

RESEARCH BRIEF

Exploring Childhood Trauma and School Discipline Rates for Black Girls

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Introduction

The U.S. Department of Education's Civil Rights Data Collection revealed in their 2018 report that Black girls were the only group of girls who were overrepresented in national school discipline and law enforcement referral rates. Hidden amongst their disproportionate school discipline rate is its possible connection to Black girls' responses to multiple sources of trauma and victimization (Morris, 2016a). Studies support that instead of receiving therapeutic services, Black girls living with the effects of trauma are further penalized through punitive discipline practices (DuMonthier, Childers & Milli, 2017; Morris, 2016a; Morris, 2016b; Smith-Evans, George, Graves, Kaufmann & Frohlich, 2014). A recent study conducted in Pittsburgh, Pennsylvania showed that Black girls who had histories of trauma were eleven times more likely to be referred to the juvenile justice system (Goodkind, 2016). This research brief aims to investigate how Black girls surviving forms of childhood trauma are criminalized in educational spaces while providing recommendations for incorporating trauma-informed school practices.

Childhood Traumatic Stress and the Exposure to Childhood Maltreatment & Violence

The National Child Traumatic Stress Network (NCTSN), a leading organization that advocates for

services supporting children surviving trauma, defines a traumatic childhood event as a "frightening, dangerous, or violent event that poses a threat to a child's life or bodily integrity" (NCTSN, n.d., para. 1). According to NCTSN, experiences that classify as traumatic incidents for children range from physical, sexual, or psychological abuse to family/community violence and the loss of a loved one. Children who have experienced one or more sources of trauma likely suffer from child traumatic stress, leaving a lasting impact on their daily lives, even after the events have ended (NCTSN, n.d.). Nationally, Black children experience childhood trauma at higher rates, making them more susceptible to childhood traumatic stress (NCTSN, 2017). The U.S. Department of Health and Human Services' Children's Bureau (2018) found that Black children and Native American children have the highest rates of child maltreatment. In comparison to children of other races and ethnicities, Black youth disproportionately live in racially segregated neighborhoods characterized higher rates of poverty and violent crimes. (Browning et al., 2017; NCTSN, 2017; Sharkey, 2009). Prolonged exposure to neighborhood violence likely results in "disparities in consequential stress processes and behavioral development, with implications for life prospects and long-term risk of chronic conditions" (Browning et al., 2017, p. 42). Subsequently, evidence from a U.S. Department of Justice study showed that Black youth age 12 to 19

are victims of crimes at significantly higher rates than their White peers (The National Center for Victims of Crime, n.d.).

Trauma, Black Girls, and Discipline & Confinement as a Response

Just as the exposure to traumatic stressors is unequal for Black children, so is the toll of toxic stress (Morris 2016a; NCTSN, 2017). When assessing the impact of trauma for Black girls, researchers from the NAACP Legal Defense and Education Fund and National Women's Law Center stated in their report *Unlocking Opportunity for African American Girls*, "Trauma — from sexual harassment and assault, community violence, and the daily stressors of racism and sexism — can have a negative effect on academic performance for any child... For African American girls, the build-up of overlapping forms of trauma may have an even more negative effect." (Smith-Evans et al., 2014, p. 20).

Black girls have an increased risk of exposure to violence and experience multiple forms of violence (intimate partner violence, homicide, sexual abuse and rape) at rates disproportionately higher than their White female counterparts (Center for Disease Control, 2017; Crenshaw, 2015; DuMonthier, Childers & Milli, 2017; Morris, 2016a). Nonetheless, when Black girls outwardly display signs of trauma, they are harmfully stereotyped and disregarded. A survey of 325 adults from various backgrounds found that adults saw



Black girls as needing less nurturing, less protection, less support, and less comfort (Epstien, Blake & Gonzalez, 2017). At the intersection of race and gender, Black girls are subjected to these damaging stereotypes, and a multitude of others, about Black girlhood that consequently influences the behaviors they are disciplined for (Epstein, Blake, & Gonzalez, 2017; Onyeka-Crawford, Patrick & Chaudhry, 2017). Black girls are more likely than White girls to be suspended for subjective offenses like insubordination, disrespect, and disruptive behavior (Smith-Evans et al., 2014). They are also 2.6 times as likely to be referred to law enforcement while on their school campuses than White girls and are nearly 4 times as likely to get arrested at school (U.S. Department of Education, 2016). Black girls who are trauma survivors are arrested, incarcerated and/or sent to juvenile detention centers at higher rates (DuMonthier, Childers & Milli, 2017). Moreover, girls—especially girls of color—who experience multiple childhood traumas are at an amplified risk of coming into contact with the juvenile justice system (YWCA, n.d.).

Recommendations for School Administrators

A practical approach to ensure students surviving trauma are not overly punished for their responses to those stressors is to train staff on trauma-informed best practices. All educators and student-support staff should be able to recognize signs of abuse and toxic stress in children. Administrators should also have a plan in place to further support those

students including a referral process for counseling and mental health services; protocol for home visits and a referral process for child protective services, if needed; and procedures for child welfare follow-up.

Understanding that school budgets can be redistricted, limiting the hiring of new student support staff, administrators should form relationships with service providers in their districts (health and human services agencies and local non-profits) to assist with filling in the gaps. Non-profit organizations that deliver positive youth development programming can also help support young people who need a little more guidance, nurturing, and outlets for self-expression. School leadership can explore how to become a host school for these organizations, a partnership that typically comes at no or low costs for the school. Administrators should also review their school's interpretation of the district's suspension policies and incorporate a trauma-informed student infraction evaluation system. If there is any suspicion that the student is suffering from a traumatic event, and depending on the severity of the infraction, alternative restorative justice methods should be explored including approaches to support the student's trauma recovery.

Recommendations for Teachers

In every school, teachers are the ones that know their students best. If a child appears to be "acting out" or acting differently, teachers are encouraged to make time to pull that student to the side and talk to them. Nurturing and talking to students who

are displaying behavioral issues, as opposed to resorting to punitive discipline practices, can help teachers better understand what challenges a student may be facing. Teachers should never hesitate to make proper referrals to their administrators and/or school social workers/counselors for students they believe are experiencing traumatic stress.

Even if the initiative is led by just one motivated educator, the push for a change in school culture is possible. Since many school districts require their staff to participate in frequent professional development workshops, a teacher can suggest that one of them focus on trauma-informed practices. They can also seek resources on their own to better understand how their students may respond to trauma in the classroom and gain the tools needed to assist them. The Treatment and Services Adaption Center offers a wealth of online resources on trauma awareness for education practitioners (<https://traumaawareschools.org>).

Conclusion

Black girls surviving childhood trauma deserve the opportunity to be affirmed, not punished. Schools should be spaces they trust to protect them. If our school systems are committed to closing the opportunity gap and improving the educational outcomes of all students, especially for our most marginalized populations, we cannot punish students because of their circumstances. Instead, we must find ways continuously encourage resiliency, support growth, provide nurturance, and keep them in the classroom.



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RESEARCH BRIEF

Increasing College Readiness for Black Students: Advanced Placement Course Participation

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Introduction

Students in the U.S. are not adequately prepared for the successful completion of postsecondary education. The U.S. Department of Education (n.d.) states “Today, about a third of American students require remedial education when they enter college, and current college attainment rates are not keeping pace with our country's projected workforce needs” (para.3). The National Assessment of Education Progress (NAEP) 2015 also reported that 37% of 12th grade students are college ready in reading and 25% are considered college ready in mathematics. For Black students, less than 20% scored proficient or above on 12th grade NAEP Reading assessment during the last four testing periods (2005, 2009, 2013, 2015) and less than 10% scored at proficiency or above during those same testing periods on the 12th grade NAEP Math Assessment (NAEP, 2015).

Aside from low achievement on NAEP assessments, recent data on postsecondary graduation rates from the National Center for Education Statistics (2018) reported that 21% of Black students that enrolled in college in 2010 graduated in four years and in total 40% graduated between 4-6 years, the lowest graduation rates of the racial and ethnic groups represented in the sample. There is a need to increase college readiness for Black students. One historically successful way of increasing college readiness has been student participation in advanced placement courses (Kettler & Hurst, 2017; Warne, 2017). Yet, the College

Board (2014) reported that out of 3,153,014 students that took AP Exams nationwide, only 9.2% of test takers were African American students. Furthermore, of those 9.2% test takers, 4.6% scored a 3 or higher (the lowest passing score) on AP Exams (CollegeBoard, 2014). Black students' participation in advanced courses could provide necessary support for increased postsecondary degree attainment. This article examines Black students' participation in advanced placement courses. This article also includes solutions to increase Black students' access to Advanced Placement courses in an effort to support increased postsecondary graduation rates for Black students.

College Preparation Coursework in High School

There has been a lack of consistent measures for college and career readiness although state and national standardized test have qualified test performance levels as indicators for college and career readiness (Mishkind, 2014). Nonetheless, exposure to college-level coursework in high school has consistently been recommended as a solution for increasing academic success for students after their transition to college (Morgan, Zakhem, & Cooper, 2018). Advanced Placement (AP) courses are examples of college preparation courses that promote college readiness (CollegeBoard, 2014). In 2019, 2,825,710 students participated in AP programs (CollegeBoard, 2019). Though some researchers contend that participation in AP Courses has unclear relations to

college readiness (Morgan, Zakhem, & Cooper, 2018; Warne, 2017), participation in AP programs is heavily supported by colleges and educational policies and has benefitted students as a way of getting ahead in college coursework (Evans, 2018; Rodriguez & McGuire, 2019; Warne, 2017).

Racial/Ethnic Gaps in Gifted Advanced Course Enrollment

Although Black students' participation in AP courses continues to increase, racial and ethnic gaps in AP course enrollment and AP testing have also continued to exist (James, Butterfield, Jones, & Mokuuria, 2017; Morgan, Zakhem, & Cooper, 2018). Kettler and Hurst (2017) conducted a longitudinal analysis to examine gaps in student participation in advanced academic courses over the span of ten years in suburban high schools. The results of the study revealed that were ethnic gaps in AP/IB testing between Black and Hispanic students and White students during this time frame. The researchers suggested that solutions to decrease the ethnicity gaps should be culturally responsive. Rodriguez and McGuire (2019) examined the impact of the Black-White AP course enrollment gap and found that increasing AP course offerings does not help close the racial/ethnic course participation gap.

Solutions for Increasing Black Students Access to Advanced Placement Courses



One deterrent of Black students' participation in Advanced Placement courses is often the lack of Advanced Placement course offerings in schools that serve a majority of Black students (Rodriguez & McGuire, 2018). Black students should be provided advanced coursework that adequately prepares them for collegiate success, whether or not AP courses are offered in their schools (College Board, 2014). One solution for increasing Black students' access to advanced coursework is through the use of online instructional tools in the classroom. CollegeBoard includes an option on their website currently for students to search for online Advanced Placement course offerings. The offering of advanced coursework via technology is a flexible option for teachers to challenge high achieving students. Advanced coursework through e-learning can positively impact students' critical thinking, written, and communication skills (Thomson, 2011). Online instructional tools could also be used to differentiate learning for gifted students that may not have access to coursework that meets their academic needs.

Aside from online offerings, high schools could offer dual enrollment courses between high schools, similar to how dual enrollment courses are

currently offered through two-year and four-year colleges for high school students. Administrators from high schools that are close in proximity could collaborate to develop schedules and transportation plans to ensure that Black students from schools lacking AP coursework offerings are provided opportunities to participate in another high school's AP class in-person. This would allow high achieving Black students the opportunity to receive more rigorous coursework, while also allowing students to learn in a new environment that is more conducive to their learning needs. While longer term solutions for increasing college readiness for Black students through increased access to Advanced Placement should address structural inequalities and educational policy, the establishment of partnerships between local high schools to increase Black students' participation in Advanced Placement courses is a short term solution that could render lasting positive outcomes.

Conclusion

There is a need to increase college readiness for students nationally, yet postsecondary outcomes and standardized test scores indicate a need for increased college readiness for Black students. Student participation in Advanced Placement courses and testing

can positively impact academic achievement for Black students at the collegiate level. The revelation of persisting Racial/ethnic gaps in AP course have been studied but solutions to closing these gaps have not been adequately addressed. Short term solutions that can occur sooner than later include expanding AP coursework offerings online and the development of dual enrollment programs between high schools. Long term solutions should emphasize policy revisions that require diversity for participating students. Both long term and short term solutions could lead to increased outcomes for Black students' postsecondary success.



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RESEARCH BRIEF

Addressing Cultural Mismatch in Urban Schools: Reforming Teacher Preparation

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Addressing Cultural Mismatch in Urban Schools: Reforming Teacher Preparation

White female teachers remain dominant in the teaching profession, making up about 80% of the current teaching force (United States Department of Education, 2019). In urban classroom settings with student populations of majority non-White students, cultural mismatch between teachers and their students contributes to many of the pressing issues facing urban schools, including low academic achievement and high rates of exclusion-based disciplinary actions (Gregory, Skiba, & Noguera, 2010). While increased efforts to support the recruitment and retention of minority teachers is critical, these efforts will take time to become fully realized. In the meantime, teacher preparation programs across the country must reform program requirements to better prepare white teachers for diverse classrooms. This research brief seeks to outline the research regarding the effects of cultural mismatch between students and teachers and offers recommendations for teacher preparation programs to better prepare teachers for diverse classroom settings.

Literature Review

In educational research, increasing attention has been given to the presence and effects of implicit bias among classroom teachers. Implicit bias is defined as “embedded stereotypes that heavily influence our decision-making without our conscious knowledge” (Godsil, Tropp, Goff, &

Powell, 2014). Studies suggest that implicit bias is at least partially to blame for the disproportionate number of African American students receiving disciplinary actions for subjective behaviors, such as defiance and disrespect (Cartledge, Gibson, & Keyes, 2012; Gregory et al., 2010). These disproportionate rates are not seen with more objective offenses, like fighting and smoking (Gregory et al., 2010). Implicit biases can impact the type of feedback teachers give to students. In a recent study, Scott, Gage, Hirn, and Han (2019) sought to measure differences in teacher feedback to students in different racial dyads, either White teacher-White student, White teacher-Black student, Black teacher-White student, or Black teacher-Black student. This study revealed that Black students were more likely to receive negative feedback than their White peers, regardless of the race of the teacher, indicating a need to address teachers’ racial biases in teachers of all backgrounds.

Whether or not teachers are aware of their own racial biases, students are aware of when they are being treated differently than their peers, thus impacting their motivation to engage in instruction (Holbrook, 2011). Reports on teacher bias and student expectations reveal that teachers are more likely to set lower expectations for African American students (Ferguson, 2003). Teacher expectations are linked to student learning outcomes (Pantaleo, 2016), therefore suggesting that low teacher expectations for students of color contribute to lower levels of academic achievement for non-White students.

Teacher preparation programs have the potential to transform prospective teachers’ thinking and classroom practices when working with diverse groups of students. Multicultural education courses are now seen as a staple in traditional teacher preparation programs. However, these courses, when taught in isolation, run the risk of reaffirming prospective teachers’ unexamined beliefs about race and ethnicity (Liu & Ball, 2019). In a study examining White prospective teachers’ responses to multicultural education courses, Horton and Scott (2004) conclude that short-term multicultural education courses may contribute to more rigid notions of White identity if they are targeted only at the “other” and do not include reflections of the self.

Recommendations

Teacher preparation programs must begin with foundation courses on diversity and cultural development. Courses should be designed to help students understand the development of their own cultural identity and reflect on how their current view of diversity can impact the way they approach teaching in diverse settings. Particularly with poor students of color, how a teacher thinks about their students affects how students are treated, as well as the instructional decisions they make (Ladson-Billings, 2011). These foundation courses will serve as only one of many steps towards developing effective teachers of diverse students.



Successful teaching of diverse students requires a different way of thinking about students, curriculum, and instructional practices (Bidwell & Stinson, 2016). Issues of diversity should be infused into all teacher preparation required courses. Content-specific methods courses in teacher preparation programs should encourage teacher candidates to put the student first when determining the appropriateness of a wide variety of instructional practices. Intentionally incorporating diversity into all teacher education coursework also shows promise in retaining minority students in teacher preparation programs (Hobson-Horton & Owens, 2004).

Before working with students in traditional classroom settings, teacher preparation programs should require preservice teachers (PSTs) to work with diverse school-aged children in community-based

programs, such as community centers or summer day camps. According to Ladson-Billings (2001), “School is typically the first place that most children encounter failure” (p. 136). If school is the first place PSTs encounter children of diverse backgrounds, they may unconsciously associate these children with failure. Other approaches to community-based teacher preparation include community walks (Henderson & Whipple, 2013) and panel discussions led by parents and community leaders (Zeichner, Bowman, Guillen, & Napolitan, 2016). While research into community-based teacher preparation is fairly limited, the research that does exist shows potential in preparing teachers to lead in diverse classrooms (Liu & Ball, 2019).

Conclusion

Implicit bias and cultural mismatch between White teachers and non-White students can contribute to negative outcomes for students, including increases in disciplinary actions for subjective offenses and lower academic achievement (Cartledge, Gibson, & Keyes, 2012; Gregory et al., 2010). With White teachers maintaining a strong majority in the field of education, teacher preparation programs have an increased responsibility to prepare prospective teachers for increasingly diverse classroom settings. Beyond isolated courses in diversity, teacher preparation programs must embed issues of diversity into all course requirements and community-based field experiences. All students deserve to have teachers who believe they can succeed in school and beyond.

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RESEARCH BRIEF

Recruitment and Retention of Teachers of Color

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In a globally competitive world, it is critical for the United States to recruit and retain a diverse group of high quality teachers. Across the United States, there is a shortage of African American, Latinx, Asian, and Native American teachers. As of 2017, 80% of public school teachers in the United States were White. The teaching population is not representative of the majority of students in U.S. public schools (Strauss, 2014). Multiple studies published in recent years have revealed the benefits children of color receive by experiencing a teacher of the same race, including reduced rates of disciplinary referrals among Black students, higher student attendance rates, and increased aspirations to attend a four-year college (Gershenson, Hart, Lindsay, & Papageorge, 2017; Holt & Gershenson, 2015; Lindsay & Hart, 2017). Despite these benefits, little progress has been made towards effectively recruiting and sustaining teachers of color. This research brief examines literature on teacher recruitment, current data on teachers of color, and possible solutions for teacher recruitment and retention.

Literature Review

One of the greatest challenges to recruiting high performing teachers is funding. Teachers' weekly wages are 23% lower than those of other U.S. college graduates (Allegretto & Mishel, 2016). Not only does the teaching profession lack a competitive salary, pre-service teachers often graduate with excessive student loans. Carver-Thomas (2018)

states, "Research shows that college students choose careers, in part, based on the debt load they will face in relation to the salaries they can earn in a given line of work" (p.3).

A successful model of teacher recruitment scholarship programs in the United States is the North Carolina Teaching Fellows. In response to a severe teacher shortage in the 1980's, the Public School Forum of North Carolina created the North Carolina Teaching Fellows, a competitive scholarship program that recruited top-performing high school seniors. In exchange for four years of tuition at selected NC universities, graduates were required to teach in North Carolina for four years. According the NC Teaching Fellows Impact Report (Cohen, 2018), 64% of Teaching Fellows taught in the classroom at least 10 years, and over 500 Teaching Fellows went on to become specialists, administrators, and superintendents.

Other states have begun implementing similar programs and scholarships to intentionally diversify teacher education. Florida, Minnesota, Kentucky, Missouri, and Tennessee offer various scholarships and loan forgiveness programs to recruit teachers of color (Carver-Thomas, 2018). Leaders in Alberta, Canada created Teach for Canada, a teacher preparation program that serves First Nations students. Priority scholarships are given to First Nations members in Alberta and Ontario (Darling-Hammond, 2017).

Teacher recruitment is only part of the problem, as retaining high quality teachers continues to be a

growing challenge across the United States. According to a longitudinal survey by the U.S. Department of Education (Gray & Taie, 2015), 17% of teachers leave the teaching profession within their first five years. Attrition rates remain highest for young and new teachers (Guarino, Santibanez & Daley, 2006). In a 2017 *Education Week* survey, 500 teachers across the nation were asked, "What would make you leave your current job?" The number one answer was leadership (Viadero, 2018). Weak leadership is a significant factor in teacher turnover (Ghamrawi & Jammal, 2013). Strengthening new teacher supports and improving school leadership is critical in retaining teachers.

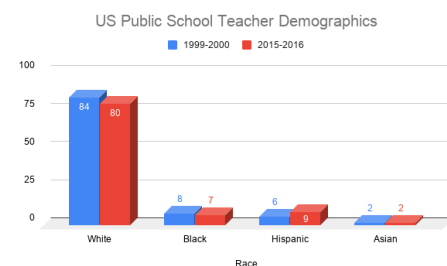


Figure 1: US Public School Teacher Demographics. Adapted from U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, 2018

Data on Teacher Demographics

According to the U.S. Department of Education (2018), White teachers make up 80 percent of the public teaching force. The percentage of Black public-school teachers has decreased one percent over a 15-year time span. The number of Hispanic teachers has increased three percent. Asian teachers continue to make up only two percent of the U.S. teaching force.



While the number of White teachers has decreased from 84 to 80 percent from 2000-2015, the number of White *students* enrolled in public schools has decreased 61 to 49 percent (NCES, 2019). These statistics demonstrate a significant discrepancy between the number of White teachers and teachers of color, along with a growing racial mismatch between teachers and students. This indicates a greater need for recruiting and retaining teachers of color.

Solution

One solution to recruiting high quality students of color into teacher education programs is offering loan forgiveness programs in every state. Similar to the North Carolina Teaching Fellows program, all 50 states should offer scholarship loan forgiveness programs that waive college tuition and housing fees in exchange for teaching four years in state public schools. Scholarship

funding can come from state education budgets or federal programs to offset costs. Preference should be given for teacher candidates of color, and Historically Black Colleges and Universities should participate when possible. This scholarship program not only aids in recruitment of Black, Latinx, Asian, and Indigenous teachers, but also retention since teachers would have financial incentives to remain in the classroom to avoid paying loans with interest. Additional solutions for retaining teachers of color include providing continuous mentoring for new teachers and improving school leadership and climate. Each state should be required to design programs where effective mentors are placed with new teachers to provide ongoing support and feedback. An effective model of mentorship serving teachers of color is the Black Teacher Project (2019), an organization that provides professional development and

mentorship for Black teachers in San Francisco, Oakland, and New York City. In addition to ongoing mentorship, it is critical that school administrators create a positive school culture that encourage teachers of color to remain in their field. School leadership can maintain a positive school climate by establishing staff norms and providing culturally responsive training.

Conclusion

A potential solution to recruiting high-performing teachers of color is to provide competitive scholarships and loan forgiveness programs. New teachers should receive comprehensive induction and mentoring to help develop and retain quality teachers. Finally, school administrators should receive training to improve leadership and school climate, thus leading to increased teacher retention.

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RESEARCH BRIEF

Out of School Enrichment: Pathways to STEM Development for Gifted Black Girls

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A recurring theme in gifted education is the underrepresentation of Black students (Crabtree, Richardson, Lewis, 2019). The 2013-2014 Civil Rights Data Collection (CRDC) report revealed that 9.9% of Black students in the United States participated in gifted education, compared to 58% of White students (CRDC, 2016). Black girls are underrepresented in gifted and are often overlooked in research efforts (Young, Young & Ford, 2017). According to the 2013-2014 CRDC, approximately 10.8% of African American girls were identified as gifted and talented compared to 57.3% of White girls (CRDC, 2016). Deconstructing barriers to equitable educational opportunities and providing access to gifted programming is vital for Black girls.

Dually, Black females are underrepresented in STEM education programs and careers (Larke, Webb-Hasan & Young, 2016a). Former President Barack Obama (2009) in his speech during the National Academy of Sciences annual meeting declared, increasing mathematics and science education in the U.S., as well as the pool of students who are prepared to pursue the sciences as a career trajectory, is of utmost urgency in this global and competitive market. It is therefore crucial that Black girls are ready to enter the field of STEM with preparation in advanced science and math classes. However, Black girls remain underrepresented in AP classes (ocrdata.ed.gov). This is counterproductive because failure to participate in advanced courses in mathematics and science can inhibit access to careers in STEM (Young et

al., 2017). Thus, more importance should be placed on the preparation of Black girls to enter STEM careers through advanced math and science classes.

Black Girls in Gifted Education

Current research and theoretical models that address racial inequity or gender disparities in gifted education often overlook the underrepresentation of Black girls in gifted programs (Evans-Winters, 2014). The importance of gifted education is evident. Studies have linked participation in gifted programs to positive future outcomes, including increased academic performance (Card & Giuliano, 2014). However, Ford (2013) noted that African American females are underrepresented by almost 40% in gifted education nationally. Racial bias, gender bias, and deficit thinking are among the leading factors that hinder the representation of Black girls in gifted programs (Mayes & Hines, 2014). When Black girls are not afforded opportunities to participate in gifted programming, opportunities are missed, setting an unlikely trajectory for underachievement.

STEM

The absence of female professionals, particularly Black women, in STEM fields is a persistent problem (National Academy of Sciences, National Academy of Engineering, Institute of Medicine, & National Research Council, 2010). Thus, diversifying and preparing students who are prepared to pursue

careers in STEM should be of utmost importance. Young (2018) asserts Black women represent a proportion of diverse learners who remain underrepresented in STEM professions. Jobs in STEM remain 75% White, with women of color comprising only 10% of the professional STEM workforce (Feller, 2012). Black women constitute 1.6% of STEM professionals with bachelor's degrees, and only 1.4% of those with doctoral degrees (Lehming, Gawalt, Cohen, & Bell, 2013). Black girls represent an underutilized resource in promoting STEM careers.

Out of School STEM Programs

In the past, the majority of efforts have focused on improving in-school STEM learning during the K-12 period; however, there is a growing awareness of the potential role of out of school programs or informal learning spaces in promoting STEM learning (Bell, Lewenstein, Shouse, & Feder, 2009; National Research Council, 2015). Informal science learning refers to science learning that takes place during out of school time (OST). Examples include visiting a museum, taking a stroll through the park, participating in aftercare or summer programs, reading books about science, raising pets at home, and even browsing the internet (Dierking, Falk, Rennie, Anderson, & Ellenbogen, 2003; Rennie, 2007). Garnering sustained interest, motivation, and engagement in math and science requires more time than is available during the school day (Young, J. et al., 2019).



Out of school STEM educational programs have the ability and time to promote an interdisciplinary approach to science, technology, engineering, and mathematics to engage populations who are underrepresented in STEM professions in powerful ways (Dorsen, Carlson, & Goodyear, 2006; Honey, Pearson, & Schweingruber, 2014). These programs are beneficial to Black girls because they are designed to consider factors directly related to developing their STEM capacity (Young et al., 2019). Thus, these programs, by design, can speak to educational inequities, close learning gaps, and provide STEM opportunities for Black girls.

Recommendations Mentorship

Mentorship through OST STEM programming is one way for gifted Black girls to develop self-efficacy and self-identify within the STEM discipline, due to the systematic and systemic barriers that perpetuate marginalization in STEM and gifted education (Young et al., 2019). Thus, OST STEM programming is dually essential as it serves as a mentorship program that gives space

for Black girls to understand and validate their collective experiences. OST STEM programs have the ability and flexibility to recruit mentors from the community to serve as role models for Black girls. Black girls need to be exposed to Black females in STEM as one strategy to increase or reinforce their interest, self-efficacy, and identify of the STEM discipline (Young et al., 2017).

Culturally Relevant Pedagogy

Culturally relevant pedagogy emphasizes that linkage among home, community, and school; however, this linkage may not happen in the traditional school setting (Ladson-Billings, 2006). Therefore, creating OST STEM curriculum with culturally relevant pedagogy in mind is essential to authentically engage gifted Black girls in meaningful STEM-based activities that embrace their lived experiences. Ford 2010, suggest curriculum should be relevant to Black girls, providing real-world and culturally relevant literature and lesson plans. These culturally relevant lessons provide affirming spaces and literature mentorship that gifted Black girls may go without in traditional school environments.

Conclusion

Pinpointing nontraditional ways to engage and support Black girls in STEM courses is essential to diversifying STEM careers (Young et al., 2017). Gifted Black girls represent a inimitable population of learners that can increase STEM professionals. OST STEM programs provide valuable experiences that increase interest and help students realize how STEM connects to everyday experiences (Thomasian, 2011). In order to increase retention rates and participation of Black girls and women in the STEM disciplines, the culture of science and mathematics must be changed to one that values the potential of Black girls (Aud et al., 2010; George, Neal, Van Horne, & Malcolm, 2001; Hanson, 2008; Hernandez-Gantes & Fletcher, 2013). Therefore, making science and mathematics more accessible through OST STEM education programs is a viable option (Feinstein & Meshoulam, 2014). OST STEM education programs have the potential to address educational inequities and broaden the participation of underrepresented populations in STEM careers.

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RESEARCH BRIEF

The Role of Context in Developing Ethical Mathematics Dispositions in Students

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The ability to produce and evaluate quantitative arguments is crucial for establishing power in today's data driven world (Gravemeijer, Stephan, Julie, & Lin, & Ohtani, 2017). To ensure equitable and ethical outcomes for diverse citizens, such individuals must have the ability to advocate for themselves and their families (Gravemeijer et al, 2017; Steen, 2001). Several studies have addressed the ramifications of the unethical and unmonitored use of mathematics in society (Best, 2013; Ernest, 2018, O'Neil, 2016; Wheelan, 2014). Researchers suggest that practicing mathematicians and statisticians should develop a critical consciousness of the effects that their quantitative products have on the world (Barwell, 2018; Crabtree & Stephan, under review; Ernest, 2018; Friere, 2018; Gutstein, 2006, 2016; Skovsmose, 2016). As a response to this charge, it is recommended that the education of our youth include the development of both mathematical/statistical literacy and ethical mathematics dispositions centered in authentic workplace, social, and political contexts (Barwell, 2018; Gravemeijer et al, 2017; Ernest, 2018; Gutstein, 2016).

Review of Literature

The pressures of high stakes testing have transformed the mathematics classroom into a computation centered environment detached from students' realities (Cobb, 1999; Landsman & Lewis, 2011; Moore & Lewis, 2012; Triplett & Ford, 2019). This lack of authentic contexts

contributes to students' skewed perceptions of mathematical utility, positioning them to misinterpret the quantitative nature of the world (Gravemeijer et al, 2017). Additionally, the inequities inherent in the United States education system have contributed to the reality that few people have the power and mathematical literacy required to access and understand the mathematics that governs their lives (Best, 2013; Brelia, 2015; Cobb, 1999; Ernest, 1991; Moore & Lewis, 2012; O'Neil, 2016). In the current age of information, quantitative arguments are central to political discourse and public policy debates (Cobb, 1999; Gravemeijer et al, 2017). Individuals who are incapable of analyzing such data are less likely to participate in democratic discourse and civic decision making, often resulting in their further marginalization and skepticism towards the political system (Gravemeijer et al, 2017; Cobb, 1999). Accordingly, quantitative reasoning is not reserved for people who desire a career in applied mathematics and statistics, but is necessary for participation in democracy (Best, 2013; Cobb, 1999; Gravemeijer et al, 2017; Gutstein, 2016, 2018; O'Neil, 2016).

Workplace mathematics are applied sciences that influence both corporate and political decision making (Cobb, 1999; O'Neil, 2016; Skovsmose, 2011). They exist in collaboration with other disciplines and when unscrutinized, have the potential to negatively impact individuals, society, and the environment (Barwell, 2018; Best, 2013; O'Neil, 2016; Skovsmose, 2011). Several expert and

field mathematicians highlight the use of mathematics as a tool for power and persuasion (Best 2013; Brelia, 2015; Ernest, 2018; O'Neil, 2016; Wheelan, 2014) and correlate mathematical instrumentalism with the "objectification and dehumanization of persons in business, society and politics" (Ernest, p. 211, 2018). Such authorities contend that publicized statistics and mathematical algorithms frequently use biased, correlational, and possibly discriminatory data to aid corporate decision making and policy that accommodate particular agendas. Such realities, coupled with evidence that marginalized and low-income families are processed more often by such models, contributes to a critical need for mathematically literate citizens and critically conscious professional mathematicians (Ernest, 2018; O'Neil, 2016).

Students Ethical Considerations in an Integrated STEM Lesson

Ethical dispositions in mathematics are a proposed construct adopted from Holzer's (2007) ethical dispositions in a textual analysis, Friere's (2018) critical consciousness, Ladson-Billings (2015) sociopolitical consciousness, and Crabtree and Stephan's (under review) critical science consciousness (CSC). They are the desired and observable results of attaining a critical consciousness in the field of mathematics. Persons who hold ethical mathematics dispositions are conscious of the potential impact of their work and make methodological choices according to what they believe is morally right.



This study used a retrospective analysis of 7th grade student interviews conducted before and after an integrated STEM lesson. Four student interviews were analyzed to explore the nature of students' ethical reasoning and the aspects of the context that were perceived to elicit such considerations. During the interviews, students were asked to solve several tasks, explain their reasoning, and engage in task related discourse with the interviewer. The first set of tasks related to ratios, proportions, and parallel lines, while the culminating task included an engineering scenario where students were asked to explain how they would build an underground cavern to escape a projected asteroid collision. In the unsituated mathematics segment, students' explanations were predominantly restricted to procedure and did not deviate from the mathematical task at hand. In the engineering scenario, however, solutions were littered with social and ethical considerations that were not required. Students chose locations that would be accessible to citizens with special needs and dense populations as well as those that had an ideal proximity to resources and transportation hubs to access survivors after the disaster.

In the case described, both the context of the task and the learning-experience context drove the students' ethical considerations. The unsituated mathematics task did not lend itself to thinking outside of mathematics because, for the students, it could not be connected to anything real. The learning-experience context was also conducive to eliciting ethical considerations. Students were expected to defend and reflect on their solutions with the interviewer. This reliance on discourse undoubtedly pushed them to extend their reasoning.

Recommendations

Substantial evidence supports the use of authentic contexts, open-ended tasks, and discourse centered learning environments in STEM classrooms (Boaler, 2002; Cobb, 1999; Hodge & Cobb, 2019; Stephan, Pugalee, Cline & Cline, 2017; Smith & Stein, 2018). Although the findings of this limited case study seem to confirm this stance with regard to task selection, more research is needed to determine the characteristics of learning contexts which are conducive to developing critical mathematics consciousness

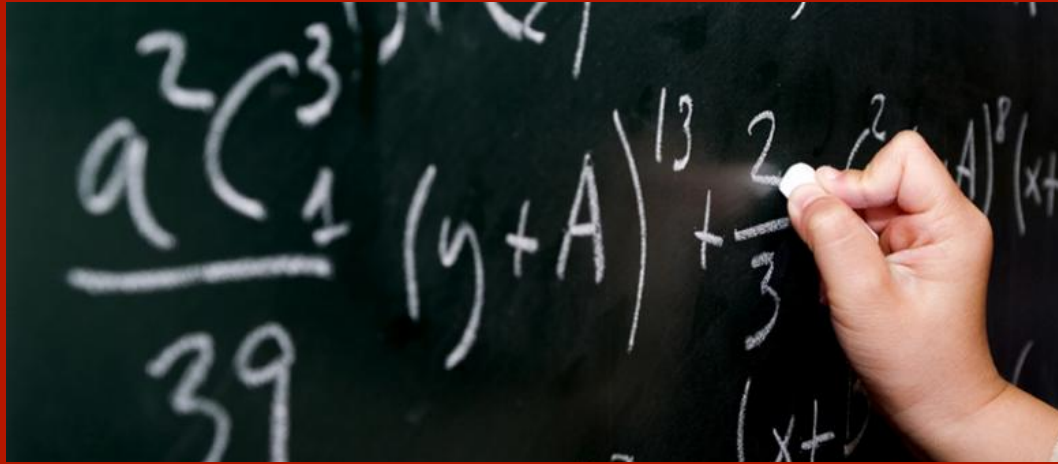
and ethical mathematics dispositions in students. A certainty, however, is that the use of mathematics both in the classroom and the field, must become what Skovsmose (2016) refers to as two-dimensional; defined as a practice of both doing and reflecting.

Preparing students for citizenship requires that they are empowered, conscious, and predisposed to do what is right (Ernest, 2018). It is essential that students engage critically with authentic tasks that reflect the mathematics used in policy, politics, and applied mathematics careers (Ernest, 2018; Gravemeijer et al, 2017). The superficial "real world" scenarios seen in many classroom tasks are not conducive to understanding the quantitative nature of society or acquiring the 21st century skills required to thrive in it (Gravemeijer et al, 2017). Learning contexts must overlap with civic and workplace contexts and encourage critical and reflective discourse (Ernest, 2018; Gravemeijer et al, 2017; Hodge & Cobb, 2019). Only then will students understand how to participate in democracy and contribute to society in a reflective and ethical manner.

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