

## What's in a Name? Absolute Value & Algebraic Identity

**Benjamin Dickman**  
Hewitt School

### Abstract

Although many well-intentioned organizations and institutions emphasize the importance of antiracism and social justice in mathematics education, there remains a lack of practitioner-oriented curricular materials exhibiting how these long-overdue shifts can manifest in classrooms. This article describes how modifying a project on absolute value functions in an Algebra 2 course was able to incorporate Learning for Justice social justice standards and weave in identity work, while supporting students' mathematical learning in a manner consonant with the four essential actions and four key areas identified in TODOS position statements.

**Benjamin Dickman** ([benjamindickman@gmail.com](mailto:benjamindickman@gmail.com)) is a high school and middle school mathematics teacher at The Hewitt School, an independent K-12 girls day school in New York, NY. Benjamin spent time as a China Fulbright Fellow researching mathematics education in Nanjing, and later as a Fulbright DAST (Distinguished Awards in Teaching Short-Term) recipient supporting mathematics educators in the Philippines. After two years working in teacher education as a postdoctoral fellow back in the United States, Benjamin relocated to his current institution, where he has taught all grades from 7 to 12 over the past seven years. His research interests include mathematical creativity and problem posing, and he is an avid word game player – including his original game, FiddleBrix.

## What's in a Name? Absolute Value & Algebraic Identity

Benjamin Dickman

### Introduction

In Summer 2020, my institution – an independent K-12 girls day school in the northeast United States – required courses for the 2020-21 academic year to include Learning for Justice (LfJ), then known as Teaching Tolerance, social justice standards (Learning for Justice, 2020). Learning for Justice describes its social justice standards as a road map for anti-bias education across K-12, spanning four domains: Identity, Diversity, Justice, and Action. (For more, see <https://bit.ly/41cVpNL>.) Moreover, my school announced its coeval intention to form an “Anti-Racist Task Force” (ARTF), drawing from members across constituencies, and for which Pedagogy & Curriculum would be one of the three areas of focus. As I sought to implement the LfJ standards into an Algebra 2 course, and as I served as one of the two faculty members on the ARTF – working alongside current students, parents, administrators, alums, fellow faculty and staff, and trustees – it became clear that there is a dearth of comprehensive curriculum that supports teachers to enact both social justice and mathematics goals as a daily act. It is true that some materials exist to support teachers’ weaving social justice into their classrooms; however, a comprehensive curriculum or text for Algebra 2 does not yet exist. Still, I needed a way to align the overall school goals with my own classroom activity. This is a story of one assignment from the [virtual] classroom, developed from my own experiences as a teacher with antiracism in mathematics education; in particular, a project on identity that covers the eight key actions and areas described by TODOS (NCSM & TODOS, 2016; TODOS, 2020). TODOS & NCSM (2016) named 4 essential actions: eliminating deficit views of mathematics learning; eradicating mathematics as a gatekeeper; engaging the sociopolitical turn of mathematics education; and elevating the professional learning of mathematics teachers and leaders with a dual focus on mathematics and social justice. TODOS (2020) built on this to argue for specific attention to how those actions manifest in four areas of our work, underscored by the COVID-19 pandemic and endemic racism: how we utilize technology, how we authentically engage parents,

how we rethink assessment, and how we attend to students’ social and emotional needs while teaching mathematics.

### Personal Practitioner Context

For seven years I have taught an upper school elective course on mathematical problem solving and posing, and this has enabled me to bring in a number of topics and strategies at the intersection of mathematics and social justice. Some examples include learner-generated social justice math trails that focus on students jointly mathematizing their surroundings (e.g., Toliver, 1993; Maldonado’s contribution in Chao et al., 2019); participating in the 2019 Park City Mathematics Institute’s social justice working group, and co-authoring an article building on those experiences, on embedding joy and identity in the study of mathematical induction through a puzzle-based project while proposing the notion of *mathematical code switching* (Dickman & Nauman, 2020); and finally, engaging students in original research on such individuals as the Mississippi Woman’s College (MWC) Putnam Examination participants. The story of the MWC team defying stereotypes associated with their institution and their gender when they came in third place in 1939 as a team should be more well known, yet there is nearly no information on this in the history of this competition’s first seventy-five years (cf. Gallian, 2017). During the seven-year time period, I taught one year of another upper school elective course on probability and statistics, and we similarly engaged across a variety of social justice mathematics topics.

Matters have been different, however, in my teaching of Algebra 2. Nationally, this is a course that generates a wide range of responses across at least four categories: real-world everyday use (e.g., are rationalizing the denominator or synthetic division topics that belong in a modern curriculum?); the acknowledgment that algebra content knowledge is vital for getting past certain barriers such as standardized tests and college admissions; pedagogical inertia given that the Algebra 1–Geometry–Algebra 2 sequence towards Calculus is widely adopted and over-relied on as a prerequisite due to modern

mathematics courses value placed on abstraction (Gutiérrez, 2013, p. 10); and, as distinct from the other three areas, actual *joy* that comes from viewing algebra as the study of patterns, rather than, e.g., unmotivated mandates to solve for  $x$ . This is complicated further by a paucity of classroom-ready materials for practitioners at the algebra-justice intersection – although not a complete absence (cf. Berry et al., 2020) – and the contention, by some, that Algebra 2 should be replaced with an alternative such as data science, statistics, or more general coursework on quantitative literacy.

I believe that there are many ways in which social justice efforts can be realized in the context of Algebra 2. These include encouraging students to critique the systems in which they are participating, and supporting their development of critical consciousness. As a white teacher at a predominantly white institution (PWI) in an affluent area of the United States working with privileged students, I am particularly interested in supporting students to develop critical consciousness through their Algebra 2 courses, for the four reasons outlined by Kokka (2020, p. 779):

1. Participation in a diverse democracy requires critical consciousness, and the privileged are also called on to do social justice work.
2. Critical consciousness development requires higher order critical thinking, which all students need.
3. Critical consciousness can help privileged individuals create social change; without it, they may abuse their power.
4. Current structures of power dehumanize everyone, including privileged students, who face unique challenges, and therefore benefit from learning about how these systems harm them.

Fittingly for my own context, Kokka concludes this section by writing, “Lastly and importantly, independent schools who serve many privileged families are showing increased interest and engagement with social justice pedagogy” (p. 779). Given my own LfJ standards guideline and the ARTF recommendations, I felt that it would be time to shift from what Gutiérrez (2016) calls “flying under the radar” to “using the master’s tools” (cf. Lorde, 1984):

With *Use the Master’s Tools*, we find ways to do what is in the best interest of our students and justify it with language that is valued in our schools or in professional documents. We can ask ourselves, “Can

my work be seen as related to my “School Improvement Plan” or “Response to Intervention?” (p. 55)

My own views on the traditional course sequence aside, I felt the imperative to enact change subject to the constraints that an Algebra 2 course presents, while both recognizing that these constraints can promote creativity (Stokes, 2005) and that there may be a pedagogical future in which this course name, and much of its learned content, is rendered obsolete. Thus, it was within this context that I modified our first Algebra 2 unit, on the study of absolute value functions, to merge content knowledge with the four strands from Learning for Justice – identity, diversity, justice, action – among which identity was to be centered as we began a new school year without an established, in-person familiarity between instructor and (most) students. In the next section, I describe the project and how it functioned; and indicate briefly the ways in which I believe it aligns with the essential actions and areas highlighted by TODOS.

### **Absolute Value Functions and Graphs Intersect With Identity**

Although the Common Core State Standards for Mathematics (Common Core State Standards Initiative, 2010) contain relatively little on absolute value functions, it has been my experience that they provide a natural segue between linear functions and higher degree polynomials, while presenting an opportunity to reinforce earlier ideas around, for example, piecewise-defined functions, connecting symbolic and visual representations through graphing, and naming graph features. For example, an absolute value function, which we define here as a function that maps  $x$  to  $a|x - h| + k$  for fixed parameters  $a$ ,  $h$ , and  $k$ , shares many features with quadratic functions: zero, one, or two  $x$ -intercepts;  $y$ -intercept; opening upwards or downwards; three parameters; a vertex or turning point; a single decreasing region and a single increasing region.

### **Modifying a Project**

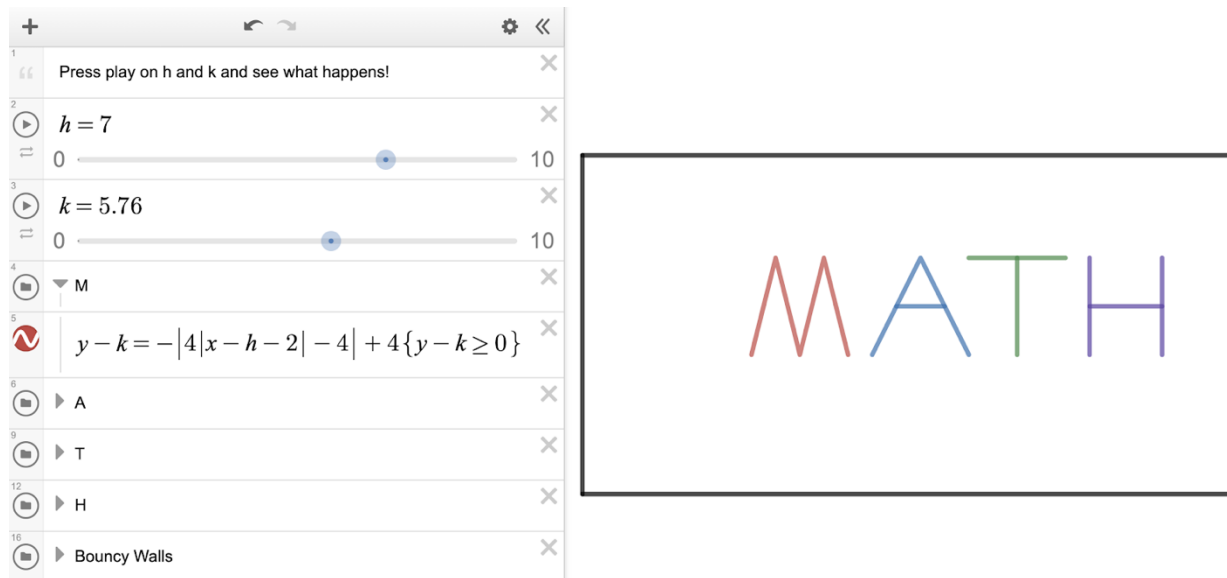
One of the three primary questions posed in the call for papers for this special issue of *TEEM* is, “What are the tensions and resolutions arising from engaging in antiracism work?” One of the tensions that I feel acutely

as a mathematics teacher – even, or especially, as one who has been aiming to infuse social justice into mathematics courses for years – is that a directive to modify mathematics courses to make them (somehow) antiracist does not come with a manual. What does it mean to teach the mathematical content knowledge of absolute value

functions in an antiracist way? The resolution that I converged to for this unit was to modify a pre-existing project (Figure 1) in which students were asked to graph the word MATH using a combination of functions – including absolute value functions – and bounce it around within a graphed box in Desmos by using playable sliders.

**Figure 1**

*Screenshot of ‘MATH’ graphing project shared with previous Algebra 2 students*



The assignment was modified so that while the core graphing and slider aspects remained, space was made for students to tell their own name stories, include their own names in their graphing task, and reflect on how names matter. The media resources provided space to reflect on the reasons that names are meaningful, and how some names are Americanized in schools, dehumanizing people (for example, see the *Facundo the Great* link in the “media resources” in the Appendix). The full assignment is also contained in the Appendix.

Crucially, students learned about names and name stories from a variety of media (text and video) and read an additional article on name-based anti-Black hiring discrimination (see Appendix for these resources). Outcomes from final graphs and students’ corresponding write-ups contain information about the past (e.g., being named after a recently deceased family member in keeping with Jewish traditions) and present (e.g., a student of color who uses one name with family and close friends and another with classmates and educators at our

PWI). Moreover, we used parts of our own course discussions to look at some of the eponymous mathematical objects (e.g., the recently-retired R.A. Fisher Award and Lecture, the UT building formerly known as Robert Lee Moore Hall) and critique them. As a concrete example, we discussed the renaming of a building that previously held the name of R.L. Moore, an avowed segregationist mathematician (UT News, 2020). In our virtual format, we looked at Moore’s wikipedia, which refers to his “having been one of the most charismatic and inspiring university teachers of mathematics ever active in the United States” (Wikipedia, 2021). This description appears in a section titled *Unusual Teacher*; reconciling it with the descriptions in the next section, *Racism*, led one student to edit the former section in real time to express her view that he was a racist – a perspective I share. This change was promptly reverted, yet demonstrates, in my estimation, an example of an empowered learner acting with agency – as well as the systemic racism built into a platform such as Wikipedia.

The systems-level problem was ironically exemplified in maintaining a glowing description by *not* allowing the straightforward mention of Moore’s racism in the section on his unusual teaching, and instead relegating it solely to the disjoint section to follow. Attempts to separate mathematical theory – and, in this case, the “unusual” mathematics teaching – of an individual from their racist actions is *not* antiracist; it is also unfortunately common in the world of academic mathematics (Bingham, 2020).

The project described here allowed students to produce mathematical ideas based on their own identities, and in some cases to modify the project further; for example, Figure 1 shows how a single *nested* absolute value function can be used to produce the letter M. As another example, some students played around with fonts, e.g., using bubble letters. By building a project that was generally enjoyed and still covered requisite content knowledge, we have a project that both positions students to get through the “gates” that presently exist while simultaneously not upholding irrelevant mathematics for its own sake: the personalization allows students to see themselves in the mathematics, and this is a project that can be implemented even if/when gates like the SATs are eradicated. The personalization went beyond sharing one’s own name and into ensuring that students’ names must be known by one another and their instructor, and, in many cases, students wrote about their identities in ways that diverged from typical mathematics write-ups, for example, by interacting with their own families to learn the origin of their names, and by engaging in storytelling around the ways in which many of them evolved in thinking about their own names over time. These name stories – shared from families to students, from students to instructors, or from students to other students – work towards a valuing of identity that is too scarce in mathematics courses. Pairing this with a reading on anti-Black name discrimination and a video on anti-Hispanic name discrimination, as well as looking at the ways in which mathematical eponyms can function as vessels for the continued racist legacy of their namesakes, opened up a space not typical in an Algebra 2 course.

Upon analysis and reflection, I can see how the assignment that was implemented makes space for myself and my students to address each of the four areas underscored in the TODOS (2020) position statement of what we need to attend to in our struggle towards antiracism in mathematics. The knowledge of Desmos’

calculator needed to graph one’s name, move it around with sliders, and ensure that it bounces off of the surrounding box all require a nontrivial level of *technological* sophistication. The Desmos calculator was accessible to all my students, and provided them with sliders to manipulate the graphs in ways that regular calculators would not have – the technology definitely *added* to the exploration. The assessment of the activity made space for valuing ways of knowing beyond traditional mathematical content standards needed to create the moving graph: I could assess the students’ understanding of absolute value functions and their graphs while also commenting on and valuing their breadth of knowledge around their name stories and critiques of racism in naming buildings, awards, etc. What I also noticed was that students have the opportunity to provide feedback to me as to whether I showed how I valued learners’ identities as a part of a new school year in which relationship building was a particularly difficult challenge due to a distanced virtual learning environment as combined with the events of the preceding months, such as the murder of George Floyd and the protests that followed it. Finally, as mentioned earlier, numerous students discussed their families (a category broader than “parents”) in articulating their name stories: this sometimes meant explaining family traditions or discussing family members after whom students were named, and it also provoked, in many cases, discussions with family members that may not have otherwise organically arisen. This was significant to me, because rarely do activities in Algebra 2 provide space for students to bring in their families and familial knowledge.

## Conclusion

Those who deride antiracism in mathematics education too often paint caricatures of radicalized indoctrination, describe misperceived ideological shifts towards “Marxism” or “Communism,” or inaccurately invoke the term “Critical Race Theory” – not as a framework for legal scholarship but rather as a catch-all term into which they can pack privileged discomfort – in manners entirely untethered from day-to-day realities of K-12 teaching and learning. The project on absolute value functions described here is a low floor, high ceiling task – and so, too, is identity work. The floor is that we pronounce student names correctly; the reality is that many white

teachers do not, or change students' names to be easier to say, or don't see how they are complicit in racist actions when they say to students, "Wow, that's a hard one to say!" or proclaim themselves unable to get the pronunciation correct. But, we *can* learn about, and value through our actions, student identities. We can ensure students, entrusted to our care as educators, are learning about the experiences of others in the world, and we can discuss reality in a manner that enables young people to build towards a more just world while recognizing that their inherent value as human beings cannot be degraded by structural forces working against them. And the whole time, they can be learning core mathematics content. Asking students to graph their names, research and write name stories, and read about the ways in which racialized names result too often in individuals' further marginalization does not constitute the ceiling of identity work.

There is a growing sentiment among many mathematics educators that antiracism and social justice should be incorporated into mathematical learning. Yet efforts to do so are pushed off for a variety of reasons: a lack of clarity around what it means, concretely, to incorporate antiracism and social justice into mathematics education; a sense that these shifts need to be paradigmatic, or that the entire education system needs to be dismantled and rebuilt before meaningful changes can be enacted; or an ill-founded belief that antiracism and content knowledge are somehow philosophically competing against each other, such that attending to one comes at the expense of the other. But movement towards antiracist mathematics education is not a binary: it is not, and cannot be, all or nothing. Rather, we have to do all we can when we can. It is my most fervent hope that the reader comes away from this project description feeling clearer about what antiracism and social justice in mathematics education can look like, and understands that classroom and community change can be effected now—even as one works in other capacities towards societal shifts.

## References

- Berry III, R. Q., Conway IV, B. M., Lawler, B. R., & Staley, J. W. (2020). *High school mathematics lessons to explore, understand, and respond to social injustice*. Corwin Press.
- Bingham, A. (2020). The history is the history. *American Mathematical Society Graduate Student Blog*. <https://bit.ly/3M2yQ8H>
- Chao, T., Maldonado, L. A., Kalinec-Craig, C., & Celedón-Pattichis, S. (2019). Preparing pre-service elementary mathematics teachers to critically engage in elementary methods. In Tonya Gau Bartell, Corey Drake, Amy Roth McDuffie, Julia M Aguirre, Erin E Turner and Mary Q Foote (Eds.), *Transforming mathematics teacher education: An equity-based approach* (pp. 147-160). Springer, Cham.
- Dickman, B., & Nauman, E. (2020). Innovative induction and mathematical code switching. *Journal of Humanistic Mathematics*, 10(2), 258-290.
- Freire, P. (1970). *Pedagogy of the oppressed* (Rev. ed.). Continuum.
- Gallian, J. A. (2017). Seventy-five years of the Putnam Mathematical Competition. *The American Mathematical Monthly*, 124(1), 54-59.
- Gutiérrez, R. (2013). Why (urban) mathematics teachers need political knowledge. *Journal of Urban Mathematics Education*, 6(2), 7-19.
- Gutiérrez, R. (2016). Strategies for creative insubordination in mathematics teaching. *Teaching for Excellence and Equity in Mathematics*, 7(1), 52-60.
- Gutmann, A. (1993). Democracy & democratic education. *Studies in Philosophy and Education*, 12(1), 1-9.
- Jemal, A. (2017). Critical consciousness: A critique and critical analysis of the literature. *The Urban Review*, 49(4), 602-626.
- Kokka, K. (2020). Social justice pedagogy for whom? Developing privileged students' critical mathematics consciousness. *The Urban Review*, 52(1), 778-803.
- Learning for Justice. (2020). *Social Justice Standards*. <https://bit.ly/41cVpNL>
- Lorde, A. (1984). *Sister outsider: Essays and speeches*. Crossing Press.
- National Council of Supervisors of Mathematics (NCSM) & TODOS: Mathematics for ALL. (2016). Mathematics education through the lens of social justice: Acknowledgement, actions, and accountability. <https://bit.ly/2N6qVfC>
- National Governors Association Center for Best Practices & Council of Chief State School Officers. (2010). *Common Core State Standards for Mathematics*. Washington, DC: Authors.
- Quellmalz, E. S., & Hoskyn, J. (1988). Making a difference in Arkansas: The multicultural reading and thinking project. *Educational Leadership*, 45(7), 52-55.
- Shoaf, M. M., Pollak, H., & Schneider, J. (2004). *Math Trails*. COMAP.

Dickman

Stokes, P. D. (2005). *Creativity from constraints: The psychology of breakthrough*. Springer Publishing Company.

Swalwell, K. M. (2013). *Educating activist allies: Social justice pedagogy with the suburban and urban elite*. Routledge.

TODOS: Mathematics for All. (2020). *The mo(ve)ment to prioritize antiracist mathematics: Planning for this and every school year*. <https://bit.ly/3j5Yvip>

Toliver, K. (1993). The Kay Toliver mathematics program. *The Journal of Negro Education*, 62(1), 35-46.

UT News (2020). UT Diversity Initiatives Will Redefine Campus Symbolism and Will Recruit, Support and Retain Top Talent. The University of Texas at Austin. <https://bit.ly/3MoRaKE>

Wikipedia contributors. (2021). Robert Lee Moore. In *Wikipedia, The Free Encyclopedia*. <https://bit.ly/3nSvtcD>

## Appendix: First unit project What's in a name?

Below is the assignment that students received, verbatim, for our first unit project:

Consider the following graph of the word MATH:

<https://www.desmos.com/calculator/atzno2qtaa>

Clicking play on  $h$  and  $k$  will make the word MATH bounce off of the walls.

Your assignment is to create a graph that does the same, but to use your name rather than the word MATH. Please use at least one absolute value function (this may require some creativity, depending on the letters in your name!). In your submitted write-up of 2-4 pages, you will be asked to reflect on your own name story as well as to describe the process that you went through in creating your Desmos graph.

Relevant Media:

1) Name Stories: <http://www.edchange.org/multicultural/activities/name.html>

2) Names Do Matter: <https://www.learningforjustice.org/magazine/names-do-matter>

3) Facundo the Great: <https://reimaginingmigration.org/facundo-the-great/>

4) Anti-Black Hiring Discrimination: <https://www.vox.com/identities/2017/9/18/16307782/study-racism-jobs>