

Chapter 2

Beyond Gap Gazing: How Can Thinking About Education Comprehensively Help Us (Re)envision Mathematics Education?

Rochelle Gutiérrez and Ezekiel Dixon-Román

One cannot talk about equity these days without being politically correct. In fact, in the United States, “equity” has become an empty signifier manipulated in/through discourse (Dixon-Román, in press). For example, although many use “the achievement gap” as an important call for school accountability around needed resources and additional support for marginalized students, (e.g., Education Trust 2005), such discourse has done little more than replace “the culture of poverty” in the latest of deficit frameworks. That is, while equity issues are becoming more mainstream in the mathematics education community, theoretical framings continue to reflect equality rather than justice, static identities of teachers and students rather than multiple, fluid, or contradictory ones (Gutiérrez 2002, 2007; Martin 2009) and schooling rather than education. Whenever words like “quality,” “democracy,” and “equity” are used, we must first unpack what these terms mean and then examine who benefits from the definitions employed.

Let us consider the prevailing equity discourse in the United States: “the achievement gap.” The excessive focus that U.S. researchers place on the gap between the mathematics achievement of white, middle-class students and that of African American, Latin@¹, American Indian, working-class students, and English learners and the need to close the gap (termed “gap gazing”) sheds light on issues of access and achievement from a dominant perspective (maintaining the status quo) with little concern for how students are constructed in the process, what additional

¹ We use the @ sign to indicate both an “a” and “o” ending (Latina and Latino). The presence of both an “a” and “o” ending decenters the patriarchal nature of the Spanish language where it is customary for groups of males (Latinos) and females (Latinas) to be written in the form that denotes only males (Latinos). The term is written Latin@ with the “a” and “o” intertwined, as opposed to Latina/Latino, as a sign of solidarity with individuals who identify as lesbian, gay, bisexual, transgender, questioning and queer (LGBTQ).

R. Gutiérrez (✉)
Department of Curriculum and Instruction, University of Illinois at Urbana-Champaign,
1310 South Sixth Street, Champaign, IL 61820, USA
Tel.: +217-244-3904
Fax: +217-244-4572
e-mail: rg1@illinois.edu

skills are needed to negotiate the discursive spaces of education, and/or how power relations play out in learning. This phenomenon exists beyond the United States as well, in the form of international comparative studies. Although all comparative studies are not problematic, they continue to privilege and normalize certain groups and practices. As such, international studies that seek to compare nations can echo this preoccupation with an achievement gap. While we recognize the essentialist underpinnings of such terms as “white middle-class students” or “American Indian students,” we use these terms as they circulate in discourses and are used to position individuals in education.

In this chapter, we begin by destabilizing the equity definition implicit in the achievement gap discourse by first outlining the dangerous effects of maintaining a gap focus and then by explaining, from a Foucauldian perspective, how the “gaze” operates. From there, we turn to research on comprehensive education to highlight the many ways in which people learn or are educated outside of schooling. Finally, we examine what impact shifting our goals from “closing the gap” to “meaning making in social interactions” might have for the endeavor of mathematics education. Throughout this chapter, we argue that both relying upon discourses like the “achievement gap” and continuing to privilege schooling as the primary institution of education will ensure that students of color and other subordinate populations will continue to be left behind. We show how questioning the concepts of “equity” and “education” leads to equally important questions such as “What counts as mathematics?”—an often overlooked issue in debates about equity, access, and democracy. Considering education comprehensively in this way may offer an opportunity to better unite philosophers, sociologists, and cultural anthropologists of mathematics with those who educate broadly.

Destabilizing the Achievement Gap Discourse

The Problem with Gap Gazing

In order to better understand the meanings operating with respect to the term “equity” as well as who benefits from such meanings, we take the perspective of subordinated individuals in society (defined here as African American, Latin@, American Indian, working-class students, and English language learners). Let us consider the various ways in which the current focus on “the achievement gap” within mainstream mathematics education in the United States is problematic. First, although mainly concerned with the well-being of marginalized students, researchers who focus on the achievement gap support practices that often are against the best interests of those students (Gutiérrez 2008). That is, while documenting the inequities that marginalized students experience daily in mathematics education could be seen as the first step toward addressing hegemony, most research stops there. Examining the gap from its many angles and perspectives (what Gutiérrez calls “gap gazing”)

has done little to change the will or commitment of a nation to engage its citizens in broader forms of mathematical literacy, in part because closing the achievement gap suggests nothing is wrong with the system. Although some would argue that gap gazing seems to relate only to research studies that document the gap and not those that attempt to reduce the gap, we use the terms “gap gazing” and “achievement gap perspective” interchangeably to denote the fact that both connote a discourse that fails to consider equity beyond the narrow definition of “access.” See Gutiérrez (2008) for further elaboration.

More specifically, because gap gazing draws upon one-time cross sections of data, it offers little more than a static picture of inequities with inadequate information about how those inequities were created. In addition, achievement gap studies often fail to question the validity of measurement tools or the choice to focus on measurement. In fact, the best we can achieve under an achievement gap lens is to close the gap, to show that marginalized students can do *as well as* middle-class whites. Most researchers and practitioners fail to question the underlying assimilationist goal and the ways in which framing the problem as an achievement gap supports deficit thinking and negative narratives about marginalized students. That is, such thinking encourages researchers to focus on ways to make subordinate populations more like dominant ones. And yet, other researchers have made cogent arguments for framing the issue of equity around other kinds of gaps, including the opportunity gap (Flores 2007; Hilliard 2003), the education debt (Ladson-Billings 2006); the gap between whites and Asians (Gutiérrez 2008; Martin 2009).

Gap gazing also accepts a static notion of student identity, presuming that students can be reduced to a set of cultural markers, rather than recognizing they are constantly in flux, dependent upon the social structures and social relations in which they are engaged. By always relying upon a comparison group, the achievement gap discourse perpetuates the idea that subordinate populations cannot be studied for their own sake and/or that such populations have nothing to contribute to more general discussions or theories about education. Ignoring the largely overlapping achievement patterns of groups, the dividing practices (Foucault 1980) common in gap gazing research serve to dehumanize students.

Moreover, the achievement gap discourse provides researchers and practitioners with a “safe” proxy for talking about students of color without naming them or having to discuss the institutions of racism, classism, or politics of language that are endemic in today’s society. And, by failing to interrogate these hegemonic institutions, the achievement gap discourse perpetuates the myth that the problem (and therefore solution) is technical in nature. Finally, gap gazing relies upon narrow definitions of learning and equity, assuming both that today’s school mathematics curriculum is the one to which we should aspire and that access to an unfair system is a sufficient goal. Yet, marginalized populations have historically shunned the idea that white student achievement levels signal excellence. Instead, they have tended to hold broader standards for themselves—defining excellence with an eye toward not just doing well in school, but also maintaining cultural values and a critical attitude in their young, often privileging ties to the community over individual success (Hilliard 2003; Kurzweil 2003; Valdés 1996).

The Impact of the Gaze

Currently, the discourse in the United States around the achievement gap is so prominent and normalizing that it is almost unimaginable that students, teachers, and community members can escape its grip. In fact, we argue they do not. Subordinate students and their local communities are assaulted daily with headlines of continued or growing achievement gaps, constructing them as inferior to middle-class whites and Asians. Much of the mathematics education community is complicit in this construction of subordinate populations. In fact, when Gutiérrez first published an article on gap gazing in July 2008, a search in Google Scholar with the words “achievement gap” + “mathematics” produced 8,000 hits; today that same search produces 137,000 hits, signaling that the research community’s absorption with this discourse is not waning. Beyond the research community, our society in general seems to have bought into this achievement gap pre-occupation. The same search in regular Google produces 404,000 hits.

The focus on the achievement gap by mainstream mathematics education allows for only certain “truths” to arise (Foucault 1980; Walshaw 2007). These “truths” are not universal or fixed. Rather, they are constructed by our choice of focus. For example, in the achievement gap story, at best (by closing gaps), we can show that students of color are capable of doing as well as middle-class whites; at worst (by failing to close gaps), we reify the notion that perhaps the intellectual capacity of students falls on a “natural” hierarchy that is coded by ethnicity/race. From a post-structuralist perspective, it is the gaze and the repetition of that gaze in discourse that: (1) makes the achievement gap comprehensible, (2) normalizes, and (3) gives authority to a particular discourse about equity. Here, the discourse is one that focuses on standardized test scores and the kinds of students who are capable of doing well in mathematics. As a result, students of color continue to be framed in comparison to whites; this comparison then becomes normalized, as if it is a “natural” way of thinking about achievement, rather than focusing on the excellence of students of color or the many other ways subordinated students may make sense of their experiences with mathematics.

By providing the categories by which teachers and students see themselves, the gaze further serves to regulate bodies in ways that shut down other possible discourses and technologies within school. Even when students are not in school and/or are grown adults, the achievement gap discourse continues to construct our notions of who is good in mathematics and who is not (Martin 2007), as well as influence how those constructions relate to intelligence overall. The residue of comparisons and testing regimes lingers long into one’s life.

Teachers who may have thought of their work in much more complex ways may find themselves ignoring other signs of excellence (e.g., improved inter-group relations in students, greater student participation in advanced mathematics courses, positive dispositions toward mathematics, students having improved/broadened visions of their futures, the ability to see that mathematics is socially constructed). This kind of self-regulation occurs because schools shape, monitor, and discipline

the knowledge, modes of operating, and positionings of teachers (Walshaw 2007). So, even if an administrator is not explicitly asking teachers to act in particular ways, the mere threat of broader surveillance, of wanting to fit in with what is deemed acceptable or professional, is enough to affect the technologies (practices) seen to be valid. This is especially true, given that the National Council of Teachers of Mathematics, the professional society for mathematics education in the United States, embraces the discourse of gap-closing when conceiving of “equity” and in its annual conferences.

If we decide that doing mathematics equates to scoring well on “achievement tests,” then the issue is not just whether the measurement tools we develop have sufficient accuracy or whether the models can become better at predicting or ensuring achievement in school. We now are in the realm of consequences for the kinds of individuals (e.g., students, teachers, parents) who are constructed, which is an artifact of the original definition of mathematics that was employed, something we return to later in this chapter.

Fortunately, individuals are not mere consumers of the discourses that operate in society. That is, just as gap gazing can close down the identities marginalized students are seeking to create/act, it also can serve as the means for opening up new identities. Subordinated students constantly (re)interpret, (re)use, and (re)invent such discourses for their own purposes (Dixon-Román 2009). As such, what may have begun as consumption can turn into a form of production. Even so, this production does not come without costs. Re-signifying/subverting such discourses (Butler 1993) requires that students do additional cognitive and emotional work (McGee 2009; Stinson 2008).

What is hidden in our preoccupation with testing and achievement is the fact that (mathematics) education happens on so many more levels than schooling. Moreover, there is a false dichotomy between the sciences and the humanities (Davis 1994). As educators, we must challenge the wisdom of using the achievement gap discourse as the means for addressing equity/democracy. Varenne (2008) reminds us that,

school achievement is but a small part of American education and we must convince policy makers (and I include everyone here from senators in Congress, to school teachers) that the main issue for American democracy is not getting everyone to achieve at grade level...it is our duty, as given by those who maintain our positions as experts, to challenge what policy makers actually enforce on each other. (pp. 364–365)

In this sense, the *debate* about what we want for our children/students/society with respect to mathematics is as important as the products that result from education. Thus, it is not just important, it is our “duty” to challenge the centering of mathematics knowledge in schooling and reveal the multiple levels of mathematics education beyond schooling.

The kinds of research questions we ask influence the knowledge that is created as well as what we might be able to do with that knowledge. We see that maintaining a focus on education as it occurs within schooling ends up (re)inscribing the inequitable conditions that produce “failing” students as if they are attributes of the

students themselves. Looking to life more generally, we see people learn everyday from many sources and for many purposes.

Thinking About Education Comprehensively

In his address to the John Dewey Society, Cremin (2007/1975) states that,

The important fact is that family life does educate, religious life does educate, and work does educate; and, what is more, the education of all three realms is as intentional as the education of the school, though in different ways and in different measures. (p. 549)

He further goes on to set forth three assertions:

First, we have to think comprehensively about education; second, that we have to think relationally about education; and third, that we have to think publicly about education. (p. 1550)

Cremin's insightful observations and analysis were a challenge to the theory of education within educational research, policy, and practice. That is, education had been (and continues to be) understood as a binary opposition between schooling and society, in which schooling was/is privileged as the site of education. Cremin points to this very contention in John Dewey's *Democracy and Education*, but argues that Dewey falls victim to the very dualism that Dewey attempts to reconcile. It is via this understanding of education comprehensively, relationally, and publicly that Cremin attempts to resolve the dualistic understanding of education and society by speaking to how one contaminates the other, how schools are related to other societal apparatuses, and how each of their relational focus is important in the equitable development of high human potential.

When we recognize the limitations of public schooling, other forms of learning in society become important, not just so they may (re)engage and validate a subordinate population, but also because they have the potential to (re)engage education as something broader. Over the years, partly because of racism, sexism, classism, and politics of language, marginalized populations have not been able to rely upon public schooling to teach their young. They often rely upon schools to transmit dominant values and skills, but recognize the need to supplement those values and skills with other things that affirm the child. Through necessity, families and other institutions supporting subordinate populations have had to become more deliberate in their teaching because their young have had to negotiate schooling as an institution in way(s) different from dominant populations. To be clear, we are not suggesting that dominant populations do not need to negotiate schooling or are not educated outside of school. But, we highlight the fact that by focusing our attention elsewhere (to the margins), we find potential solutions for making education overall better, not just for the subaltern.

For these reasons, and building upon Cremin, others (Gordon et al. 2005; Varenne et al. 2009) have begun to theorize, examine, and consider many of the

various forms of supplementary and comprehensive education. Supplementary education refers to all of the learning and developmental experiences that occur outside of schooling; whereas, comprehensive education is concerned with the deliberate and relational educative experiences in all institutions of society, not just schooling. They suggest supplementary and comprehensive education might include libraries, museums, childcare centers, health education and clinics, martial arts, hip hop, after school programs, athletics, parenting practice workshops, financial literacy programs, prenatal services, among many others. It is via each of these community institutions, spaces, and practices that we find the various intentional educational processes that Cremin asserts.

For our work, we rely upon Varenne's distinction of thinking about education comprehensively, rather than thinking of some entity we might call comprehensive education that would replace schooling. Building upon the idea that the arrangements of education are somewhat arbitrary (Garfinkel 2002), Varenne (2007, 2008, 2009) puts forth the idea that we are all ignorant and that leads us to seek knowledge. Individuals are constantly trying to figure out what is happening around them, as well as learning to be adaptive to their environments (Lee 2008). When people try to figure out who they are, they rely upon those around them. When people fool around (do not follow the rules), they are instructed in how to behave. This education happens not just with respect to families, but occurs while one is standing in line at the post office, when one is given medicine, or when one is instructed by labels as to which product is best for us.

Considering a more comprehensive view of education allows us to move beyond distributive models of justice (the redistribution of resources in society) toward affirming multiple (and unsanctioned) ways of knowing and challenging the norms of decision-making processes. Both of these are non-material resources of power that are not addressed by distributive models of justice (Dixon-Román, in press; Young 1990). We turn now to what this might mean for mathematics.

Exploring Mathematics Education Comprehensively

The research in mathematics education has not been completely centered on schooling. In fact, programs of research in ethnomathematics, social justice mathematics, and out-of-school mathematics bring us a step in the direction of challenging school-centered mathematics knowledge (Ascher 2002; D'Ambrosio 2006; Frankenstein and Powell 1994; Miranda 2008; Nasir 2000; Nasir et al. 2008; Nuñez et al. 1985; Saxe and Esmonde 2005). However, policy makers and educators are often left scratching their heads about what to make of the fact that students cannot transfer their knowledge of mathematics in out-of-school contexts to an ability to do mathematics in school. These studies do not tend to offer compelling arguments that doing mathematics as an endeavor should be challenged, as they tend to privilege school mathematics as a frame for identifying (i.e., judging) what happens outside

of school. Nor do they explicate the desired relationship between schooling and institutions outside of schooling, the relational piece that Cremin put forth.

At times, these studies seem to imply that schools simply need to do a better job of reflecting the real-world problems that people encounter in their lives. However, such a task would require fabricating false problems that are not really those of the particular individuals in a classroom. In fact, out-of-school studies do not suggest that because we know African American males do mathematics while they are engaged in such “cultural practices” as playing basketball or dominoes, we should necessarily include domino playing or basketball as a means for hooking such students into learning school mathematics or highlighting their intelligence. However, other than chronicling that people do mathematics in various effective ways outside of school and that these ways should be valued, the aims of out-of-school mathematics seem poorly articulated with educational policy in general or schooling as an institution.

More than just thinking about the forms of mathematical practices and whether they are valued—be they social justice-oriented, ethnomathematics, or out-of-school—thinking about education comprehensively pushes us to think about the ways in which mathematics formats our worlds. Such thinking moves beyond a sole focus on the practices themselves toward a greater awareness of the role(s) that mathematics play in decision-making. Without paying greater attention to these current structuring roles, we are unlikely as a community to (re)interpret, (re)use, or (re)invent the roles we would like for mathematics to play in our future.

Rethinking (the Roles of) Mathematics

Most researchers writing about equity in mathematics education fail to question what counts as mathematics and/or what should be its role in helping create a more just society. This kind of question is typically reserved for the philosopher, anthropologist, or sociologist. Yet, what counts as mathematics is important to the endeavor of education because the definition of mathematics is complicit in constructing difference (Gutiérrez 2010 in press; Wiliam 2003). In fact, the high status that society confers on mathematics may relate more to the fact it correlates with intelligence tests and is easy to create large differences in performance between individuals than the fact that there is something inherent in mathematics that makes it powerful. The continuation of this falsely earned status in schooling may be due to the fact that males tend to perform better on such tests (Wiliam 2003; Wiliam et al. 2002).

What would it look like in mathematics to consider education comprehensively? To answer this question, we need to grapple with the practices in which people are mathematizing their world and that happens everywhere, not just in schools. We must ask ourselves when are these practices defined as mathematical, when are they considered something else, and when do they blur the boundaries? In fact, regardless of where they occur, social practices can never really be defined in essentialist terms such as mathematics or non-mathematics; however, they can be seen as more

or less consistent with previous inscriptions of mathematics as (e.g., measurement) or something that departs from that. We turn, here, to the work of Ole Skovsmose, in particular his notion of “mathematics in action” and the “formatting power of mathematics” to help uncover the roles that mathematics plays in structuring reality.

Skovsmose and colleagues have put forth the argument that in society, being rational is correlated with being mathematical (Christensen et al. 2008; Skovsmose 2004; Skovsmose and Yasukawa 2004). That is, mathematics is seen as the arbiter of truth.

When debating the quality of a mathematically based decision, only questions concerning rigour of the mathematical description and analysis appear to be open to serious discussions. (Christensen et al. 2008, p. 78)

This view is supported because individuals generally assume that mathematics has the potential to adequately represent the essential characteristics of all things. If we have two different cell phone plans and we need to make a decision between them, we can model with statistics what are the likely outcomes for the average user to arrive at our answer, even knowing that no such “average” user exists. The idea is that mathematics imbues a kind of rational order to things that allows one to choose without emotion or bias. Yet, we need only consider how difficult it is to “quantify” or otherwise capture in “mathematical” ways the cultural significance of things (e.g., the value of a deceased loved one’s picture, the significance of being able to speak one’s mother tongue freely, the impact of art/music on the psyche) to see how this line of thinking goes awry.

Considering a comprehensive view of education, we note that everyday decision-making is never purely mathematical. While some models become useful for making sense of our world, we must also recognize that at some level they are imprecise, fabrications of our surroundings. We often make decisions partly by what the “mathematics” tells us, partly by what “other things” tell us. How do we justify our decisions to ourselves (and others) when they are inconsistent with the “data” we have before us? The fact that people choose to invest in “green” funds or buy “local” or “organic” suggests much more is being considered than maximizing returns or some other straightforward (universal), “rational choice,” or cost-benefit analysis.

The valuable point that Skovsmose and colleagues make is not just that individuals and communities are enculturated into this view of mathematics (e.g., as inherently powerful), but that realities become substituted by false situations. This is what they call the “formatting power of mathematics.” They argue further that education becomes the process by which reality is falsified in order to dominate.

Following this logic, D’Ambrosio wonders whether we should educate the indigenous/marginalized or whether such individuals might be better off *not* being indoctrinated with such mathematical formatting of the world that is part of the culture of power. But, here is where D’Ambrosio slips into privileging schooling as the main institution of education. In fact, if we recognize that many institutions educate, then we can see how society in general (families, religions, museums, media, community centers), and not just “schooling,” contributes to this formatting

power of mathematics. And, yet, drawing from the Program ethnomathematics, we can also acknowledge that not all societies value quantity over quality (privilege the products of measurement).

Studies of adults learning to use mathematics (to learn what they did not learn in school, to get better jobs, to take part in political discussions) offer some interesting findings (e.g., FitzSimons 2002; FitzSimons and Godden 2000). These studies highlight flexible learning (e.g., self-teaching) and the de-institutionalization of education (e.g., workplace valued over the academy). Moreover, these studies illustrate how individuals deal with technologies of power that serve to construct them as either “doers” or “knowers” of mathematics. Drawing on studies of adult learners, we might ask, how do individuals negotiate these technologies of power? How do adults become aware of their role in producing and/or using mathematics? What are the implications of market-driven learning that deprofessionalizes teachers and places the responsibility for life-long learning on workers?

By thinking about education comprehensively and therefore rethinking the roles of mathematics in society, it moves us from tinkering with the current arrangements in school (e.g., developing better lists of how to improve achievement for particular populations, creating better models for measuring or predicting achievement, closing the gaps between haves and have nots) and moves us to trying to better understand the reliability of mathematics put into action. When does mathematics capture the salient aspects of one’s surroundings and when does it miss? When it misses, what new creative inventions of mathematics are put into play? What is the relationship between doing mathematics and doing other aspects of everyday life? What might it mean to embody ethical actions when using mathematics (Skovsmose 2004)? A broader dialogue is necessary if we are to coordinate the various institutions of education that operate in society.

Although the main purpose of thinking about education comprehensively is to de-center schooling as the primary source for education, it is not to completely dismiss the role of schooling in the broader enterprise of education. As such, we also consider what can schooling learn from a comprehensive look at education? What do people learn about the value and power of mathematics through schooling? Much attention has been placed on the achievement gap. Beginning at that level, instead of asking how we might close the gap, we might ask: through the discourse of the achievement gap, what do individuals learn about themselves and others (e.g., what people are capable of)? What do people learn about competition and/or inequalities? How does that relate to the formation of self and other? Moving beyond the gap gazing discourse, we might ask what are some of the roles that mathematics plays in structuring our realities? When do we “do” mathematics and for what purposes?

Besides becoming more aware of what counts as mathematics, schooling can learn to recognize the structure of the discipline. Traversing the belief of a universal mathematics and recognizing that individuals produce different mathematics in relation to others (over time) allows us to see that academic mathematics is but one form of ethnomathematics (Frankenstein and Powell 1994) that does not always support people to make sense of and function effectively in their worlds. If

mathematics has become a tool by the dominant to justify their position, often to look down upon those seen as less rational, how can students learn to be more aware of when they are (re)interpreting, (re)using, or (re)inventing mathematics? How might teaching mathematics for social justice deliberately connect with or contribute to this endeavor?

Schools can learn from people/institutions that operate outside of schooling (both in content and in form). That is, those who educate can be more deliberate about what supplements life (in recognizing how mathematical practices shift over time, deciding whether to speed up these shifts, try to stop them, etc.). In some ways, technology's impact on mathematics is a good example. From time to time, heated debates arise within mathematics education about whether students should have access to technology (primarily calculators) before they have learned the "basic skills" that technology performs. The question of whether to use calculators/computers in math class assumes schooling can somehow control what students "learn" about mathematics, as if they are not already using such technologies outside of mathematics class to make decisions or to educate themselves. Moreover, rather than stressing the importance of introducing students to "real-world problems" in mathematics classrooms as a means to "hook" (i.e., trick) students into doing school mathematics, schools can learn more (e.g., from studies of out-of-school mathematics) about how individuals make judgments concerning when mathematical description is (or is not) adequate as well as what else needs to be considered.

It is not just that thinking about education comprehensively adds to the mathematics education literature by helping us focus on which practices to attend to (e.g., other cultures, other places besides school). It also moves us beyond the mere chronicling of practices to developing a policy agenda. That is, beyond understanding the structuring roles of mathematics in our lives, we also care to influence (push back on) those roles. There are many decisions to be made. We might ask what are some of the ways we would like mathematics to relate to uncertainty, politics, and/or technologies? Perhaps we want school leaders to educate about both the horrors (applications of destruction) and the beauty of mathematics? Rather than perpetuating an internal sense of power to mathematics, we might want citizens to develop the ability to discern for themselves which kinds of questions can be answered using mathematics and which cannot. By thinking critically about the benefits and drawbacks to formatting realities with mathematics, we could be more deliberate in how and when we want to use/create mathematics in our everyday lives.

Conclusion

A brief review of the problems in research using an achievement gap lens helps illustrate that testing and assessment are the remains of "schooling" as a practice. In contrast, thinking about education comprehensively highlights important policy implications. For example, demanding an obsolete disconnected mathematics and testing students to do well in it will not prevent students from rejecting it as a practice.

Achievement gap-only ways of thinking about equity will only continue to privilege schooling as the primary institution of education, imprinting upon students the residue of the hegemonic manners in which schooling has operated over the centuries, not liberate them from oppressed positions in society.

Our purpose in unpacking the gap gazing trend in the United States and in considering education more comprehensively is not to propose a fully developed policy agenda with respect to mathematics education. However, we have offered a number of questions along the way that may guide the development of a policy agenda. For example, what are the structuring roles played by mathematics in a technological and global society? More specifically, in what way(s) does mathematical formatting convince individuals they are making value-free decisions? How do those structuring roles influence the available identities of individuals and the constructions of “truth” about the world in which we live? In what way(s) does surveillance (by others, by self) play into the project of mathematics education? We believe many more questions still need to be asked, and in ways that better engage the broader public in decision-making. In fact, we have refrained from trying to answer these questions outright because we believe there is much more exploration and theory-building that needs to be done and because offering answers now may close down the kind of dialogue we see as important.

We need to be constantly considering the forms of mathematics and what they seek to deal with. As society presents new demands, new technologies, new possibilities, we must ask ourselves whether our current version of mathematics is adequate for dealing with the ignorance that we have.

Discourses like the achievement gap freeze mathematics into a commodity that needs to be “sold” to students while they are in school. Yet, when we look at how individuals and communities make sense of their surroundings with/through/in mathematics, we begin to open up possibilities for rethinking what mathematics does along the way. It is in rethinking “what is education?” and “how might mathematics participate in the creation of a more just world?” that is at the very heart of the democratic project.

References

- Ascher, M. (2002). *Mathematics elsewhere: An exploration of ideas across cultures*. Princeton: Princeton University Press.
- Butler, J. (1993). *Bodies that matter: On the discursive limits of “sex”*. New York: Routledge.
- Christensen, O. R., Skovsmose, O., & Yasukawa, K. (2008). The mathematical state of the world: Explorations in the characteristics of mathematical descriptions. *Alexandria: Revista de Educacao em Ciencia e Tecnologia*, 1(1), 77–90.
- Cremin, L. (2007/1975). Public education and the education of the public. *Teachers College Record*, 109(7), 1545–1558.
- D’Ambrosio, U. (2006). *Ethnomathematics: Link between traditions and modernity*. Rotterdam: Sense Publishers.

- Davis, P. J. (1994). Mathematics and art: Cold calipers against warm flesh? In P. Ernest (Ed.), *Mathematics education and philosophy: An international perspective* (pp. 164–183). Bristol, PA: Taylor and Francis.
- Dixon-Román, E. (2009). *Deviance as pedagogy: A critical perspective on indigenous cultural capital*. A paper presented at the annual meeting of the American Educational Research Association. San Diego.
- Dixon-Román, E. (2010). Inheritance and an economy of difference: The importance of supplementary education. In L. Lin, E. W. Gordon & H. Varenne (Eds.), *Educating comprehensively: Varieties of educational experiences: Vol. 3. Perspectives on comprehensive education series*. Lewiston: The Edwin Mellen Press (in press).
- FitzSimons, G. E. (2002). *What counts as mathematics? Technologies of power in adult and vocational education*. Boston: Kluwer Academic Publishers.
- FitzSimons, G. E., & Godden, G. L. (2000). Review of research on adults learning mathematics. In D. Coben, J. O'Donoghue & G. E. FitzSimons (Eds.), *Perspectives on adults learning mathematics: Research and practice* (pp. 13–45). Dordrecht: Kluwer Academic Publishers.
- Flores, A. (2007). Examining disparities in mathematics education: Achievement gap or opportunity gap? *The High School Journal*, 91(1), 29–42.
- Foucault, M. (1980). *Power/Knowledge: Selected interviews and other writings, 1972–1977*. New York: The Harvester Press.
- Frankenstein, M., & Powell, A. B. (1994). Toward liberatory mathematics: Paulo Freire's epistemology and ethnomathematics. In P. McLaren & C. Lankshear (Eds.), *Politics of liberation: Paths from freire* (pp. 74–99). New York: Routledge.
- Garfinkel, H. (2002). *Ethnomethodology's program: Working out Durkheim's aphorism*. Lanham: Rowman and Littlefield.
- Gordon, E. W., Bridgall, B. L., & Meroe, A. S. (2005). *Supplementary education: The hidden curriculum of high academic achievement*. Lanham: Rowman & Littlefield Publishers.
- Gutiérrez, R. (2000). Is the multiculturalization of mathematics doing us more harm than good? In R. Mahalingam & C. McCarthy (Eds.), *Multicultural curriculum: New directions for social theory, practice, and policy* (pp. 199–219). New York: Routledge.
- Gutiérrez, R. (2002). Enabling the practice of mathematics teachers in context: Towards a new equity research agenda. *Mathematical Thinking and Learning*, 4(2 & 3), 145–187.
- Gutiérrez, R. (2007). (Re)defining equity: The importance of a critical perspective. In N. Nasir & P. Cobb (Eds.), *Diversity, equity, and access to mathematical ideas* (pp. 37–50). New York: Teachers College Press.
- Gutiérrez, R. (2008). A “gap gazing” fetish in mathematics education? Problematising research on the achievement gap. *Journal for Research in Mathematics Education*, 39(4), 357–364.
- Gutiérrez, R. (2010). The sociopolitical turn in mathematics education. *Journal for Research in Mathematics Education* (in press).
- Hilliard, A. G. (2003). No mystery: Closing the achievement gap between Africans and excellence. In T. Perry, C. Steele & A. G. Hilliard (Eds.), *Young, gifted, and black: Promoting high achievement among African-American students* (pp. 131–166). Boston: Beacon Press.
- Kurzweil, J. (2003). Redefining excellence. *SACNAS News*, 5(2), 1–2, 11.
- Ladson-Billings, G. (2006). From the achievement gap to the education debt: Understanding achievement in U.S. schools. *Educational Researcher*, 35(7), 3–12.
- Lee, C. D. (2008). The centrality of culture to the scientific study of learning and development: How an ecological framework in education research facilitates civic responsibility. *Educational Researcher*, 37(5), 267–279.
- Martin, D. (2007). Mathematics learning and participation in African American context: The co-construction of identity in two intersecting realms of experience. In N. Nasir & P. Cobb (Eds.), *Diversity, equity, and access to mathematical ideas* (pp. 146–158). New York: Teachers College Press.
- Martin, D. (2009). Researching race in mathematics education. *Teachers College Record*, 111(2), 295–338.

- McGee, E. (2009). *A model of mathematical resilience: Black college students negotiating success in mathematics and engineering*. A paper presented at the annual meeting of the American Educational Research Association, San Diego.
- Miranda, F. O. (2008). *Ethnomathematics and critical mathematics: Exploring the meaning for everyday teachers*. Unpublished master's thesis, Champaign, University of Illinois at Urbana-Champaign.
- Nasir, N. S. (2000). Points ain't everything: Emergent goals and average and percent understanding in the play of basketball among African American students. *Anthropology and Education Quarterly*, 31(3), 283–305.
- Nasir, N. S., Hand, V., & Taylor, E. (2008). Culture and mathematics in school: Boundaries between “cultural” and “domain” knowledge in the mathematics classroom and beyond. *Review of Research in Education*, 32, 187–240.
- Núñez, T., Carraher, D. W., & Schliemann, A. D. (1985). Mathematics in the streets and in the school. *British Journal of Developmental Psychology*, 3, 21–29.
- Saxe, G. B., & Esmonde, I. (2005). Studying cognition in flux: A historical treatment of fu in the shifting structure of Oksapmin mathematics. *Mind, Culture, and Activity*, 12(3 & 4), 171–225.
- Skovsmose, O. (2004). Mathematics in action. *Philosophy of Mathematics Education Journal*, 15. <http://people.exeter.ac.uk/PERnest/pome18/contents.htm>. Accessed 20 July 2009.
- Skovsmose, O., & Yasukawa, K. (2004). Formatting power of ‘mathematics in a package’: a challenge for social theorising? *Philosophy of Mathematics Education Journal*, 15. <http://people.exeter.ac.uk/PERnest/pome18/contents.htm>. Accessed 20 July 2009.
- Stinson, D. W. (2008). Negotiating sociocultural discourses: The counter-storytelling of academically (and mathematically) successful African American male students. *American Educational Research Journal*, 45(4), 975–1010.
- Valdés, G. (1996). *Con respeto: Bridging the distances between culturally diverse families and schools: An ethnographic portrait*. New York: Teachers College Press.
- Varenne, H. (2007). Difficult collective deliberations: Anthropological notes toward a theory of education. *Teachers College Record*, 109(7), 1559–1588.
- Varenne, H. (2008). Culture, education, anthropology. *Anthropology and Education Quarterly*, 39(4), 356–368.
- Varenne, H. (2009). Educating ourselves about education—comprehensively. In H. Varenne, E. W. Gordon & L. Lin (Eds.), *Theoretical perspectives on comprehensive education: The way forward: Vol. 2. Perspectives on comprehensive education series*. Lewiston: The Edwin Mellen Press.
- Varenne, H., Gordon, E. W., & Lin, L. (2009). *Theoretical perspectives on comprehensive education: The way forward: Vol. 2. Perspectives on comprehensive education series*. Lewiston: The Edwin Mellen Press.
- Walshaw, M. (2007). *Working with Foucault in education*. Rotterdam: Sense Publishers.
- William, D. (2003). Constructing difference: Assessment in mathematics education. In L. Burton (Ed.), *Which way social justice in mathematics education?* (pp. 189–207). Westport: Praeger.
- William, D., Bartholomew, H., & Reay, D. (2002). Assessment, learning, and identity. In R. Zevenbergen & P. Valero (Eds.), *Researching sociopolitical dimensions of mathematics education: Issues of power in theory and methodology* (pp. 43–62). Dordrecht: Kluwer Academic Publishers.
- Young, I. M. (1990). *Justice and the politics of difference*. Princeton: Princeton University Press.

Mapping Equity and Quality in Mathematics Education

Atweh, B.; Graven, M.; Secada, W.; Valero, P. (Eds.)

2011, XXXV, 624 p., Hardcover

ISBN: 978-90-481-9802-3