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**“A critical mathematical literacy curriculum can be relevant to getting more people of color [and members of other underrepresented groups] into mathematics and science fields.”**

-Marilyn Frankenstein, 1990, p. 346

## Did You Know

Current Mathematic Instruction Advantages



Although it is difficult to tangibly prove institutional racism (Battey, 2013), the underrepresentation of historically marginalized students in advanced math courses suggest a system that sorts and stratifies students when disaggregated by race, sex, and socioeconomic status resulting in significant outcome disparities (American Psychological Association, 2012; Martin, Gholson, & Leonard, 2010). This manifests particularly in three areas: curricular alignment with standardized testing, decentered focus on all students' identities, and the inaccessibility of historically marginalized students to proceed through advanced math coursework. Often in schools, educators are in a position to provide curriculum that aligns with standardized testing, leaving them to teach lower-level content—which perpetuates minimum standards (Davis & Martin, 2008).

In addition, studies suggest that the quality of mathematical instruction differs in schools by socioeconomic status and race; that is, less experienced math teachers serve in under-resourced schools, and foci tend to be on subjective discipline and control in these classrooms, taking away from meaningful student-teacher interactions and effective math instruction—especially when curriculum is often not culture neutral (Battey, 2012; Battey, 2013; Varley Gutierrez, Willey, & Khisty, 2011).

While current mathematical curricula and instruction are typically characterized as culture neutral, there is evidence to suggest that math education practices operate within a sphere of dominant ideologies (e.g. White, male, non-dis/abled, etc.), becoming “personally beneficial” to students in dominant groups (Battey, 2013; Varley Gutierrez, Willey, & Khisty, 2011, p. 31). Davis and Martin (2008) argue that curricula suppress non-dominant voices and perspectives, inadvertently legitimizing the dominant White, male voice. This view is supported by evidence that schools that serve under-resourced populations typically adopt curriculum from White schools—making White children the “standard”—and ignoring what is best for children from non-dominant groups (Davis & Martin, 2008).

The discrepancy in advanced math courses is indicative in the complexion of elite colleges and high-paying math-related fields (Battey, 2012). These outcomes may lead historically marginalized students to believe math and math-related fields are not for people who look like them. It is the duty of math educators to debunk this myth for students, and strive to have their classrooms reflect that all students are capable of succeeding. By not troubling the cycle of math operating along dominant racial ideologies, math educators are perpetuating this stereotype, keeping math inaccessible to all students, but particularly for historically underrepresented students.

The inaccessibility of equitable mathematic instruction for all students has the

potential to be redressed by: 1) supporting a positive mathematics identity for all students, and 2) creating curriculum that is inclusive of all students' identities, while also being critical of dominant ideologies. Educators can develop instruction through a critical literacy lens. In addition, they can transform their classrooms into environments where math instruction is designed in a way that is inclusive of all levels of understanding, but it also communicates culturally relevant information (Leonard, Brooks, Barnes-Johnson, & Berry III, 2010; Martin, 2000). In order to center equity in mathematics instruction, it will take a concerted effort by educators to ensure their curriculum is both informative and transformative for all students (Battey, 2013; Gutstein, 2003; Leonard et al, 2010).



## Why It Matters

Equitable Math Instruction Should Affirm All Students' Identities

Studies have consistently shown historically marginalized groups not having a positive mathematic identity. This is made evident by their learning outcomes and lack of opportunities in math related fields (Battey, 2013; Davis & Martin, 2008; Gutstein, 2003). Centering historically marginalized students' [lived experiences](#) within mathematics instruction, empower students in a space where they can begin to develop a sense of agency over their learning, by addressing issues that may affect them in society (Frankenstein, 1990; Gutstein, 2003).

How educators engender their students' mathematic literacy and identity may help build students' self-esteem, and help to make opportunities to advance in math and [STEM](#) fields a possibility for all students (Gutstein, 2006). If educators are not creating inclusive math environments that encourage multiple lenses, then mathematical literacy may be insufficient for students to effectively analyze and critique the world around them with and through math (Davis & Martin, 2008). When used together, [culturally relevant](#) (CRP) and [social justice](#) (SJP) pedagogical methods of teaching mathematics helps to address the deficiencies of traditional mathematical instruction (Gutstein, 2003; Leonard et al, 2010).

By definition, CRP and SJP utilize students' [funds of knowledge](#) to inform instruction. Educators and students' use students' funds of knowledge and community practices to critically analyze and confront systems that privilege some, while discriminating against others (Leonard et al, 2010). These methods serve to make math relevant to historically marginalized groups in a way that helps them confront oppressive systems (Frankenstein, 1990; Gutstein, 2003; Leonard et al, 2010). By teaching math in this way, educators not only help to

make math accessible to ALL students , but it exposes the injustices of the world to students (Martin, 2000). The goal of the educator should be to present an accurate snapshot of the world around them, effectively addressing social issues—even in mathematics (de Freitas, 2008).

In order to revolutionize the way math content is presented, educators must engage in **critical reflection** to ensure relevant and unbiased content, and combine this with formal math instruction (Gutstein, 2007). Through critical math literacy, educators help students examine and critique the structures that are in place that perpetuate mathematical inequity (e.g. wage differences, incarceration rates, wealth, loan acquisitions, graduation rates, etc.), and develop connections to construct cultural relevance, ultimately developing a sense of student agency (Frankenstein, 1990; Leonard et al, 2010). By centering social justice in mathematic instruction, it creates a platform for students to see themselves as capable of enacting change while learning about the forces that shape the world around them (Gutstein, 2003).



## For Equity Now

Integrating Real-Life Situations with Math  
Helps Build Math Skill and Citizenry

Educators must ensure that all students realize the agency they have to shape the world around them and combat injustices—including through the use of mathematics instruction (Gutstein, 2003; Gutstein, 2006). It is within every math educator’s capacity to revolutionize the way in which they present material and to encourage students to realize their power. For educators, incorporating CRP and SJP is a deliberate process that requires a level of self-reflection on one’s own culture, while realizing their position in the cultures of their students; this is to understand the complexities that come with using these approaches, particularly the attitudes towards social change (Gutstein, 2007; Leonard, 2010).

In doing this the educator can begin to conceptualize how to authentically integrate their students’ cultures into the math lessons, rather than sporadically inserting token, topical examples (Leonard, 2010; Varley Gutierrez, Willey, & Khisty, 2011). Leonard et al (2010) offers elements of what it looks like to begin to transform math instruction to reflect CRP and SJP:

- (a) access to high-quality mathematics instruction for all students;
- (b) curriculum focused on the experiences of marginalized students;

- (c) use of mathematics as a critical tool to understand social life, one's position in society, and issues of power, agency, and oppression; and
- (d) use of mathematics to transform society into a more just system (p. 262).

Considering these criteria, there are many examples of lessons that can be applied in mathematics instruction to begin examining the many biases that permeate every area of society (Gutstein, 2003). Gutstein (2003, 2006) conducted a study where he created real-world math projects for a group of 7th-8th grade Latin@ students. One example includes using racially disaggregated data for traffic stops, whose central operations focus was proportionality and expected value, to study racial profiling (Gutstein, 2003). Gutstein (2003) notes that his projects also incorporated other components including writing and interpretation of data, graphics, and media outlets like newspapers to gather information. In addition to some ambivalence due to this exposure to new information, results included the building of analytical skills that had not previously been done in school, as well as a connection to math and society (Gutstein, 2003).

In order to begin changing the face of who participates in advanced math courses, and subsequently who has access to colleges and employment associated with that mathematical knowledge, educators must first recognize that disparities are not only in students' misunderstanding the material—but are also in to whom lessons are targeted. Educators' implicit bias may cause these realizations to fall short, impeding pedagogical change. All students are capable of learning rigorous math material, so long as educators are willing to make their classroom environments reflect opportunity.

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