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## On "Icky" Data, the Political Classroom, and *Towards Equity and Social Justice in Mathematics Education*: A Conversation with Tonya Bartell

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## On "Icky" Data, the Political Classroom, and *Towards Equity and Social Justice in Mathematics Education*: A Conversation with Tonya Bartell

### Abstract

Tonya G. Bartell, ed. 2018. *Towards Equity and Social Justice in Mathematics Education* (Switzerland: Springer International Publishing) 341 pp. ISBN 978-3319929064.

This brief interview with Tonya Bartell introduces *Towards Equity and Social Justice in Mathematics Education* to the *Numeracy* audience. The interviewers also discuss with Tonya connections between quantitative literacy and mathematics for social justice, particularly in the context of US K-12 schooling. Tonya shares her perspective on topics ranging from the placement of quantitative literacy in K-12 mathematics education and how one might get started in incorporating a social justice lens into their teaching to paradigms for research in education.

### Keywords

numeracy, social justice, mathematics education, equity, interview

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### Cover Page Footnote

Samuel Luke Tunstall is a Ph.D. candidate in mathematics education and University Distinguished Fellow at Michigan State University. His dissertation centers on the dynamic relationships between numeracy proxies and numeracy practices. Oyemolade "Molade" Osibodu is a Ph.D. candidate in mathematics education at Michigan State University. Her dissertation centers around understanding how a pan-African youth community draws on mathematics primarily to make sense of key critical social issues facing their individual communities, countries, and continent. Tonya Gau Bartell is an associate professor of mathematics education interested in exploring teaching practices that promote mathematics learning for all students. Her research focuses on issues of culture, race, and power in mathematics teaching and learning, with particular attention to teachers' development of mathematics pedagogy for social justice and pedagogy integrating a focus on mathematics, children's mathematical thinking, and children's community and cultural knowledge.

Quantitative reasoning yields power in multiple ways, and so access to its use engenders conversations about social justice. In the brief conversation below, Oyemolade Osibodu and Luke Tunstall discuss a new volume, *Toward Equity and Social Justice in Mathematics Education* (Bartell 2018), with its editor, Tonya Bartell, Associate Professor of Teacher Education at Michigan State University. The purpose of the interview was to hear Tonya's perspective on the volume, as well as to connect conversations about numeracy with those about teaching mathematics for social justice. Portions of the interview were edited for readability.

## The Conversation

**Oyemolade:** Tonya, can you share a bit about your background in getting to where you are today?

**Tonya Bartell:** I was initially a high-school mathematics teacher. One of the most meaningful turning points for me and my teaching was helping found an alternative school for students that were kicked out or dropped out of the regular high school. They often self-identified as “non-math” or “non-school” people, but they were the brightest, most wonderful students I ever worked with. And so it was there that I started to notice that we could engage with curriculum in different ways. We examined the mathematics of a skate park, and they were doing trigonometry. We actually built the skate park, and these were kids that couldn't pass an eighth-grade standardized mathematics test and yet were doing advanced trig around right-angled triangles. The way that they were treated in schools by their peers and by other teachers was striking to me. Teaching mathematics for social justice is really about disrupting understanding and disrupting these systems. And it's a lot less about balancing the mathematics. It's a lot more about us as human beings.

This was in a predominantly white district, and so we didn't see patterns along lines of race. It was mostly along the lines of class. Those experiences led me to thinking about graduate school, and when I was thinking about graduate school, it just so happened that the Diversity in Mathematics Education Center for Learning and Teaching (DiME) was up and running and taking its first group of applicants. That was just a natural fit for me.

For my dissertation, I asked, “What does it mean to teach mathematics for social justice, and how do we support teachers in developing that in their own practice?”

**Luke:** Can you tell us about the process of conceptualizing your new edited volume and what it came out of?

**Tonya:** In 2015, Kristin Bieda and I had the pleasure of hosting the North American Chapter of the International Group for the Psychology of Mathematics Education (PME-NA) here at Michigan State University. I found myself drawn to sessions that were about equity and social justice, but I didn't get to attend any of them because we were so busy with conference organization and implementation. This became an opportunity for me to say, well, "What is happening in our field right now?" So, if I pulled all the various people that presented on equity and social justice and invited them to expand on what they presented, then we'll have sort of a picture of the kinds of questions that mathematics educators are grappling with in particular for PME-NA, and that's a certain slice.

**Oyemolade:** Why do you feel like this is an important addition to the conversation around teaching for social justice and equity? Can you provide an overview of the book?

**Tonya:** The people that wrote the chapters in this book are phenomenal scholars who push our thinking, and so the more people that can have access to and read the things that they're thinking about in the work that they're doing, then the better. This reaches more people.

The first section was around theoretical and political perspectives on equity and justice. And I think for me, those were broader pieces pushing us to think about mathematics education differently ... about social justice differently. I would say that they were sort of more umbrella pieces, like let's rethink the whole idea of "misconceptions." Let's rethink what we even mean by equity and mathematics education by looking at its history. The second section was on identifying and connecting to family and community funds of knowledge—an important thread of work that continues in our field. So, how are we continuing to take up and think about connecting to families and communities in the instruction and the work that we do? The third section was focused on student learning and engagement in classrooms, and so if we start to think about equity and social justice and mathematics education in the context of schools and classrooms, what's some of the work that we're doing in this space? And then the last section moves into teacher education and how we support teachers in doing this work in their classrooms.

**Oyemolade:** Are there particular chapters that you think might be helpful as somebody who might be starting to think about social justice in their work?

**Tonya:** So, if I think about the *Numeracy* audience in particular, immediately the chapter from Laurie Rubel and colleagues comes up. If you kind of want to get a sense of some of the history and the lay of the land, that might be a nice chapter. I

think it depends on the kind of work that you're doing. If I think about the *Numeracy* audience, I think about Aditya Adiredja's (2018) chapter on why do we label things as misconceptions? Is there such a thing as a misconception? Is that all conceptions? What's the danger of that label, especially when we think about misconceptions with respect to identity politics and the nature of who we say is or is not good at mathematics? Aditya raises some really interesting questions.

**Luke:** Next, I'd like to try to bridge some of the conversations happening in the book with some of those that are happening in conversations about numeracy. If we look at existing literature in *Numeracy*, we often see that the student population of interest is adults. Something that's puzzled me is why constructs like numeracy, quantitative literacy, and quantitative reasoning don't appear much in conversations about K–12 mathematics education. Do you have any thoughts on why that might be the case?

**Tonya:** I have a few thoughts on that. One is going back to the history of schooling and the ongoing debate of what counts as school mathematics versus, let's say, applied mathematics. Quantitative literacy was often in the quote-unquote business mathematics class or the elective class, and that's been a debate. So you can go back to the origins of schooling where there's been this positioning of quantitative literacy and any sort of applied mathematics of any kind—any contextual math—as less than the pure, absolute mathematics. Which I don't believe in, but some people do. So that's, I think, one of the divides. And I also think that, as soon as you open up this idea, that of quantitative literacy or numeracy, one asks, "What does that mean?"

If we're going to look at data, suddenly the data that we look at feels controversial in certain ways. If we really want to look at authentic data, there's more opportunities for things to get political, for things to get uncomfortable, and for things to tap different perspectives. And that's harder; thus many teachers say, "I just want to focus on the mathematics, and not get into all that other icky stuff." I think that those are some of the pressures that are at play. I think there's also this "young and old," like adult-child, divide that we have. You have to be mature before you can understand the world that you live in. And so we wait and then we just really want to lay the foundations of mathematics first and sort of save that other stuff for later. I mean all of these things [contribute to why numeracy doesn't appear much in K–12 conversations]. These are patterns and assumptions I disagree with, but they exist. Young children are absolutely engaged with the world around them and our classrooms are political whether we think they are not.

**Luke:** I know this is a broad question, but do you see elements of numeracy or quantitative literacy in the Common Core State Standards for Mathematics, for example?

**Tonya:** Somewhat is maybe the best answer that I can give, and I think that it depends on your interpretation of quantitative literacy or numeracy. Generally speaking though, I would still say no, not quite. I would say that the way that a lot of the pieces are getting taken up in the field are further marginalizing quantitative literacy and numeracy in certain circles. So I think there's opportunities for those interpretations out of the Common Core, but when I walk into a school, that's not what I'm seeing manifesting in classrooms. I'm seeing it in the research community, but I'm not seeing it in classrooms. There's some work to be done.

**Oyemolade:** In what ways do you not see it manifesting?

**Tonya:** Many classrooms still look very—what I would call—traditional in the sense, you know? You learn your multiplication tables, engage in mathematics worksheets, and focus on procedural efficiency—less on any sort of contextual understanding of numbers and how they relate to each other in particular contexts, or looking at a newspaper article and thinking about what that means mathematically versus what that means in social studies. So I think that we have a long way to go with respect to seeing those changes in our schools.

**Oyemolade:** When I think about quantitative literacy even here at Michigan State, good quantitative literacy courses are positioned numerically at the bottom [of the course offerings], which is interesting given that Luke and I taught a course a couple of summers ago, and I thought that all we learned was extremely important.

Next, we wanted you to read the mission statement of *Numeracy*—found on its website. As someone with a professional background in mathematics education, what comes to mind when you hear this mission statement?

**Tonya [after hearing statement]:** It's actually a very positive [statement] that this is going back to some of the initial ideas of understanding the world that we live in ... critiquing that and reflecting on that. The personal application is going to look different for everyone, right? There's not a sort of one-size-fits-all approach, and I think that understanding the context and situations in which we live is at the heart of disrupting the inequities that we see. And so being able to say, this data, or whatever is at hand, is generated or being written from a particular perspective ... is being interpreted from multiple perspectives. And so with that in mind, what are the implications of those perspectives on what we believe about each other? How

we treat each other? How we design schooling? How all of these things are perpetuating inequities, or not?

So I think there's a lot of potential there. At the same time, I wonder about certain phrases like the nature of the types of evidence. I think it said empirically-based evidence or evidence-based, and so I wonder what counts as evidence. Often, work around social justice and mathematics is marginalized because of differing views of what counts as evidence. So if you have someone telling you about their marginalization in a numeracy class at the secondary level or at the undergraduate level, are we listening to that? Are we counting that as evidence of a need to change the approaches that we might have to numeracy in undergraduate education, for example?

**Luke:** That's really interesting. How would you position the work that you do within the various research paradigms in education?

**Tonya:** I tend to read and do qualitative work. I tend to be drawn to qualitative work, but right now as a co-editor of *The Journal of Teacher Education*, I'm reading everything you can imagine, so quantitative, mixed methods, qualitative, empirical, theoretical, etc. It's all interesting, it all contributes to our field, and I think we need all of it. I don't think that we would benefit as a field if we chose any single methodology as being "the" approach that we should take.

**Oyemolade:** Switching gears a bit, it's not uncommon to hear someone say something like, "I include social justice projects in my class." In your view, have those words lost their meaning at all? Or is this a positive direction?

**Tonya:** This happens continually, right? I think Michael Apple (1996) talked about it, about terms being sliding signifiers and so whether that's equity or culture or social justice, they start to take on broader and sort of ubiquitous meanings. And so what happens is you see social justice taken up in a lot of different ways, and it loses the critical meaning from which it was initially developed. So then often what we see is that a new term replaces that old term, but the push and the drive and the focus is still very similar and very rooted in a long history of activism and progressive education. So yes, it has been taken up as a banner, in that if I'm doing work I should probably have social justice in here somewhere without necessarily getting into the nuance of how one is using it and why one is using it.

**Oyemolade:** So what would you suggest as a way that we might try to avoid doing that?

**Tonya:** I don't think moving on to another term really benefits us. We're just sort of replaying the cycle. I think what I'd rather see is whatever term you use, define it, conceptualize it, be required to think about it from different perspectives, you know. Think about if I use the term social justice, being really clear about my positionality as a white woman who grew up in rural Minnesota who has this, you know, alternative education as a teacher sort of background that's feeding into my ideas of social justice. And so I'm using it in particular ways. I see things in particular ways and I think we have an obligation as a field to make sure that's part of what we're publishing. So even if it's a quantitative study, I want to know something about who you are and the lens that you're bringing and how that might be affecting your conceptualization of the terms that you're using. Even a term like numeracy or a term like mathematics. Tell me a little bit about how you're thinking about that when you are doing your work.

**Oyemolade:** As we wrap up, for those—especially in the university community who are interested in issues of justice, but who may not know where to begin—do you have any resources that they might engage in as they start?

**Tonya:** I'm happy to say that there are many. First of all, that's something that we haven't always been able to say. When I start thinking about what teaching mathematics for social justice might look like in schools or classrooms, I think about the work of Eric Gutstein and Bob Peterson, and the *Rethinking Mathematics* books that they have developed through *Rethinking Schools* (Gutstein and Peterson 2013). When I think about questions of quantitative literacy and numeracy and undergraduate education, I think of Marilyn Frankenstein's work, specifically with adults. And so there's some nice entryways in that sense.

Questions I have as you are getting started—especially if you are thinking about the design of your quantitative literacy course—include: Are you thinking about the positioning of the quantitative literacy course in this broader picture? Are you thinking about your own biases? For example, for me as a white woman who grew up lower middle-class in rural Minnesota, I have to read about class and about whiteness. I have to read about anti-racism (e.g., Pollock 2004; Wise 2011; Coates 2015). I have to learn about those things and continually learn about those things. Reading other people's stories drew me into this work because it had this human component that I really appreciated.

**Oyemolade:** I appreciate that, because it sounds like the starting point for people who want to start this work is not just to think about, "Oh, how do I do this in my class?" but to spend some time really thinking about their own positionality and learning. That's great.



**Tonya:** Yeah. Like what does [it] even mean [for positioning] to even be happening in a class? I mean, it's like I wasn't ready to read about implicit bias until I understood explicit bias. And then ... there comes a time when you're ready to start thinking about implicit bias. The work of Dan Battey and Luis Levya (2018), included in the book, in particular is right on the cusp and pushing me to think about the implications of this for what we do on a daily basis.

**Luke:** Wonderful. Wrapping up, do you have any parting questions or comments for the *Numeracy* community to consider?

**Tonya:** So, two thoughts come to mind. One is that we have seen in our field that when people take up this critical work, they may be attacked by organizations that disagree with them. I think it's important to look at the kinds of attacks that have been set against Rochelle Gutiérrez (Singh 2017), Laurie Rubel (Iqbal 2018), and the responses to those as ways in which we perpetuate and are part of what's happening to our colleagues and the ways in which we can disrupt and stop what's happening to our colleagues. So, I think sort of being aware of that political landscape is important. And also, I would just really like to hear people's reactions to my thoughts here. This is my quick take on some of these ideas, and it's not a nuanced discussion in the way that further conversation would allow. And so I hope that people will respond and have discussions and continue to think about this work.

## Excerpt

Below is an excerpt<sup>1</sup> from Chapter 12 of *Toward Equity and Social Justice in Mathematics Education*, titled “The Micro-Politics of Counting” and written by Annica Andersson and David Wagner.

### **Introduction**

When you count, you have to decide what counts and what does not count. In this chapter, we identify how such micro-political moves are manifested in language and how language shapes the moves. People use and invent language to make distinctions that they want to make in their interactions. This general phenomenon is also at work in mathematical problem-solving contexts, including out-of-school problem contexts for which mathematics is used. Thus, in our research, we look for language strategies that enable and/or direct the process of deciding what to (not) count. We consider how such communication strategies form political acts. This

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<sup>1</sup> pp. 191-194

kind of analysis could, and probably should, be done with any mathematics, but we choose counting here because it is the most fundamental mathematical act.

We begin this chapter unconventionally; we begin with reflections on a counting exercise, which we would encourage others to try some time with their friends or others. Our exercise involved trying to decide among ourselves who has been in the most countries. We had to count the countries we visited, of course. Counting countries seems quite straightforward at first, but it doesn't take long to find controversy. For example, both of us have visited Yugoslavia before it was divided into smaller countries. Shall we count one for Yugoslavia because it was one country when each of us was there? Or can we count three or four (different for the two authors) for the current countries represented by parts we visited? We may decide it counts as one, because it was only one country when each of us was there.

A clearer question would be to ask how many national political entities we have visited. Germany complicates such reasoning. We have both spent time in East Germany, West Germany, and modern, unified Germany. Shall we count all three of these entities that we have visited even though it was never three countries (in our lifetimes)? Furthermore, one of us traveled through some countries by train. Does it count to travel through a country on a train if one doesn't get off the train? What about flying over a country? Or landing in a country to refuel but staying on the plane? What about a one-hour stop that includes a passport stamp? Or crossing the border and being escorted out by police? And then there are disputed territories, like the West Bank (of the Jordan River), or First Nations (Aboriginal lands never conceded to colonialist governments). These were just some of our political controversies when counting countries. Others who try this experiment are likely to have some of these controversies and others.

When we count, we have to decide what counts and what does not count. For example, what counts as being “in a country,” and what counts as “a country?” This is political because different people will have unique reasons for wanting a country to count or not. The status of a country is a question in geopolitical dialogue—for example, Palestine has recently been recognized as a country by the United Nations—but the definition of a country is also a political question in a group of friends who may want to one-up each other. It is possible that someone has not traveled outside their country, which highlights yet another political aspect. Comparing numbers of countries visited may privilege people for whom travel has been possible and thus exclude others (if traveling is considered to be a good thing in the light of global environmental sustainability). Nevertheless, someone has to decide what counts and that decision sets up certain people's experiences as normative. For example, if a group of friends tried this exercise on our behest, we would be the ones deciding what is normative, but the group may make the question their own as they start dialoguing about it. Maybe it would be better to count our meaningful interactions with diverse people, or it may be even more appropriate to

reflect on the qualities of those interactions instead of quantifying them. Indeed, it is possible to travel to many countries and remain insular.

### **Research on Counting**

Counting has fascinated researchers for some time. One of the oldest domains in experimental psychology investigated children's counting abilities—called numerosity (Luwel, Lemaire, and Verschaffel 2005, p. 449). Many studies have investigated people's ability to identify the number of objects in a group without counting (Dehaene 1997)—called *subitization*. Subitization and numerosity are complemented with operations on number to form number sense (though this term is used in diverse ways). Others have compared human and animal number senses (e.g., Barrow 1992). Linguists have been interested in counting as well, with a focus on the words used for numbers—for example, Gordon (2004) reported on the limited vocabulary for numbers among the Pirah. Amazonian Indians of Brazil, and Owens et al. (2017) reported on the rich vocabulary for numbers in Papua New Guinea.

Mathematics education research covers these interests as well, generally with a pedagogical orientation. A large body of research has distinguished between cardinal and ordinal numbers especially in preschool education—for example, Bruce and Threlfall (2004) and the special issue of *Mathematical Thinking and Learning* (2015), “The Acquisition of Preschool Mathematical Abilities: Theoretical, Methodological and Educational Considerations.” Tangentially, our literature review directed us to a rich research body on chimpanzees' learning of cardinal and ordinal numbers (Biro and Matsuzawa, 2001; Matsuzawa 2003) and on parrots counting (Pepperberg 2006). We note here that the choices of whose counting to research is political; why did the researchers choose chimpanzees and parrots to research?

Mathematics education research goes beyond the cardinal-ordinal distinction. Wagner and Davis (2010) distinguished between number sense and quantity sense, and they provided approaches to teaching to support the development of this quantity sense. Sinclair (2015), who focused on embodied learning and technology, proposed “an alternate way of approaching number that places much more emphasis on ordinality, rather than cardinality, and that highlights number's temporality” (p. 347). Also Radford's (2014) research on gestures supported this claim that counting is an embodied, but also cultural, activity.

There are politics involved in any of this research. Some of the researchers recognized the politics in their work. For example, Wagner and Davis (2010) suggested that people may numb themselves from disparities by working with numbers without awareness of their quantities. And as noted above, there is politics in choices about what to research. This is in line with Frankenstein's (2008) presentation of ways to help people understand large quantities in political contexts.

Similarly, we note that there are politics involved in our choices for this chapter; we acknowledge that we chose to do this in Canadian English homogeneous first-language contexts, which may suggest or support the idea that English is a critically important language, and that children's experiences in Canada are important for others to know about. Most typically, researchers do not identify the politics in their work. For example, when languages are compared by the extent of their numbers, it is a way of identifying simplicity and development in the compared cultural contexts, whether or not that was the intention of the researchers.

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Questions of equity, social justice, and mathematics education were central to the discussions that led to the founding of this journal ten years ago. At that time, *Numeracy*'s mission was to advance “a society in which all citizens possess the power and habit of mind to search out quantitative information, critique it, reflect upon it, and apply it in their public, personal, and professional lives.” The push for quantitative literacy across the curriculum was democratic in that the goal was to help all students gain the knowledge and skills they need to act effectively in a world awash in numbers. For many educators, quantitative literacy was seen as an alternative to traditional mathematics curricula.

In the ten years since the founding of this journal, significant work has gone into examining math pathways, particularly in the community college sector. Led by Uri Treisman, the Dana Center Mathematics Pathways (DCMP) project mission aligns with the vision of *Numeracy* and NNN: “A working knowledge of basic mathematics empowers individuals to engage productively in a society and economy that increasingly rely on data and quantitative reasoning. Yet all too often, mathematics is an obstacle, rather than an opportunity, to students who want to achieve their career goals through higher education.”<sup>1</sup> The DCMP identified two obstacles in particular: math course content that isn't aligned to students' career and life goals, and overly long sequences of pre-college math courses.

The Carnegie Math Pathways have been designed as solutions to these problems. *Statway* combines college-level statistics with developmental math. *Quantway* focuses on quantitative reasoning and fulfills developmental requirements. While the math pathways work enjoys wide support, some mathematicians and math educators are concerned that pathways amounts to a contemporary form of tracking. For example, Robert P. Moses, mathematician and civil rights organizer, argues that learning algebra is a basic civil right. Given the role that algebra plays as a gatekeeping course in schools, young people who don't take it or pass it get shunted aside. Without algebra, Moses argues, young people, especially young people of color, are given a “sharecropper” education. As Moses put it in a speech at North Seattle Community College in February 2003, “You have a whole people who are only going to do a certain kind of work, and so they only need a certain kind of education, the sort of education really tied to menial work.”<sup>2</sup>

Bartell's new book is a welcome contribution to these lively and consequential conversations about math education. As Bartell explains in the preface, the book grew out of the 2015 Annual Meeting of the North American Group of the Psychology of Mathematics Education (PME-NE) held at Michigan State

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<sup>1</sup> <http://dcmathpathways.org/learn-about-mathematics-pathways>: retrieved from the DCMP website 12-6-18

<sup>2</sup> [http://wacenter.evergreen.edu/sites/wacenter.evergreen.edu/files/fall2003\\_0.pdf](http://wacenter.evergreen.edu/sites/wacenter.evergreen.edu/files/fall2003_0.pdf): retrieved on 12-6-18 from a newsletter published by the Washington Center for Improving Undergraduate Education in 2003 and posted on the Washington Center website