Journal of Humanistic Mathematics

Volume 13 | Issue 2 July 2023

# Mathematics and Society: Towards Critical Mathematics Research and Education

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## Cover Page Footnote

This material is based upon work supported by the National Science Foundation under Grant No. DMS-1929284 while the authors were in residence at the Institute for Computational and Experimental Research in Mathematics in Providence, RI, during the Data Science and Social Justice programs in 2022 and 2023.

# Mathematics and Society: Towards Critical Mathematics Research and Education

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The role of mathematics in society, whether through education or research broadly construed, has long been discussed in various circles. In recent years the mathematical community at large has taken a deeper and critical interest in such questions. Within this context, this special issue on Mathematics and Society carries the conversation forward towards this critical space. This issue provides a venue for those pushing the boundaries of the questions that can and should be asked in the field of mathematics and mathematics education. In this special issue those questions range from the sociology of mathematics to the role of mathematics in social justice issues to the ways that social justice is attended to in mathematics education.

While we have noted an increasing interest, the roots of critical mathematics are long in the United States. Du Bois used data visualization to discuss race, oppression, and Black genocide in America [4]. Critical mathematics education gained spotlights, particularly in K-12 education, with the Algebra Project under Bob Moses [1] and Rochelle Gutiérrez's many approaches and frameworks under the umbrella of the sociopolitical turn [2].

We cannot provide an extensive list of all of the roots, but note how they have matured. The field of science, technology, and society studies has carved a path for a critical approach to our mathematical research fields [3, 5], particularly in the midst of a society increasingly dependent on big data and models and embroiled in resurging violence begetting conversations on oppression and human rights. Thus, we have been called to examine our own practices with a critical lens. This is also affecting how we conduct higher education, informed by research and secondary education and accelerated by COVID-19. In the papers we share in our special issue, we invite you to this conversation and growth.

The first paper of Buckmire *et al.* opens with a powerful question: "How do we define the mathematical community?", which naturally leads to the question of what is a "mathematician"? The authors offer various working definitions based on function, qualification, and identity, and compare them against the personal positions taken by each of the contributing authors, which is a diverse group in itself. The analysis is bookended with considerations of the power relations that are involved in making — or imposing — such definitions, and invites the reader to question their own assumptions.

Roca *et al.* unpacks recent conversations in the professional mathematics community on Twitter, which began in 2019. They discuss the literature and research on #HashtagActivism, then introduce readers to the #DisruptJMM hashtag movement organized as an intervention to the 2020 Joint Mathematics Meetings. While most community organizing around social justice in higher education is ascribed to racial justice calls events in 2020 after #GeorgeFloyd, this work investigates a slightly earlier timeline of conversations important in the mathematical community. How did those conversations start, what was the reason, how did the hashtag movement build community, and what was discussed in that community?

The next piece by Piercey continues the use of mathematics research and critical inquiry to discuss genocide, "acts committed with intent to destroy, in whole or in part, a national, ethnical, racial, or religious group." Piercey describes the ways in which mathematics and data science may be used for genocide prevention, with explicit focus on ethical and responsible data use surrounding these algorithms. This piece weaves together history, mathematics, data science, ethics, and harm mitigation strategies along with his own positionality that will engage readers interested in interdisciplinary work where the stakes are particularly high.

The following set of papers discuss classroom discussions on social justice. The next paper, by Roth and Ward, is equal parts a conversation, reflection, endorsement, and guide for teaching mathematics and democracy in post-secondary classrooms at various levels. The authors walk us through how they began teaching their course on math and democracy, to the content of the class, and some considerations to be made while teaching it. For those searching for more resources on teaching mathematics and democracy, as well as additional materials on these issues, check out the appendix for an extensive list categorized by subject.

Dickman and Feinberg's "Critical Co-Investigators of Math Trails: Reflections from a Student and Teacher" begins with an overview of "co-investigation" between teacher and student, then an overview of what math trails are and a brief history. The rest is a combination of how students and teachers are working together to investigate mathematical questions in their communities and engage others. The learning outcomes agreed upon by the class: Access, Connection, and Joy. Indeed the paper also captures these three themes. Together we learn about the class's creations and the behind the scenes conversations and mentoring. While the context of the original work is secondary education, this is a reading that is likely to engage all teachers.

The final two papers concern the possibilities and potential pitfalls in teaching post-secondary mathematics for social justice. The first, by Ince, sets stage by mainly pointing out that since 2020, mathematics teachers have become increasingly interested in incorporating antiracist pedagogy but such resources for higher education remain lacking. Ince offers several suggestions on how to proceed. Tragically, Dr. Ince passed away while their paper was under revision. Our decision to publish the paper, with the permission of Ince's family, is to honor their memory and their commitment to social justice in mathematics. In the absence of a final revision, we have invited a complementary article from Lee-Hassan, which broadly signposts various pitfalls to be aware of when attempting to incorporate social justice issues into one's mathematical pedagogy.

We are pleased by the number of authors that submitted to our special issue. With the pandemic still a reality, not every article made it for the due date of this issue. However, we will continue to work with JHM to publish this collection, and we hope this is just the beginning of a broader collection of critical mathematical work.

## References


[1] Robert Parris Moses and Charles E Cobb, *Radical Equations: Math Literacy and Civil Rights*, Beacon Press, Boston, 2001.

[2] Rochelle Gutiérrez. "The sociopolitical turn in mathematics education," *Journal for Research in Mathematics Education*, Volume **44** Issue 1 (2013), pages 37–68.

[3] Cathy O'Neil, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*, Crown, New York, 2016.

[4] W. E. B. (William Edward Burghardt) Du Bois, *W.E.B. Du Bois's Data Portraits: Visualizing Black America: The Color Line at the Turn of the Twentieth Century*, The W.E.B. Du Bois Center at the University of Massachusetts Amherst, 2018.

[5] Ruha Benjamin, *Race after Technology: Abolitionist Tools for the New Jim Code*, Polity, Medford, MA, 2019.