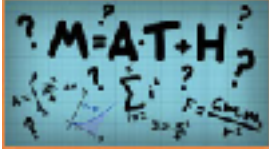


POLICY BRIEF

Culturally Sustaining Mathematics Education

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Introduction

In the digital age of information, social justice for all students is synonymous with a quantitatively literate student population. Reaching this goal in the high stakes United States Education system requires a significant upheaval of current teaching methods and values. Considerable research in both general and mathematics education supports equitable teaching pedagogies as beneficial to student learning and autonomy (Grudnoff et al., 2017; Gutstein, 2006; Ladson-Billings, 1995; Rubel et al, 2016; Skovsmose, 1985; Stinson et al., 2012). Unfortunately, mathematics-specific equity frameworks do not adequately address the difficulties and inequities inherent in United States mathematics classrooms. This brief will identify a necessary paradigm shift in mathematics education that attends to sustaining student identities with mathematics. Through this lens, it will call for practitioner based research whose purpose is to provide realistic and tangible products that are useful for mathematics educators.

Documented struggles of existing equitable teaching pedagogies in mathematics include an inability to select critical topics that align with content goals, the execution of both critical and content-based learning outcomes, an inability to connect with students and their communities, and difficulty seeing past the dominant perspective (Gutstein, 2006; Rubel, 2017). In addition, current assessment strategies are found to both inhibit authentic learning opportunities, problem solving and creativity. They

both misrepresent student learning and ability and are not conducive to fostering student growth. Despite such struggles and systemic roadblocks, considerable literature exists on how educators may incorporate equitable strategies into their practice. Such pedagogies however, require an intentional melding of critical and mathematics education pedagogies as well as continuous personal work on the part of the teacher that might sustain a self-awareness and sense of agency.

Equitable teaching strategies are especially necessary in mathematics classrooms given the current racial disparities in mathematical proficiency, advanced mathematics enrollment, STEM degree seekers, and the consequences of innumeracy for individuals and society (Champion and Mesa, 2016; Paolos, 1989, 2001; US Census Bureau, 2018). Currently, state mathematics standards and equity frameworks targeted at mathematics fail to provide insight as to *how* teachers may be able to teach the content to different types of students (Apple, 1999; Bartell et al, 2017; Cuban, 1990). Barajas-López and Larnell (2019) argue specifically that such frameworks fail to address how necessary partnerships between schools, parents, and communities can be established and maintained. They further suggest that the discourse regarding equity in mathematics education is too often race-neutral and/or race-lite as a result of the predominantly White audience of teachers, researchers, and policy advisors, suggesting that “*how* race and culture are included should be a primary consideration” [emphasis added] (p. 354). Finally, they affirm work by

Martin (2009, 2011), declaring that mathematics educators must “*consult literature and frameworks outside of mathematics education which attend explicitly to race and culture*” [emphasis added] (Barajas-López & Larnell, 2019).

In order to transform the mathematics classroom into an environment which validates diverse students' identities, promotes equity, and attends specifically to race and racism, it is imperative that we explore critical pedagogies and their role in United States' mathematics classrooms. Culturally Sustaining Pedagogies of practice (CSP), as described by Paris and Alim (2017), aim to amplify educational outcomes for students of color by attending specifically to their culture and language resources. Champions of CSP maintain that in order to escape the *double consciousness* (Du Bois, 1994/1903) and *White gaze* inherent for students of color in United States schooling, we must reframe our conceptions of access and equity (Alim & Paris, 2017). Specifically, we must “reimage schools as sites where diverse, heterogeneous practices are not only valued but sustained” through the explicit promotion of multilingualism and multiculturalism (p. 5). This requires that we understand and accept that both language and culture are constantly evolving and are driven by both history and youth (Ladson-Billings, 1995).



Accordingly, educators are charged with continuous cultural and linguistic research and relationship building to provide a space where students are able to acquire knowledge, cultural competence, and critical consciousness to both understand and critique the oppressive systems in their lives (whether as the oppressor or the oppressed) (Paris & Alim, 2017; Friere, 1970/2018). Unfortunately, the literature does not provide examples, or explicitly address the importance of CSP, in mathematics and STEM classrooms more broadly.

A crucial objective in applying CSP to the mathematics classroom (CSMP), as argued in this paper, is the recognition of mathematics as a language of power, and quantitative literacy as an equalizer. Paris and Alim (2017) maintain that the goal of CSP is to “develop practices and policies that foster a pluralist future,” moving beyond those that “uphold and reproduce assimilationist, monolingual, monocultural, and antidemocratic futures” (Paris and Alim,

2017, p. 169). Through this lense, the goal of mathematics education is to arm diverse students to defend their cultures against oppressive systems. Students must understand both the nature of quantitative reasoning, its relevance, and its power in their lives. Through such active awareness and mathematical critique of sociopolitical systems, students may begin to (1)



value numeracy and (2) acquire the quantitative reasoning skills to advocate for their communities.

This brief is an attempt to highlight the importance of shifting the mathematics education paradigm to promote critical consciousness and advocacy through mathematics. We hypothesize that CSMP classrooms encourage students to critically reflect on their cognitive

and metacognitive processes using chosen and available language (Connolly & Vilardi, 1989), develop autonomous learners and STEM literacy through guided inquiry and productive mathematical discussions (Stephan, Pugalee, Cline & Cline, 2017; Smith & Stein, 2018); and situate such learning in real world social, cultural, economic, and political contexts. The lack of literature, strategies, and collaboration between higher and K12 education highlights the need for practitioner-based, action, and design-based research to explore and provide tangible resources to transform mathematics education. Our desire is to develop pedagogies which position students to discover the nature of mathematics in authentic contexts and to obtain levels of mathematical proficiency and critical reflection which enable them to dismantle oppressive systems and become innovators in the realm of quantitative justice. We call on the mathematics education community to come together and explore how we might make it happen.

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