students, not only to analyze complex situations but also to develop confidence and a positive identity. Taking action and engaging in social justice curricular experiences empower students to stand up to the exclusion, prejudice, and bias in many contexts of their lives. By supporting them in deciding upon and designing

an appropriate and effective response to social injustice, grounded in a mathematical rationale, they are rehearsing their future work as uniquely empowered activists against social injustice.

2. Time for Action

Responding to social justice issues requires a commitment to serving our global society. Mathematics teachers and teacher educators can respond by infusing social justice into mathematics teaching and learning. Now is the time to determine how we will teach mathematics about, with, and for social justice so that the goal of facilitating authentic, meaningful relationships between students becomes a lived reality.

First, commit to reading the position papers below. Then, reflect on how they inform your understanding of social justice in mathematics teaching and learning and what questions or wonderings you might need to explore further.

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- Benjamin Banneker Association, Inc. (2017). Implementing a social justice curriculum: Practices to support the participation and success of African-American students in mathematics. http://bbamath.org/wp-content/uploads/2017/11/BBA-Social-Justice-Position-Paper_Final.pdf
- National Council of Supervisors of Mathematics & TODOS: Mathematics for ALL. (2016). Mathematics education through the lens of social justice: Acknowledgment, actions, and accountability. <https://www.todos-math.org/socialjustice>

Next, determine a starting point by envisioning what a classroom may look like and sound like that is ready to tackle the injustices of students' lives. Then, identify a goal and list the steps you will take the next 3-, 6-, and 12-months to make the vision become a reality.

Finally, share your vision with others and invite them to hold you accountable and support you as you bring social justice to your mathematics classroom (Staley, 2018). Accountability partners hold one accountable for their actions, words, and beliefs. Teaching mathematics for social justice requires shifts in teaching and mindsets.

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