

# “WRITING THE WORLD” THROUGH WRITING: PRIORITIES FOR COMPOSITION RESEARCH IN SOCIAL JUSTICE MATHEMATICS

Susan Staats, Jessica Forrester, Sousada Grande, Noah Jefferson, and Vern Nelson

University of Minnesota

*This qualitative review of four internationally-distributed curricular accounts of social justice mathematics highlights ways in which the activity of writing is under-developed if students are to “write the world” with mathematics. Writing is defined as students’ linguistic expression of at least one sentence. A review of 63 lesson plans, lesson memoirs, or curricular planning guides suggests the pressing need for research on composition processes associated with students’ action steps subsequent to a social justice mathematics activity; on creative or fictional writing; and for research debate on scaffolding the act of interpreting mathematical work in justice terms.*

## INTRODUCTION

“Write just as you speak,” Freire advised his students (Freire & Macedo, 1987, pp. 48, 50). Indeed, social justice mathematics classrooms usually are portrayed as lively places filled with speaking, negotiation, and purposeful mathematical investigation (e.g., Gutstein & Peterson, 2005). However, the modalities of reading and writing have their most explicit development in social justice mathematics as theoretical constructs, metaphors for agentic processes in which students “read the mathematical word” in order to “write the world with mathematics” (Gutstein, 2016). Though transformational, this model belies the complexity of social justice mathematics writing. Literal writing is fundamental to the social justice mathematics project, yet is barely reported in mathematics education scholarship.

Students write mathematics in multiple forms such as equations, graphs, diagrams, explanations of methods, autobiographies, recasting many received discourses to make mathematics intelligible, for self or for others (Barwell, 2018). Furthering Barwell’s position, in social justice mathematics classrooms, students write not just for self and for others but *with* others and *about* others, too. This significant responsibility of telling others’ stories is intended to help students change the world. The act of writing is therefore both prominent and erased in social justice mathematics, relying on a kind of “theory hope,” (Fish, 1989, p. 342) that if we do valuable things in the classroom, valuable things for humans are likely to happen later. Mathematics education scholarship could productively deconstruct the metaphor of writing into operational terms to better inform pedagogical action.

As a beginning point, this paper offers a qualitative review of stances towards writing in several internationally-distributed social justice mathematics curricular accounts.

We use a focused definition of writing: students' linguistic expression in the form of a sentence or a broader rhetorical form. When one writes a numerical answer or an equation, the social meaning is unspecified, but writing a sentence requires taking a moral or agentic stand on how the world works (van Leeuwen, 2008). Our research question, "In what ways are acts of writing and their consequences under-developed in social justice mathematics curricular accounts?" allows us to suggest priorities for future research on social justice mathematics composition.

## **LITERATURE REVIEWS**

Within the comparatively rare research reports of social justice mathematics learning (Kokka, 2017), several dimensions are especially relevant to issues of writing. Students' learning may differ based on aspects of their social identities that are either privileged or marginalized and on whether the teacher shares life experiences with the students (Esmonde, 2014; Brantlinger, 2013). Students occupying privileged positions may find their stereotypes of marginalized people reinforced (Esmonde, 2014), or they may learn to conduct "display" of justice orientations rather than to critique the systems that provide them with advantages (Larnell et al., 2016). Social justice mathematics can produce feelings of sadness for marginalized students, who may come to prefer traditional math content and pedagogies (Brantlinger, 2013; Kokka, 2017). These complexities of social justice mathematics learning, and by extension, writing are amplified in superdiverse classrooms that bring together students of varied cultural histories or economic conditions. What it means to write for self, for others, with others and about others involves hidden potentials and vulnerabilities that have barely been addressed in mathematics education research.

Composition studies offer three interrelated orientations to researching and teaching writing that provide accessible entry points for social justice mathematics scholars: text-oriented, writer-oriented, and reader-oriented approaches (Hyland, 2015). Text-oriented approaches focus on the structure of writing rather than the writers' activity, but nonetheless involve social considerations such as genre, as when a student writes a persuasive, math-focused letter to a newspaper editor. Writer-focused approaches attend to authors' creative expression, to cognitive problem-solving processes, or to the autobiographical or material situation that influences text production. An ethnographic or interview-based study of intersectional identities of social justice mathematics writers could grow from this research tradition. Finally, reader-oriented approaches engage the sociality of writing through attention to communities of writers, intertextuality, and roles of power and ideology in writing processes.

## **METHODS**

To understand the breadth of uses of writing in social justice mathematics lessons, we reviewed four, formally-published, internationally distributed resources spanning primary through secondary grade levels:

*High School Mathematics Lessons to Explore, Understand, and Respond to Social Injustice* (Berry III et al., 2020)

*Rethinking Mathematics: Teaching Social Justice by the Numbers* (Gutstein & Peterson, 2005)

“*Mathematics,*” in *Textbooks for Sustainable Development: A Guide to Embedding* (Wagner et al., 2017)

*Teaching About Gender Diversity: Teacher-Tested Lesson Plans for K-12 Classrooms* (Woolley & Airton, 2020).

Our review of these accounts is neither comparative nor evaluative. Each is a successful and valuable contribution to social justice mathematics pedagogy. Instead, we reviewed them to compile a wide range of representations of writing in social justice mathematics activities. Within these sources, we reviewed 63 chapters, lesson memoirs, lesson plans, and for Berry III et al. (2020), publicly-available worksheets connected to many of the chapters. Data saturation was judged when an additional review of cross-disciplinary lessons in Gutstein and Peterson (2005) and a random selection of 20% of the lessons in Stocker (2017) did not generate new types of writing. A limitation of the method is that we can comment only on the lessons as presented. Focused attention towards writing might have occurred without being reported for the mathematics education audience. Although these four publications comprise a relatively small sample of formally and informally available curricular sources for social justice mathematics, the review was sufficiently detailed to generate useful perspectives on writing in social justice mathematics curriculum.

Using the sentence-level definition of student writing, we excluded activities that appeared to result only in a calculation, a graph, an equation or related mathematical representations, or a list of words. We excluded cases in which students spoke and the teacher wrote some of their words on the classroom board. We wanted to understand cases in which writing is under-imagined or taken for granted in the curricular documents, and so we included cases of “implicit writing,” in which we were fairly certain that students needed to write in order to accomplish the task. Implicit writing often happened when students created a formal presentation for powerful stakeholders. We believed that in these cases, students would likely spend time preparing their presentation using written sentences.

Initially, we used provisional codes drawn from research on mathematics writing, contextualized mathematics, and our practitioner knowledge of social justice mathematics teaching and curriculum (Barwell, 2018; Miles et al., 2020). Each of the 63 accounts were read by at least two research team members, with coding differences resolved through discussion and consensus. The full team met regularly to refine the coding process through constant comparison and to review each other’s analytical memos. Final coding collected information on types of writing, authorship groups, audience, purpose, and whether the writing was explicit or implicit.

## FINDINGS

The four sources varied substantially in their attention to writing, doubtless due to their varied form and purpose: highly detailed and scaffolded lesson plans, generalized lesson plans, memoirs of particular class sessions, and curricular design suggestions. Our analysis identified 151 cases of social justice mathematics writing (Table 1).

<b>Primary type of writing</b>	<b>Subtype of writing</b>	<i>Rethinking Math</i>	<i>Social Injustice</i>	<i>Sust. Develop.</i>	<i>Gender Diversity</i>
<b>Reflective writing</b>	Individual reflection	23	25	2	3
	Interpret/explain math	7	4	6	1
	Scaffold interpretation (including worksheets)	3	14		4
<b>Group writing (not for action)</b>		2	1		
<b>Creative or fictional</b>			1		
<b>Public-facing writing</b>	Persuasive or informative	9	2	1	1
	Promoting action	5	25		
<b>Other</b>		3	9		
<b>Cases of writing</b>		<b>52</b>	<b>81</b>	<b>9</b>	<b>9</b>

Table 1: Major types of writing in social justice mathematics lessons

Reflective writing was the most common form of social justice writing. This could involve activities such as journaling or writing briefly to externalize knowledge of a social situation; sometimes this writing was shared with others and sometimes it was only available to the student author. The reflective writing reported in these sources rarely (only once) focused solely on mathematics—otherwise, it always involved social knowledge. Two other forms of social justice mathematics writing are also common: writing that scaffolds or guides students towards expressing a social judgement, primarily within Berry III et al (2020) worksheets, and writing that promotes action—sometimes action at the level of the classroom itself, but usually at a greater distance such as the school or the community. Writing to promote action often involves implicit collaborative group writing. Rare forms of social justice mathematics writing include

collaborative group writing that is not intended to promote action, and writing that is creative or fictional. Of the many types of social justice mathematics writing identified in Table 1, we focus our current discussion to highlight pressing research priorities.

## **DISCUSSION**

Our goal in this paper is to articulate priorities for future research rather than to complete the analysis of any of these types of writing. Our discussion is framed by the conviction that writing and the teaching of writing are fundamentally social processes (Lee, 2000):

the discourses in which we teach—in which we and our students write, speak, and represent our “selves,” experiences, and our teaching—are already political, already historically and socially situated (p. 37).

The reader-focused tradition within composition studies is the most clearly committed to this social analysis, but depending on the grain-size of the writing and particular epistemological issues arising in socially-focused mathematics writing, the other traditions of text- or writer-orientation may also prove useful to future studies of social justice mathematics writing (Hyland, 2015).

Text-oriented writing research could frame a needed debate on the role of interpretive scaffolding in social justice mathematics lessons. Scaffolding from mathematical activity to social interpretation, the moment in which we say or write a sentence about what a particular kind of mathematical work means for humans, is an epistemological singularity. In this moment, discourses of mathematical factuality must interact with the contingencies of the experiences and justice orientations of all the immediately involved authors. The following worksheet question is an example of explicit scaffolding, to be completed by student groups, on the crisis of racial discrimination in police traffic stops in the United States that all too often lead to extra-judicial killings of Black people:

In this study, \_\_\_\_ percent of the people stopped were Black, while \_\_\_\_ percent were white. In the previous activity, we learned that looking at only Black and white people in Oakland, \_\_\_\_ percent are Black and \_\_\_\_ percent are white. From this I can conclude / wonder / observe (choose one) \_\_\_\_ because \_\_\_\_ (Raygoza & Gorrin, 2020).

It was the last sentence that caused this activity to be coded as “writing” for this project. There is a brief mismatch of a group activity phrased as “I can conclude / wonder / observe”, so that substantial and hidden justice negotiation needs to take place to complete this text-focused task. The prompt invites perspectives in a relatively open, non-impositional manner. We do not criticize the form of this prompt, but we call attention to the fact that the process of social interpretation is, literally, a blank, and that this blank is writ large in social justice mathematics research. As researchers, we do not know what it means to pass from the discourses of percents to the discourses of

justice. We feel that scaffolding justice interpretation through cloze sentences or a sequence of brief guiding questions is likely to be a field for rich debate.

An exceedingly rare type of social justice mathematics writing is any type of writing that deviates from a factual, argumentative or analytical frame—creative writing as fiction, poetry, or brief but carefully composed messages such as the caption of a meme. Hyland categorizes writing that is expressive or that draws upon the authors' autobiographies within writer-focused research traditions, but social process approaches are also relevant (Lee, 2000). The single case identified through our coding approach asked student groups to write a scenario after learning about types of social resistance:

Task each group with crafting a scenario (approximately one paragraph long) about a student or students engaging in one of the four types of resistance. The story can be entirely fictional, or it can be inspired by their own or other classmates' or schoolmates' stories (Raygoza, 2020, p. 77).

Raygoza provides some emotional space for students to share personal knowledge outside of a factual or autobiographical frame. Fictional and expressive writing can provide more flexible and explicit merging of social voices and perspectives than argumentative or declarative frames, allowing students more genuinely to “write just as they speak;” they may engage a wider range of student talents in social justice mathematics classes; and they may produce public-facing messages that could move audiences toward action. Staats (2014) provides additional examples of students' creative writing that engages their in-class mathematical learning.

Among the classes of writing in Table 1, writing with the goal of promoting social action is arguably the closest step towards “writing the world with mathematics.” However, this vitally important aspect of social justice mathematics writing displayed several under-elaborated pedagogical dimensions. First, students seem to present the social messages of their mathematical work without presenting the mathematical reasoning itself. Explaining mathematical reasoning was required in only eight of the 30 cases of writing for action. This poses a pedagogical question: in presenting mathematically-informed calls for action, should students be prepared to explain their mathematical work or even to “teach” the mathematics to their audience?

Writing for social action is underspecified in other important ways, too. Half the time, writing for action was coded as “implicit” (14 out of 30 cases)—high stakes activities such as presenting to community or political figures seemed to require preparatory writing, but neither the prompt nor the activity of writing were described. Frequently, in 21 of these 30 cases, writing for action was conducted by groups of students rather than by individuals. Some of the persuasive or informative cases of writing involves groups of students presenting their findings to their class, but apart from these, mentions of collaborative writing groups were rare. This perhaps represents lost opportunities to practice collaborative writing before composing action steps for others. Measured against the potential learning vulnerabilities posed by social justice

mathematics (Brantlinger, 2013; Esmonde, 2014; Larnell et al., 2016; Kokka, 2017), there is a significant research need to understand and to support more closely these communities of social justice mathematics writers as they negotiate written action steps. Future research on these aspects of mathematical writing for social action could draw upon reader-focused composition studies of collaborative writing groups and of writers' engagements with power and ideologies.

## CONCLUSION

Torre and Fine document a young Black man's public presentation of quantitative analysis of racial inequality in school suspension data—a de facto form of racial educational segregation—to a series of school principals and other public stakeholders (2008). Some received his presentation openly, and many others resisted his analysis, disputing the validity of the data. Notably, the researchers were present and documented the entirety of this action step. The young man felt supported or legitimized by the “power of the aggregate,” knowing that quantitative evidence upheld his position (2008, p. 413). We can only imagine that his classroom and research community was also a supportive aggregate throughout his action experiences. This story, reported from outside the field of mathematics education, speaks to the intense need for care, attention and support for students as they develop and deliver writing that might have the potential to “write the world with mathematics” (Gutstein, 2016) through stories written for self, others, with others and about others. Future social justice mathematics research will do well to bring the trope of writing into pedagogically-guided reality in social justice mathematics classrooms.

## References

- Barwell, R. (2018). Writing in mathematics classrooms. In A. Bailey, C. Maher, & L. Wilkinson (Eds.), *Language, literacy, and learning in the STEM disciplines* (pp. 101-114). Routledge.
- 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.
- Brantlinger, A. (2013). Between politics and equations: Teaching critical mathematics in a remedial secondary classroom. *American Educational Research Journal*, 50(5), 1050-1080.
- Esmonde, I. (2014). “Nobody's rich and nobody's poor ... It sounds good, but it's actually not”: Affluent students learning mathematics and social justice. *The Journal of the Learning Sciences*, 23, 348-391.
- Torre, M., & Fine, M. (2007). Theorizing audience, products and provocation. In P. Reason, & H. Bradbury (Eds.), *The SAGE Handbook of action research: Participative inquiry and practice* (pp. 407-419). Sage.
- Fish, S. (1989). *Doing what comes naturally: Change, rhetoric, and the practice of theory in literary & legal studies*. Duke University Press.

- Freire, P., & Macedo, D. (1987). *Literacy: Reading the word & the world*. Routledge & Keegan Paul.
- Gutstein, E. R., & Peterson, B. (Eds.) (2005). *Rethinking mathematics: Teaching social justice by the numbers*. Rethinking Schools.
- Gutstein, E. R. (2016). “Our issues, our people—Math as our weapon”: Critical mathematics in a Chicago neighborhood high school. *Journal for Research in Mathematics Education*, 47(5), 454-504.
- Hyland, K. (2015). *Teaching and researching writing*. Routledge.
- Kokka, K. (2017). *Social justice mathematics: Pedagogy of the oppressed or pedagogy of the privileged? A comparative case study of students of historically marginalized and privileged backgrounds* PhD Manuscript. Harvard Graduate School of Education.
- Larnell, G., Bullock, E., & Jett, C. (2016). Rethinking teaching and learning mathematics for social justice from a critical race perspective. *Journal of Education*, 196(1), 19-29.
- Lee, A. (2000). *Composing critical pedagogies: Teaching writing as revision*. National Council of Teachers of English.
- Miles, M. B., Huberman, A. M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook*. Sage.
- Raygoza, M. C. (2020). The mathematics of transformational resistance. In R. Berry III, B. Conway IV, B. Lawler, & J. Staley (Eds.), *High school mathematics lessons to explore, understand, and respond to social injustice*. (pp. 75-80). Corwin Press.
- Raygoza, M. C., & Gorrin, K. (2020). “BBQ Becky,” policing, and racial justice. In R. Berry III, B. Conway IV, B. Lawler, & J. Staley (Eds.), *High school mathematics lessons to explore, understand, and respond to social injustice*. Corwin [https://resources.corwin.com/sites/default/files/lesson\\_7.3\\_worksheet\\_1.pdf](https://resources.corwin.com/sites/default/files/lesson_7.3_worksheet_1.pdf)
- Staats, S. (2014). The interdisciplinary future of mathematics curriculum. *For the Learning of Mathematics*, 34(2), 7-9.
- Stocker, D. (2017). *Maththatmatters: A teacher resource linking math and social justice*. Canadian Centre for Policy Alternatives.
- Van Leeuwen, T. (2008). *Discourse and practice: New tools for critical discourse analysis*. Oxford.
- Wagner, D., Warmeling, A. F., Isoda, M., Sinclair, P. (2017). Mathematics. In *Textbooks for sustainable development: A guide to embedding* (pp. 35-63). Mahatma Gandhi Institute of Education for Peace and Sustainable Development.
- Woolley, S., & Airton, L. (2020). *Teaching about gender diversity: Teacher-tested lesson plans for K-12 classrooms*. Canadian Scholars Press.