
Developing a Positive Mathematics Identity for Students of Color: Epistemology and Critical Antiracist Mathematics

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Utilizing critical race theory and antiracist education as the main theoretical frameworks, this paper critically analyzes mathematics education (ME) and problematizes the ways mathematics teaching and learning is approached in many K-12 schools. If mathematics fields are going to diversify, an epistemological shift in how we think about, teach, and learn mathematics is imperative. This conceptual paper: 1) uncovers epistemological racism in mathematics; 2) explores the theoretical frameworks underlying antiracist education (AE) and critical mathematics (CM); and 3) discusses critical antiracist mathematics (CAM) and the promise it holds for facilitating the development of a mathematics identity for students of color.

Critical race theorists contend that one of the major modes for disseminating “master narratives” of the dominant group is through the system of schooling (Zamudio, Russell, Rios, & Bridgeman, 2011). More often than not, these master narratives are presented as objective truths, but in fact are grounded in Western epistemologies, and serve as mechanisms to silence alternative truths or narratives. Zamudio et al state, “Educational institutions present themselves as objective disseminators of knowledge. CRT educators question and interrogate the viability of objectivity in a context of power relations. In doing so, CRT educators work towards broadening truths to include the history and experiences of people of color” (p. 5). As CRT educators and scholars, it is our intention to not only interrogate and critique the racism embedded in the ways mathematics is traditionally approached, understood, and taught, but to provide emancipatory alternatives for educators to approach teaching and learning differently in schools. We contend that critical consciousness, a strong math

identity, and opportunities to be seen and understood as knowledge producers is essential for students of color to navigate mathematics, and push mathematics to transform for greater justice.

Epistemological Racism: Decolonizing Mathematics

In 1997, James Scheurich and Michelle Young questioned the racial bias embedded in epistemologies commonly used in educational research. Pleading with scholars to critically analyze epistemological racism, they state, “we educational researchers are unintentionally involved, at the epistemological heart of our research enterprises, in a racism, epistemological racism, that we generally do not see or understand.” (Scheurich and Young, 1997, p. 12). This critique, of course, was not new. Scholars of color have argued for decades that dominant research paradigms are based in white male contexts and have marginalized the ways of knowing of diverse people for centuries. This epistemological racism is not limited to just education research(ers). In mathematics, which is overwhelmingly grounded in Western positivist epistemologies, the ways of thinking about, teaching, and learning math are also based in an epistemological racism that scholars generally do not see or understand (Clarkson, 2000).

In the same way that many scholars have articulated a resistance to Euro-Western research methodologies through a process of decolonizing, we believe that we must also decolonize mathematics from Euro-Western epistemologies if children of color are to develop a mathematical identity (Chilisa, 2012; Smith, 2012; Wilson, 2009). According to Chilisa (2012), “decolonization is a process of centering the concerns and worldviews of the colonized Other so that they understand themselves through their own assumptions and perspectives” (p. 13). Decolonizing, therefore, is a process which involves liberating the mind from the oppressive structures and conditions of Western colonization and also the “restoration and development of cultural practices, thinking patterns, beliefs, and values that were suppressed but are still relevant and necessary to the survival and birth of new ideas, thinking, techniques, and lifestyle that contribute to the advancement and empowerment of the historically oppressed

and former colonized non-Western societies” (Chilisa, 2012, p. 14). Decolonizing mathematics, therefore, opens up spaces for the historically marginalized (colonized Other) to use their knowledge systems and thinking patterns to solve problems and birth new ideas.

Bishop (1990) explicitly acknowledges Western mathematics as a tool “in the process of cultural invasion in colonised countries,” specifically mediated by education. Perpetuating the idea that mathematics is a culture-free endeavor producing culture-free knowledge is a general Euro-Western standpoint, and a method to facilitate cultural imperialism. In his 1988 article, *Mathematics Education in a Cultural Context*, Alan Bishop explains the fallacy of this argument (p. 201):

...“a negative times a negative gives a positive” wherever you are, and triangles the world over have angles which add up to 180 degrees. This view though, confuses the “universality of truth” of mathematical ideas with the cultural basis of that knowledge. The ideas are decontextualized and abstracted in such a way that “obviously” they can apply everywhere. In that sense they are clearly universal.

The dissection of this argument reveals the tension involved in the conceptualization of “universality,” questioning the origin and necessity of 180 degrees in a triangle and of the idea of negative numbers (Bishop, 1988b, p. 201). Ultimately this calls into question the cultural knowledge base, or master narrative, that is referenced when discussing these mathematical concepts. Despite the introduction of ethnomathematics by D’Ambrosio in 1985, worldmath by Anderson in 1990, and the historico-epistemological analyses of mathematics by Radford in 1997, the idea that mathematics is a culture-free endeavor producing culture-free knowledge persists to be the dominant standpoint. This dominant view, then, is the master narrative that is perpetuated in school and used to silence the narratives and views that mathematics is in fact a “cultured” enterprise.

Similarly, mathematics has also been considered a value-free endeavor producing value-free knowledge due to its seemingly irrefutable nature. Bishop (1991) suggests that values actually play an integral role in the mathematical curriculum and in the mathematical classroom. Valuation happens on multiple levels. At the societal level, mathematics is highly valued because of its control and power

in the commercial and industrial domains and can lead to higher status jobs (Bishop, 1991). At the institutional level, such as within the institution of education, mathematics is highly valued and has become a gatekeeper (Stinson, 2004) in which success is necessary in order to complete benchmarks, such as gaining a diploma, in order to access further opportunities. At the pedagogical level, the value of mathematics varies depending on the teacher and is manifested in the mathematical knowledge environment (Bishop, 1991) that they create. As a result, values at the individual student level will be quite diverse, demonstrated in students' attitudes and values statements (Bishop, 1991). These levels do not operate independently of each other, with classroom values being derived from institutional and societal level values.

As such, these institutional and societal values must be derived from somewhere, and Bishop (1991) suggests that it must be "in some way from qualities, beliefs and values of mathematics *itself*" (p. 199). He offers six principle clusters of beliefs and values that permeate Western mathematics, which is the mathematics dominant in our public school curriculum. The ideological values of rationalism and objectism lead to a high valuation of logic, abstraction and the symbolic representation of phenomena. The sentimental values of control and progress lead to a high valuation of the security derived from predictability, generalizability, and controlled change and alternatives. The sociological values of openness and mystery lead to a high valuation of the verification of the truth of propositions representative as universal facts and the mysterious quality of decontextualized and abstract knowledge (Bishop, 1991). He is "not claiming that these values are *only* associated with Western mathematics, nor that these values are superior to any other, although earlier educators certainly *have*, particularly in the Western European colonial era" (Bishop, 1991, p. 205).

When specifically comparing the African and "Western" conceptions of the mathematical concept of objectism, Horton (1967, as cited in Bishop, 1988a) observed the "African preference for explanation using personal idiom and the 'Western' preference for using the impersonal. ...Mathematics favours an objective, rather than a subjective, view of reality" (p. 65). Thus, the mathematical value of objectism is not inherently a Western notion; what is however, based in Western paradigms is the prevailing mathematical conception of objectism. As a result, these Western epistemological frameworks and

values associated with mathematics provide the master narrative in schools, by which all other narratives and ways of being are silenced. Delgado Bernal (2002) argues that the insidious nature of Western Eurocentric epistemological perspectives allows it to subtly shape the belief systems and practices of educators and school curriculum while simultaneously adversely affecting the educational experiences of students of color.

Antiracist Education

Unlike multiculturalism writ large, antiracist perspectives believe that racism is institutional not attitudinal (Duarte & Smith, 2000). Meaning, racism is an internalized ideology of white supremacy as manifested in the unequal distribution of resources and power to non-white groups (Grinter, 2000). This system of inequality that privileges whiteness is supported by structures and policies in society resulting in the notion that racism is normal. The ideology that racism is normal and permeates social systems and ideologies is a central tenet of critical race theory (Ladson-Billings, 1998; Zamudio et al, 2011). Uncovering the tacit and overt ways that racial thinking operates to systematically privilege whiteness while subjugating people of color is a central concern of critical race theorists and antiracist activists (Ladson-Billings, 2000; Delgado Bernal, 2002). Therefore, critical race theorists and antiracist educators do not seek prejudice reduction on an individual level, but rather to dismantle systems of oppression through collective action (Duarte & Smith, 2000). Antiracists seek to build solidarity across lines of race, class and gender, for collective political action to redistribute power and economic resources.

Antiracists see this goal being achieved through three strategies: 1) problematizing hegemony rooted in white supremacy; 2) taking collective political action through multiracial coalitions; and 3) antiracist education programs that are anti-assimilationist (Duarte & Smith, 2000). Antiracism, therefore, seeks to develop “learning processes that question the social structure and its basic assumptions, to produce activists against social injustice” (Grinter, 2000, p. 144). Therefore part of antiracist education is to “involve students in the analysis of the whole school ethos and power structure, and in work to identify and remove racism from their educational institution” (Grinter, 2000, p.

144). Critical (multicultural) perspectives grounded in the work of Paulo Freire, such as critical mathematics can be employed to achieve this end.

Critical Mathematics

Critical mathematics owes much of its origin to the work of the Critical Mathematics Educators Group (CMEG), who were highly influenced by the InterAmerican Committee on Mathematics Education (IACME), the International Congress on Mathematical Education (ICME), and the African Mathematical Union (AMU) (Powell, 2012). Initially, these influential organizations placed a focus on the structure and content of curricula, and the contexts surrounding their implementation. There was a growing concern around the social and political issues of mathematics education, specifically around the impacts of colonial and neocolonial educational structures and textbooks (Powell, 2012). The work of Marilyn Frankenstein (1983) further developed the concept of critical mathematics, as she explicitly tied it to Freire's (1970) notion of "critical" and the necessity of critique in emancipatory education.

According to Powell (2012), the purpose of critique is to "challenge and to change taken-for-granted ideas and conditions of life so as to improve social life" (p. 25). Thus, one aim of critical mathematics education is to "engage students, socially marginalized in their societies, in cognitively demanding mathematics in ways that help them succeed in learning that which dominant ideology positions them to believe they are incapable" (Powell, 2012, p.27). Borrowing from Freire's (1970) notion of reading and writing the world, Eric Gutstein (2012) applies this idea specifically to mathematics where students can use "*mathematics as a weapon in the struggle*" (p. 23). Reading the word and the world is about redefining notions of literacy to include not just the reading of text (word), but "the unstated dominant ideologies hidden between the sentences as well" (Kinchloe, 2008, p.16). When students learn to read the world and the word, they question knowledge and the knowledge production process and recognize that they have the power to be change agents in the world around them (Price & Mencke, 2013). Gutstein (2012) explains that through mathematics education, students need to be prepared to investigate and

critique injustice, as well as take action against oppressive structures and actions.

As a result, critical mathematics education, according to Paul Ernest (2010), is responsible to “offer values-based criticisms of society, mathematics and the social practices of ME [Mathematics Education], most notably the teaching and learning of mathematics” (p. 3). Given this responsibility, Ernest (2010) describes four main domains critical mathematics education should consider including: 1) clarification of presupposed values, 2) a critique of epistemological issues of mathematics, 3) a critique of society and the role of mathematics in society, and 4) a critique of the teaching and learning of mathematics (p. 3). Critical mathematics research, unfortunately, has placed almost exclusive focus on the latter two of the domains at the expense of deeper examinations of power, privilege, and values embedded within mathematics itself. In other words, more research in the area of uncovering and problematizing the dominant epistemology of mathematics explicitly connected with the domains of teaching and learning mathematics is needed.

It is particularly relevant, then, to explicitly address the epistemological origins, embedded values, and underlying assumptions behind the mathematics taught in schools, which is derived from what Bishop (1990) calls “Western Mathematics.” However, it seems insufficient for only researchers and teachers to become aware of the Western European history, culture and values embedded in mathematics and school mathematics. If students are to engage in critiquing and transforming the world using mathematics, they must also become fully aware of the Eurocentric epistemological origins, values and assumptions of the “weapon” that they are armed to use. That is to say that students must be aware that they are “using the master’s tool” to attempt to “dismantle the master’s house” (Lorde, 1984). Developing critical consciousness to use “mathematics as a weapon” can allow students to become more aware of their potential alignment/discontinuity between the values embedded in school mathematics, Western European values, and their own cultural values. Secondly, it also creates space for students to critically reflect on the limitations of this cultured weapon to address issues in their specific context.

In critical mathematics, a mathematics identity is formed by one’s belief about one’s “(a) ability to do mathematics, (b) the significance of mathematical knowledge, (c) the opportunities and barriers to

enter mathematics fields, and (d) the motivation and persistence needed to obtain mathematics knowledge” (Martin, 2000, p. 19). This definition of mathematical identity implies the inclusion the content and practices of mathematics, as well as the importance of a person’s epistemological stance. Though the critical mathematics definition of mathematical identity (Martin, 2000) seems to imply a focus on both mathematical content and practices, research on master-narratives, counternarratives, and identity in mathematics thus far has emphasized topics like agency, voice, achievement, persistence, school-based mathematical practices, and participation (Martin, 2007). Understanding how these concepts impact student engagement with mathematics and the development of their mathematical identity is integral; however, all of these concepts are symptomatic of the epistemological racism of Western, and thus, school mathematics. For example, stereotypes in the mathematics classroom are often cited as a barrier to mathematics achievement (Martin, 2007; Nasir, 2013; Steele, 1997). It is our contention that stereotypes and stereotype threat are symptoms of racist ideologies and Eurocentric epistemologies that assume mathematics is neutral; the mis-perception from both teachers and students that students of color cannot achieve at this universal, neutral mathematics reinforces liberal ideologies that deficiency is an individual problem, not a systemic one rooted in white supremacy (Ladson-Billings, 1998). When research only locates the barriers outside of mathematics without critiquing the underlying values and assumptions embedded in the field, it runs the risk of reinforcing the Eurocentric taken for granted assumption that mathematics is neutral and objective. Thus, we must also look *within* mathematics to identify barriers to engagement, achievement and mathematics identity development.

Critical Antiracist Mathematics & Mathematics Identity

Critical Antiracist Mathematics focuses on the development of a mathematical identity, as does critical mathematics, but acknowledges the centrality of race in that development. Haymes (2002) supports a focus on race in the deconstruction of systematic oppression in that

the reality of people of color “...in an anti-black racist society is that they live class through race and therefore as ‘black people’” (p.155). This is in alignment with our Critical Race Theory (CRT) standpoint which critiques the institutional racism embedded in the epistemologies and practices that dominate schooling, and in our critique, mathematics.

Critical Antiracist Mathematics (CAM) supports the critical mathematics definition of mathematical identity (Martin, 2009), but opens spaces for critiques of the structural and ideological racism that permeates mathematics. Grounded in Critical Race Theory, CAM offers opportunities for students’ counternarratives and epistemologies to be validated, as they are also understood and seen as knowledge producers. Delores Delgado Bernal (2002) discusses the importance of critical raced-gendered epistemologies and the use of counternarrative and testimonios to counter the hegemony in Western Eurocentric epistemologies that dominate school curricula and practices.

Raced-gendered epistemologies also push us to consider pedagogies of the home, which offer culturally specific ways of teaching and learning and embrace ways of knowing that extend beyond the public realm of formal schooling. Because power and politics are the center of all teaching and learning, the application of household knowledge to situations outside of the home becomes a creative process that challenges the transmission of “official knowledge” and dominant ideologies” (pp. 109–110).

Critical raced and gendered epistemologies offer opportunities to see and hear (counter) narratives and experiences that are not visible from Eurocentric epistemological stances. The power of using non-majoritarian narratives in classrooms is not just in their ability to voice different experiences that are often not heard; it is in learning to listen deeply, making those stories matter and challenging the normalcy of epistemological racism in education.

Explicitly recognizing that mathematics is not “value-free” or “culture-free,” CAM is counter-hegemonic and does not approach mathematical teaching and learning from the idea of one master-narrative or universal truth. Instead, it recognizes multiple truths and narratives and explicitly names the racism that often serves as barriers for marginalized people to participate in the knowledge production

process. Consistent with the Freirean conception of conscientização, developing critical consciousness alongside a mathematics identity allows students to learn and use mathematics to examine power relations and hegemony in social institutions for greater justice, while also developing agency (Freire, 1970). Leonard et al (2010) explain the importance of developing a positive mathematics identity “because mathematics education as a social construction is a gendered and racialized experience” (p.262). Affording students of color the space to critique systems of oppression and develop critical consciousness provides avenues for students to navigate the complex power relations inherent in schooling to think beyond what is, and imagine emancipatory and democratized futures.

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