

# Visible or Invisible? Black Girls' Experiences in a Mathematics Classroom

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*Building on extant literature, the present qualitative study explored Black adolescent girls' racial and gendered experiences as mathematics learners. Data collection included focus groups with Black adolescent girls ( $N = 30$ ,  $M_{age} = 12.64$  years). Several themes concerning their racialized and gendered schooling experiences emerged, which centered on language use, competition with boys, and working hard to prove themselves. To cope with the racialized and gendered experiences within mathematics classrooms, Black girls developed informal support networks. It was also revealed that some of these coping strategies (e.g., resistance for survival) might put Black girls at risk for lower mathematics beliefs and attitudes. Directions for future research and implications for Black girls as mathematics learners are discussed.*

**Keywords:** Black girls, mathematics, grounded theory, race, gender, focus groups

## Introduction

During the last decade, there has been an increase in the research on Black girls' mathematics learning and experiences within the classroom (e.g., Gholson & Martin, 2014; Joseph et al., 2018; Neal-Jackson, 2018; Young et al., 2017). These studies range from methodologies such as a synthesis of research, quantitative, and mixed-methods approaches in understanding the unique racialized and gendered experiences of Black girls as mathematics learners. The growing literature on Black adolescent girls' experiences in STEM (Science, Technology, Engineering, and Mathematics) learning contexts highlights how they remain underrepresented and systematically neglected and marginalized (National Women's Law Center, 2014; Let Her Learn, 2017). In the past, education research has focused more extensively on the experiences of Black male and White female adolescents rather than on the unique educational experiences of Black adolescent girls (e.g., Apple, 1999; Brown, 2011; Rollock, 2007). Brown (2011) articulates this tension with Black boys, stating:

The emphasis on the condition and opportunities for Black males has constructed a unitary framework for oppression. Consequently, Black girls are treated as a variable within these discussions, or Black girls are otherwise pitted-against Black boys. (p. 600)

For instance, Gholson (2016) refers to this as “process-based invisibility” which suggests that Black girls' invisibility centers around gap gazing where the analyses are disaggregated by race and ethnicity and not gender...rendering Black girls invisible (despite Black girls experiencing similar racialized experiences within communities). As a result, pivoting Black girls and Black boys against each other is harmful. This continues to perpetuate the narrative that Black girls are resilient and have better academic outcomes, despite the fact that Black girls perform only 2 to 3 points higher than Black boys on mathematics performance standardized test (NAEP, 2015). Thus, Black girls are not the new “model minority” (Crenshaw, 1991; Ward & Robinson-Wood, 2006) and previous focus on boys neglects the unique racialized and gendered experiences of Black girls, perpetuating the false narratives about Black girls academic and psychological well-being within classrooms. This is often the same narrative that is perpetuated when examining across gender, in that Black girls are often invisible when compared to White girls. Because of the White norms that are perpetuated in STEM success (White & male), Black girls are at a disadvantage because they comprise two marginalized identities (e.g., being Black and a female). For example, Rollock (2007) suggests that Black girls occupy a conflicting social position given that dominant school discourses characterize female students as “good students,” while also relegating Black students to the margin of educational opportunities and access. Thus, Black girls' racial identity renders the gender privilege that positions White adolescent girls as “good students,” obsolete. In like with this, scholars who amplify the experiences of Black girls in STEM emphasize how they are “doubly marginalized” within school settings due to their experiences with racism and sexism (Al'Uqdah, 2006; Gholson & Martin, 2019). Thus, being overlooked and invisible can influence Black adolescent girls STEM identity (Merolla et al., 2012; Morton & Parsons, 2018).

Building on extant literature, the present qualitative study draws on Black Feminist Theory (BFT) (Collins, 2000) and the Integrative Model for the Developmental Competencies of Minority Children (Coll et al., 1996) to explore Black adolescent girls racialized and gendered experiences as mathematics learners. In particular, we sought to highlight how the intersection of racism and sexism in Black girls' day-to-day educational experiences may undermine their

developing identities as math learners (Gholson, 2016; Gholson et al., 2019). In addition, we utilized BFT as a theoretical lens of resilience to critically analyze how Black girls resist racist and sexist injustices within the broader school context and maintain their motivation as math learners. Our guiding research questions included: How do Black girls feel about math? How do Black girls describe their racialized-gendered experiences in mathematics classrooms? And how do their racialized-gendered experiences influence their attitudes and beliefs about their academic performance in mathematics?

### **School Contexts as Developmental Niches**

Interdependent challenges with racism and sexism leads to unfair treatment in the classroom and puts Black girls at risk for lower achievement and psychosocial wellbeing (see, Morris, 2016). While Black girls have been positioned by some as a “model minority” student compared to Black boys (Kaba, 2008), other scholars dispel this myth by highlighting how racist and sexist policies (i.e., dress code violations and body and tone policing) marginalize and “push out” girls from school (e.g., Epstein et al., 2017; Gholson, 2016; Morris, 2013). In addition to unfair disciplinary practices, Black girls are often perceived as having adult-like behavior in comparison to their White peers across all developmental stages (Epstein et al., 2017; Morris, 2014). Thus, in addition to the lower performance of Black girls in mathematics, the rate in which Black girls are being pushed out of the classroom is alarming.

Neal-Jackson (2018) and Joseph, Viesca, and Bianco (2016) found that Black girls were more likely to perceive unfair treatment from school administration. More specifically, Neal-Jackson (2018) conducted a meta-ethnographic review of African American girls’ experiences within the classroom and found that school officials described and labeled Black girls as, 1) being an average student, 2) having lower educational aspirations and expectations, and 3) having an intellectual deficit or not being as smart as other students. In other words, the fact that Black girls are not White and male, they are often viewed as outsiders within educational spaces (Gay, 2010; Gholson & Martin, 2014; Jones-DeWeever, 2009; Joseph & Alton, 2018). Additionally, Eggleston and Miranda (2009) found that in order to fit in, Black girls changed their attitude, speech, and behavior. Black girls’ interactions (e.g., relationships with teacher, staff, administrators, & peers) and comfort level at school (e.g., sense of belongingness at school) influences their achievement attitudes and beliefs (for review, see Neal-Jackson, 2018), thus shaping mathematics learning and performance. While the school context is considered a critical environment for bolstering the educational resilience and academic motivation of students (Brooks, 2006), less is known about the types of school environments that Black girls perceive as supportive or hindrances to their educational performance. Additionally, Black girls’ experiences within the classrooms are not equitable. In addition to unfair disciplinary practices, Black girls are perceived as having more adult like behavior in comparison to their White peers across all developmental stages (Annamma et al., 2016; Epstein et al., 2017; Morris, 2014).

These racialized and gendered experiences within the classroom might explain the mathematics performance outcomes of Black girls. According to the National Education Assessment Program (NAEP) (2015), Black students in 8<sup>th</sup> and 12<sup>th</sup> are the lowest performing in mathematics nationally. However, examining gender by race/ethnicity revealed that Black females are the lowest performing in mathematics in 8<sup>th</sup> and 12<sup>th</sup> grade. Developing knowledge that increases our understanding of the racialized and gendered schooling experiences of Black

girls is therefore critical to addressing the educational needs, especially in mathematics, in promoting an equitable environment (Evans-Winters, 2014; Joseph et al., 2016).

The present study investigates how daily interactions with teachers and peers influence Black girls' experiences within math learning contexts. Based on previous literatures, Black girls' experiences within classrooms (e.g., Carter Andrews, Brown, Castro, & Id-Deen, 2019), school discipline (Epstein et al, 2017), and the mathematics underperformance of Black girls nationally (NAEP, 2015), we sought to examine Black girls' experiences as mathematics learners in various types of school settings (i.e., predominantly White and predominantly Black public schools, private schools, and a charter school), and also explore the roles and functions of race and gender discrimination in shaping Black girls' mathematic attitudes and beliefs.

### **Black Girls in Math**

Although literature suggests that Black girls demonstrate an avid interest in science and math during high school, very few choose to pursue STEM careers (Hanson, 2008). Past research illustrates that adolescents internalize societal representations of different groups, which for Black girls, may not include images of Black female scientists and mathematicians (Battey & Leyva, 2016; Grossman & Porche, 2013). For instance, a recent study of high school students' STEM interests found that less than 40% of Black students reported that they were interested in pursuing science or math careers after graduation (University of the Sciences, 2012). However, a growing body of literature suggests that for Black girls, deciding not to pursue a STEM career may be related to systemic messages about their limited potential ability and success in the field due to their race and gender (Archer et al., 2015; Battey et al., 2016). In beginning conversation about Black girls as mathematics learners it's important to acknowledge the role of "Whiteness" within the classrooms. Whiteness in institutional spaces is evident in the ideological stance of learning. Battey and Leyva (2016) suggest that White spaces within classrooms are created based on how Whiteness operates in mathematics education. This can be seen in the lack of culturally responsive pedagogy, little to no focus on equitable racial and gender instruction, endorsing colorblind attitudes, and endorsing apathetic beliefs and classroom instructions on equity-related issues. For example, Battey and Leyva (2016) stated the following:

Within mathematics education is that an ideology of Whiteness operates to devalue, oppress, and discriminate those perceived as "less" or not white...An ideology of Whiteness would then serve to position White people, White ideas, and White behaviors as more valued institutionally and in classrooms which may not always be visible.

Whiteness oppresses Blackness through deficit ideas, poor treatment, and lower quality of instruction. (p. 55)

For instance, Whiteness in institutional spaces is evident in the ideological stance, more specifically, the ideological discourses around the "racial hierarchy of mathematics" which can be described as the physical space (e.g., school messages, visibility of students, & control of physical expression) – in other words, what are the ways in which Black girls can be themselves and learn in this environment; history (e.g., curricular perspectives & patterns of exclusion) – in what ways are students of color, particularly Black girls in mathematical spaces learning curricular and engaging in curricular that reflects who they are; and organizational logic – who has power and who does not within the educational context? More often, girls of color do not have power within the classroom. Whiteness is embedded in many mathematics classrooms and has the potential to prevent equitable learning opportunities.

Additionally, a handful of scholars have addressed how privileging Whiteness in mathematics education (e.g., an assumption of White students' higher ability in math learning and exclusion of students of color from advanced math classes), shapes the expectations, interactions, and kinds of mathematics that students' experience (Martin, 2007; 2012). Research indicates that privileging whiteness supports harmful socialization practices in mathematics classrooms that may undermine Black girls' developing identity as math learners (Hottinger, 2016; Joseph, 2017; Joseph & Alston, 2018; Joseph et al., 2019).

### **Silence, Race, and Academic Identity**

In spite of race and gender discrimination and structural barriers in school (Battey et al., 2016), many African American girls still profess a keen interest in science and math and use a variety of methods to achieve academic success in these subject areas. For instance, Gholson and Martin (2019) found that Black girls create their own spaces in mathematical learning environments that buffer the negative impact of racial and gender stressors. This protection appears as “aloofness” and “stoicism” to protect against racism, classism, and sexism. Prior literature also suggests that Black girls may disengage from their racial and cultural background and adopt characteristics of the majority culture in order to excel academically (e.g., Eggleston et al., 2009; Marsh, 2013; Ricks, 2014). While these coping strategies may help Black girls excel in the classroom, both are detrimental because they teach them that the only way to succeed academically is to turn off their Blackness, an impossible and damaging goal. Self-silencing and racelessness, what Robinson and Ward (1991) define as “resistance for survival,” are strategies Black girls adopt to cope with racism and sexism but are “short-term solutions” that compromise their personhood, cultural group and psychological well-being in the long-term. Essentially, these young Black females are able to achieve academic success by becoming an invisible population in education, further exacerbating their position as a vulnerable population in broader society.

More recently, there is an increasing body of work that challenges the notion of “racelessness” among Black students as a method of success in education. Literature documents that racial identity may serve as a promotive and protective factor for Black girls' resiliency in mathematics and their overall ability to thrive in educational settings (O'Connor, 1997). For instance, Zirkel and Johnson (2016) and others suggest that racial identity is linked to a broad range of positive outcomes among Black students, including greater resilience in coping with discrimination experiences, higher academic performance in school, a stronger commitment to educational attainment, and improved learning outcomes such as educational utility and academic self-efficacy (Rivas-Drake et al., 2014).

Furthermore, a number of studies have illustrated how Black girls actively reject the expectation of “racelessness,” and instead employ a variety of strategies to reduce the academic impact of demeaning stereotypes about high-achieving Black students in STEM (Carter, 2010; Gholson & Martin, 2019; Kynard, 2010; Martin, 2012; McGee, 2013). For example, McGee (2013) draws attention to the ways in which a mathematically high-achieving girl in a predominantly White high school uses negative stereotypes about her ability as a Black student as an extra source of motivation to excel in school. The young girl expressed:

I already knew I would only [be] one of few Black students there. And those Blacks [at the private high school] are mostly uppity. So, I was already trying to pump myself up to

take the joint [entrance examination test]. So, I had to let them all know that I deserved to be there, cause I'm highly favored and academically stunning! (p. 257)

For Black girls, holding a clear awareness and explicit rejection of the negative stereotypes can motivate their achievement and preserve their sense of connection to their sense of self. This is, according to Robinson and Ward (1991) an example of “resistance for liberation”—a resistance to oppression that strengthens connections to the self and others and serves collective uplift. Finally, prior research suggests that Black girls regularly draw on supportive friends, family, and educators to help maintain their academic identity and engagement in deleterious learning contexts (Gholson, 2016; Gholson & Martin, 2014; Joseph et al., 2017; Young et al., 2017). For instance, Gholson et al. (2014) noted the important role of positive peer networks in promoting mathematics success, in that Black girls who were embedded within a social network of other achieving Black girls were more able to express themselves and actively pursue their math learning. Importantly, the authors note how skin tone distinctions within and among the Black girls themselves, led to intragroup processes of inclusion or exclusion in the classroom environment, highlighting the importance of social relationships in math learning communities. Indeed, Robinson et al., (1991) contend that for Black girls, the oppression of racism is compounded by the isolation of independence. As such, forging and working to maintain intimate relationships with others in a society that devalues such interdependence, is an act of resistance for liberation (Robinson & Ward, 1991). In the context of STEM education, this network of support may be integral to Black girls' academic motivation, given the broader lack of inclusivity in society for Black girls in math and science (Pinder & Blackwell, 2014).

The present study builds upon existing literature to investigate Black girls' experiences in mathematics classes (i.e., daily interactions with teachers and peers). Specifically, we sought to develop a better understanding of Black girls' lived experiences as mathematics learners in various types of school settings (i.e., predominately White desegregation programs, predominately Black, private schools, and charter schools). We paid particular attention to the roles and functions of race and gender, and the ways in which these experiences shaped girls' attitudes and beliefs towards mathematics.

### **Guiding Framework**

Black girls deserve a theoretical framework in mathematics education that addresses their unique educational needs at the intersection of race and gender, which must include a sociohistorical understanding of their vulnerability and resilience as students. In the present study, we draw from Black Feminist theories (Collins, 2000) and Garcia Coll and colleagues' (1996) Integrative Model for the Developmental Competencies of Minority Children, to examine how various mathematics classrooms supported or prevented the positive construction of math identities among Black adolescent girls. In other words, do Black girls' experiences in the classroom contribute to their knowledge or interest in mathematics? To what extent do racialized and gendered experiences with teachers and peers shape their mathematics learning?

Black Feminist Theory (BFT) provides an intersectional framework to understand how Black girls manage to attain acknowledgement, respect, and achievement in academic settings that deem them “less than” due to their race and gender identities (Collins, 2000; Turner, 2002). Black girls' experiences in the classroom are oftentimes untold or misunderstood when research attempts to explain their schooling through one-dimensional frameworks that focus on race or gender as independent constructs. Importantly, BFT validates and asserts the multi-layered

realities in which Black girls exist and privileges the many ways that Black girls strive for self-definition and the ability to be heard. Too often, mainstream American society enforces cultural narratives of negative stereotypes of Black girls and women (e.g., disruptive, incompetent, and lazy) (Koonce, 2012; Ladson-Billings, 2009), which constrain their opportunities and access to higher education (Ricks, 2014). In contrast, BFT centers the counter-narratives of Black girls and women, which requires scholars to re-articulate dominant discourse on knowledge production (for similar work counter-narrative work with Black boys, see Berry et al., 2011). Finally, BFT is prescriptive in nature, thereby challenging us to move beyond descriptions of Black girls' experiences as students, to anti-racist and anti-sexist solutions that will eradicate their ongoing marginalization in math learning spaces (Berry et al., 2014; Bullock, 2017). In all, BFT displays the multiple realities and challenges that Black girls encounter in educational spaces and provides a framework that can bring to life the ways in which these girls draw on individual strengths and cultural assets to challenge inequitable schooling experiences in mathematics settings (Young et al., 2017).

We also draw on the Integrative Model for the Developmental Competencies of Minority Children (Garcia-Coll et al., 1996). The model suggests the unique role of one's social position status (race/ethnicity, class, and gender) and how this shapes experiences within the school setting. Thus, the social position that Black girls within a mathematics space occupy will shape their peer to peer and teacher interactions. For instance, Jones (2003) found that teachers equated White girl's mathematics performance to their own middle-class upbringing that involved a style of dress that was familiar. In comparison, Black girls' experiences were often tied to their cultural background (often viewed as a cultural deficit by teachers, mothers' lower SES status, and style of dress (e.g., baggy clothes). West-Olatunji and colleagues (2010) also found that school counselors generally endorsed lower mathematics and science expectations for Black girls. Additionally, Lim (2008) interviewed a Black girl and found that she struggled more in terms of her racial identity and that influenced teacher ratings of her behavior (often viewed negatively) and mathematics performance, indirectly causing significant anxiety and stress. To understand the experiences of Black girls in mathematics classrooms, Black adolescent girls from various school settings (predominately White, desegregation programs, predominately Black, private schools, and charter schools) were interviewed. We use both models to highlight the experiences of Black girls within mathematics classrooms. For instance, Garcia-Coll et al., (1996) state that the school environment can serve as a space that promotes learning or it can serve as a space that inhibits learning. These positive or negative experiences are contingent upon one's social position (e.g., race, class, & gender) shaping educational outcomes. BFT situates and centers Black girls voices specifically allowing Black girls to own and take up space where they have been typically silenced. Thus, the classroom space serves as a promotive or inhibitive environment. Also, despite the common sociocultural experience of racism and discrimination encountered by children of color, school settings are not exceptions to the rule and may perpetuate the negative biases and stereotypes affecting various developmental competencies (i.e., academic performance) (Lynn & Parker, 2006). Including this intersectional approach is therefore critical to understanding Black girls' experiences within mathematics classes. Because of the dearth of research in examining the mathematics learning environment of Black girls in varied school settings, no hypotheses are presented. For instance, because Black girls comprise two oppressed identities – Black and female, we wanted to understand how these

social identities shaped their learning experiences and outcomes. Our research was guided by three primary research questions:

- 1) How do Black girls feel about math?
- 2) How do Black girls describe their racialized-gendered experiences in mathematics classes?
- 3) How do these experiences influence their attitudes and beliefs about their academic performance in mathematics?

## **Method**

### **Design, Sampling, and Recruitment**

To better understand Black girl's attitudes and beliefs about mathematics, we used an inductive, qualitative research design (Creswell, 2012). In particular, purposeful samples of Black adolescent girls in grades sixth through ninth from various school settings were selected to participate in focus groups. The principal investigator (first author) who has an existing relationship with participating school districts facilitated recruitment.

To understand the racialized and gendered experiences of Black girls, we recruited from diverse school settings, including those who attended private and public schools that varied in school racial composition. Collectively, we were interested in understanding the myriad experiences of Black girls within mathematics educational settings and the way in which their racialized and gendered experiences impacted their mathematics learning. Additionally, because of the power dynamics in schools that are organized and navigated by race and gender and the interactions with teachers, we wanted to understand how Black girls' occupancy of space within classrooms shapes their mathematics learning experiences. Flyers were distributed to schools near the university. We also used the snowball sampling technique for recruitment of additional students in the school. Student information packets were sent home, and families interested in participating returned signed forms. The principal investigator then contacted parents and explained the study and answered any questions and/or concerns parents had about their child participating. Upon receiving verbal, parental consent for their child to participate, as well as parents' permission to contact their adolescents directly, the data collection team, which was composed of three Black women (a developmental psychologist and two MSW graduate students), contacted the young women via telephone to explain the study and to obtain their verbal assent to participate. The entire research team consisted of a total seven members, which included the above data collectors and three additional analysts.

### ***Participants***

A total of 30 Black adolescent girls participated in the study. Their mean age was 12.64 years old. On average, their parents reported attending some college, and a majority were married. Additionally, the average reported yearly income among the participant's parents ranged from \$40,000 to \$49,999. Students were in the following courses: pre-algebra, algebra, and general math.

To examine the racial and gendered dynamics within the classroom, Black girls were recruited from schools that varied in the school racial and ethnic composition (see Tables 1 & 2). Fifteen girls were recruited from two predominately White middle schools. Six girls were recruited from two racial and ethnically diverse schools. One student was recruited from a

Montessori private school. Two students were recruited from two predominately Black schools. Finally, six students were recruited from one predominately Black charter school. Pseudonyms are used.

### ***Procedures & Data Collection***

A total of four focus groups were conducted with 30 Black adolescent girls varying from 6 to 8 girls in each session. The meetings were scheduled based on adolescent girls' school and extracurricular activity schedule. A semi-structured focus group guide was used to stimulate conversations about girls racialized and gendered experiences in their mathematics classroom and their attitudes and beliefs surrounding their academic performance. Specifically, the research team devised a comprehensive list of questions that were informed by the research literature (e.g., Martin, 2000). Questions centered on participants experiences in their mathematics classes. We specifically asked questions about their interactions with their teachers and peers to better understand the role gender and race played in their schooling experiences.

Each focus group was conducted at the local university and was arranged outside of school time. Due to the small number of students recruited from schools that provided parental consent and assent to participate in the study, extra-curricular activities, and tutoring, focus groups were not organized by students from one specific school. In other words, because of the small sample size of students from specific schools (see Table 1), the focus group interviews included students that could participate in the scheduled day and time focus group session. Upon each adolescent's arrival to the university, a member of the research team obtained written assent and consent from each participant (i.e., adolescent and parent), and reviewed confidentiality guidelines. Each focus group lasted approximately 1.5 hours and the participants received a \$20.00 gift card to Barnes & Noble after completion of the focus group interviews.

### ***Coding Analysis***

Following data collection, audio recordings were outsourced for transcription. Once the focus groups were transcribed verbatim, the research team comprised three Black women (a developmental psychologist and two MSW graduate students) who verified the transcripts to assure accuracy, specifically with regard to language and dialect that may have been missed or transcribed incorrectly. The verification process is critical in order to capture precisely how Black girls' themselves describe their classroom experiences. The focus group transcripts were then uploaded into Atlas.ti, a qualitative data analysis software program (Scientific Software Development Company, 2011). Grounded theory techniques were used to analyze the data (e.g., coding, constant comparisons, etc.), as this analytic approach allowed us to examine conversational patterns that illuminated the participants' attitudes and beliefs concerning mathematics (Charmaz, 2002; Strauss & Corbin, 1998). Three analytic questions were utilized to devise the codes: (a) How do Black girls relate to mathematics? (b) What type of support do Black girls receive in a mathematics classroom? (c) If they perceive any differences between boys' and girls' mathematics ability in the classroom. To assist with coding, four additional students were recruited for coding of the transcripts. Thus, in total, six graduate research assistants and the PI met weekly to developing emerging codes and themes over the Fall 2016 semester. The research team read each transcript. There were approximately 100 pages per transcript. The research team coded each of the transcripts separately, reviewing for initial categories and codes using open coding. The research team then met to discuss initial codes and

categories that emerged while coding individually. At this meeting, we discussed each of our initial interpretation of what Black girls were discussing within their mathematics classroom. The research team met weekly over the academic semester to develop several iterations of the identified code, which were derived from the data, and worked collaboratively to define each code. With these guiding analytic questions, each member of the research team reviewed each transcript separately to identify emergent codes. Definitions from all research team members were discussed and codes were created. Based on the initial coding of themes at our first meeting, follow-up meetings consisted of revising existing codes and creating new codes. We then developed several iterations. After reviewing and confirming the entire list of codes and definitions, the research teams re-read each transcript and met to reconcile any disagreements. Overall, there was 85% agreement. Fifteen percent of the disagreements were due to the coding of the definitions. As a result, these codes were recoded to reach agreement amongst the research team. Codes were created after each meeting. Additionally, as new codes emerged, the research team met to discuss definitions and to obtain a consensus. When necessary, codes and definitions were modified in order to more accurately capture the participants' voices. Pseudonyms are used to ensure confidentiality (see Tables 3).

### **Researcher Positionality**

The research team in this study identify as Black/African American and female. Each of us bring our lived experiences to the research project from various backgrounds as it relates to social class, regions throughout the U.S., and in other ways, we bring our different educational experiences in P-12 educational system to this work. We are not a monolith group of Black/African American females. For instance, some members of the research team attended predominately White public schools, elite predominately White private schools, predominately Black schools, racially and ethnically diverse schools, some having attended charter schools. We approach this work by valuing Black girls' voices. Engaging in equitable research with Black girls as mathematics learners requires centering their experiences and allowing for Black girls to share narratives which reduces our misinterpretation, misrepresentation, and obtaining misinformation of Black girls within mathematics spaces (see Milner, 2007). The PI had a relationship with two of the school districts and upon hearing about the work of the PI, the other schools wanted to participate. Working with the schools as partners in this work, the research team established rapport and trust with the teachers, school administrators, and the families. Our racial, gender, and social class experiences assisted us in navigating within the schools.

### **Findings**

Given the Black adolescent girls racialized-gendered experiences, they often attempted to remain invisible in their mathematics classes (i.e., using silence and liberation) in order to excel academically. However, they also relied on the support of their Black female peers when faced with academic challenges that undermined their ability to achieve academic success, especially in mathematics. Yet, in some instances, relying on peer support further disconnected these girls from the classroom setting. As such, the girls held the belief that they had to prove themselves in their mathematics classes, which in many ways diminished their confidence in their mathematic abilities, despite the fact that they liked math. The analytic process yielded four themes that

elucidate these findings: 1) “Whiteness and math”; 2) “the boys do too much”; 3) “if they weren’t in my class I’d have all F’s”; and 4) “you have to work for it and prove yourself.”

### **Math is Important**

#### ***Can’t Tell Me Nothing, I’m Good in Math.***

Before we delved into questions about Black girls racialized and gendered experiences in their classroom we wanted to understand the general feelings about mathematics. In each of the focus groups, we asked the question, “How do you feel about math? Do y’all like math?” Several of the girls raised their hands. The responses varied from single responses (e.g., “no”) to more detailed responses on their general feelings about this subject. In the following example, the girls expressed the varied reasons why they do and don’t like math.

Interviewer: How do y’all feel about math? Tell me about that.

Tia: Yes and no. I just don’t like math.

Tekise: Yes, I love math because people think that just because we are Black we can’t do things others do and we are just as equal as others in opinion.

Summer: I kinda don’t and kinda do because I know math would be something I have to learn.

Ke’era: Yes, because it comes very easy to me.

Fantasia: I kinda like math but then I kinda don’t because I don’t understand some of the things we learn but when I do get it I feel good about myself and enjoy math.

Layla: Yes, because I love science and I keep A’s in math and science all year.

Rasheeda: Yes and no, because I get angry on some of the sections of math that I don’t get. But on some sections I do get it and I am proud of myself for being able to accomplish this.

Amora: Yes, because I got an A in math.

Parker: No because it is hard and I don’t have the time to get it.

Tomeka: I like math because it’s something I’ll need for life, and I’m going to have to like it one way or another, so –

Natasha: I can’t say I hate it, but I can’t say I love it, because it’s boring, but I can work with it.

Rasheeda: Because math- I can work with math. I’m really good at math. But, it’s not interesting. They don’t make it interesting. They don’t teach it interesting.

Whitney: No. I don’t like phrases and word problems that have to do with math and stuff. I don’t like word problems and algebra and stuff. Too many letters.

Taraji: It’s unrealistic. Like if you buy 170 watermelons...

Whitney: Or you have 86 chocolate bars

Taraji: and you eat 80 of them in one day. What do you have? Diabetes.  
(Laughter)

Overall, Black girls liked math and felt that it was important. For instance, some were especially proud of themselves in learning strategies to perform in math and feeling proud of themselves. Other’s expressed that they didn’t like math. This comment was followed up by asking additional questions about math beliefs. Some of the students just stated they didn’t like it while others stated they didn’t but overall knew it was beneficial to their success. With regards to their racialized and gendered experiences, Tekise noted that Blacks were just as equal as others in

learning math while Layla, Amora, and Ke'era stated they loved math and it was easy. Similar to previous findings (Gholson & Martin, 2019) several students said they hated mathematics, yet other students in our study knew the importance of math regardless of the academic emotion that was attributed to mathematics. Our findings corroborated themes in Gholson and Martin (2019) as themes they found in their study were, "dislike of mathematics," and "mathematics as painful." Being viewed as anti-intellectual within mathematics spaces also was apparent in some of the classrooms. For instance, Tekise states, "I love math because people think that just because we are Black we can't do things others do and we are just as equal as others in opinion." This statement corroborates literature on Black girls and anti-intellect within classrooms (Carter Andrews et al., 2019). There was also some discussion about making math more interesting with specific critiques on the types of word problems they were solving within their math classes, underscoring the need for more culturally responsive pedagogy within the classroom.

### **Survival Strategies: Silence and Invisibility**

#### ***Whiteness and Mathematics Identity***

Throughout each focus group, the young women talked extensively about what it means to be Black and White at their school. According to the participants, "acting Black" refers to someone who is "cool," "laid back," "goes with the flow," "acts hip," and is "ghetto." Conversely, students who were characterized by the participants as "acting White" were described as "shy," "not talkative," and "paying attention all the time" in class. Language and behavior were therefore essential elements these young women used to construct racial definitions in this setting, as they often perceived that their teachers held the belief that students who act and speak "White" are smarter. The girls therefore frequently turned off their Blackness in their mathematics classes, especially when asking teachers for help. In the following example, Layla, Sia, Ke'era, and Tomika provide examples of how they act White when asking their teachers for help and the consequences associated with acting Black.

- Interviewer: How do teachers help and support you in the classroom?  
 Ke'era: Yeah, when I – like when I need help I kind of turn my Blackness off.  
 Tomika: Well, yeah, something like that.  
 Ke'era: If I need help.  
 Interviewer: What do you mean? When you need help?  
 Ke'era: Like if I don't understand it, I'm going to ask for help and I'm not going to act all ghetto. But if I understand it and I just know it, I'm going to act the same.  
 Interviewer: Okay, so if you need help, what is the Black way of asking for help?  
 Ke'era: 'Ms. Laura, over here.'  
 Layla: No, that's not the Black way.  
 Interviewer: What's the Black way?  
 Ke'era: 'Can you come help me?'  
 Interviewer: Okay. And what's the reaction of the teacher if somebody says something like that?  
 Tomika: She ain't gonna help you.  
 Sia: Wait patiently.  
 Ke'era: Yeah, she gonna say, 'Wait, I'm doing other stuff.'  
 Interviewer: And what's the White way?

Ke'era: Just wait calmly till she's done.

Tomika: Just sit back.

Given the lack of support the girls received from their teachers when asking for help the "Black way," many felt they had to conform to the dominant culture present in their classrooms. Teachers, in particular, played a critical role in facilitating and perpetuating these girls' invisibility, as Tomika expressed, "They'll correct you if you ask in a Black way, and ask you to ask in a different way." In another focus group, Tomika also compared teachers in city and county (suburban) schools, to highlight the differences in racial climate within these two different educational settings. She stated, "In the county schools it's like we know we say something and we might end up getting put out because of our color." As a result of these racialized experiences, there was a consensual agreement among the girls that they had to act White in order to excel academically.

Yet, while all of the participants reported acting White, in some instances, to excel academically, others also used silence. Ke'era, when asked to describe how she gets a teacher's attention when she needs help, said, "It depends on who it is. I would just sit there. I'd just sit there until they get the answer." Although Ke'era initially suggests that not all teachers in this school context perpetuate their invisibility, her decision to use silence as a strategy to cope with her racialized schooling experiences caused her to remain invisible in her mathematics class. Nevertheless, while these young women's coping strategies often perpetuated their invisibility, these examples help to highlight the resilience they enacted in order to achieve academic success. In Gholson and Martin's (2019) study, it was found that Black girls created their own spaces in mathematical learning environments. This protection appears as "aloofness" and "stoicism" to protect against racism, classism, and sexism. This can be described as a cool, calm, and confident pose known as "*blackgirl face*," which on the outside might present as being unbothered, but also might be a way to mask the stressors of negative classroom experiences.

In addition to perceiving that their teachers held the belief that students who act and speak White are smarter, participants also noted that the language used in the instruction and delivery of mathematics in their schools, in many ways, perpetuated these racialized beliefs. For instance, during one focus group, Tamika, Whitney, Kristen, Summer, and Taraji discuss the important role language plays in keeping them interested in their mathematics classes.

Tamika: Because math. I can work with math. I'm really good at math. It's not interesting. They don't make it interesting. They don't teach it interesting.

Whitney: What bothers me about math the most is when I'm reading word problems, they use like the weirdest names that don't even make sense.

Kristen: That's true. That's true [laughter]

Whitney: They don't like, like Naya, Lenay.... It's always Sarah. Sarah is like the most classic name ever.

Taraji: Sarah or Olivia.

Summer: Or Emily ... Emily is like the most common name ever!

### ***"The Boys Do Too Much"***

The conversation around participants' gendered experiences within their mathematics classes underscored Black girls marginalized status. In particular, the young women expressed that the boys in their mathematics classes "do too much," in that they are overly "competitive"

and exert more confidence than girls. In the following conversation, Jessica, Ke'era, and Tekise explain to the researchers what they mean when they say, "boys do too much."

Interviewer: Okay, so what do you think about the – the boys? When she said they do too much, do you think they do too much?

Tekise: Well, it's kind of hard to explain, because like some of the boys, like when they get answers, like they'll jump out of their seats or like they'll be yelling and stuff. But the girls-

Interviewer: Are the answers right?

Tekise: Sometimes. Basically, they look stupid when they go up.

Interviewer: So, is it just out of pure excitement that they answer?

Tekise: excitement.

Interviewer: Okay. And the females aren't as – as excited when it comes to math?

Layla: No.

Jessica: Some of the girls be like, I think they be scared cause like they be scared if they get it wrong she'll be like, some of the girls in my class they'll feel embarrassed but...

Interviewer: Why would they feel embarrassed?

Ke'era: Because like in my math class it's like I'm trying not to call them retarded but like ... slower learners...

Jessica: You already know them, so it's like Joe and all of them, and they think – like the same thing in Science, they want to be the first to have everything done and nine out of 10 times, they always right, so the girls just write, they either write anything down or not even try to do it so...

Interviewer: The girls?

Jessica: Right. They basically down themselves.

In the above example, Jessica's statement, "they basically down themselves," points to the intimidation girls often feel in their mathematics classes. The boys' competitive and confident behaviors, thus, in many ways, forced the young women to use silence to cope with their negative gendered schooling experiences. Tekise, in saying, "they look stupid when they go up," not only supports this claim, she also alludes to the fact that girls lack of confidence in their mathematic abilities. Additionally, Jessica, in saying, "they want to be the first to have everything done and nine out of 10 times, they always right, so the girls just write," appears to not only frustrate her with the boys' behaviors in their mathematics classes, yet also suggests that, within this school context, boys are smarter than girls in math.

We then continued with the interview, asking about how they were treated in the classroom. Participants discussed their gendered experiences and interactions in their mathematics classes by their teachers. More specifically, the young women were asked to describe how their teachers and/or peers in their mathematics classroom treated them. In many cases, participants perceived that boys received more attention than girls in their math classes, and that they were perceived by teachers to be smarter. For instance, during a focus group Tia expressed, "[Math teacher] think girls don't know or are not paying attention in class. Tekise echoed Tia's statement by saying, "Yes, they act like boys know it all!" In another focus group, Kristen, Parker, Taraji, Tamala, Natasha, Rihanna, and Sia also expressed that some math teachers treat girls differently than boys. They state:

Kristen: If there are like two girls talking, but then there's like a whole

- group of boys, the teacher automatically goes to girls, that's not okay.
- Parker: Yeah, they automatically split up the girls before they split up the boys, when they start moving around.
- Kristen: Right.
- Taraji: Well, I would have to say that my sixth-grade teacher had like a favoritism for girls answering questions.... All the boys in class, just really – they're too goofy for her, so she said she would rather have a class full of girls than a class full of boys.
- Tamala: But I will say, at my school ... most of the boys in sixth grade got bumped up to seventh grade math, and when they were in seventh grade math, they kept on complaining about how hard it was. So then most of the seventh-grade boys got bumped up to eighth grade math, and half the girls just stayed in our math.
- Interviewer: So how many girls got bumped up?
- Natasha: Only like four
- Interviewer: How many boys?
- Rihanna: Like seven or eight.
- Sia: Yeah, you could see the boys. They always appear to be more focused.

In addition to being aware of when their teacher was being dismissive of them, some participants were also aware of how these gendered experiences impacted their behaviors in their mathematics classes. Often time, we had to probe further to determine Black girls' silence was due to protest or to get assistance (e.g., not asking the “Black” way). After probing further, it was determined that they felt because of their gender, the teacher did not want to call on them and raising their hands would not get the teacher's attention. However, waiting, sitting, and not raising their hand and waiting in silence got the teacher's attention. For instance, Nicole expressed:

“My teacher, Mr. Ogle, so it's only like two girls, and every time Jennifer and me would raise our hands, he wouldn't choose on us, so I just had to start sitting there to get called on. But then on my report card he says, I don't pay attention.”

Fatima and Jamiya also expressed, respectively:

“They treat the boys different because the boys, they just get like a deduction or something [for not doing their work, and if they girls don't do their work, they send us in the hallway and give us silent time.”

“If the girls don't do their work, it's a bigger deal than what the boys are doing.

But at the same time, the teacher is like, ‘Oh, I know you are not going to do this anyway, so whatever.’”

Our findings corroborate Robinson and Ward's (1991) model of “Resistance for Survival and Resistance for Liberation.” The first theme, “*Survival Strategies: Silence and Invisibility*”, detail strategies Black girls perceived as culturally appropriate that would result in positive outcomes based on the out-group (e.g., teachers). For example, strategies were used around the language Black girls used when asking for help to solve a mathematics problem. They felt that if they asked for help like White students do, they would get assistance. This was not necessarily based on the way they asked, just the perceptions on how they viewed Black and White students within their school setting. In most instances, Black girls used silencing strategies in the classroom with not wanting to be perceived as “cool,” “laid back,” or “ghetto.”

Moreover, all of the strategies used are harmful and contributes to the silencing and the invisibility of Black girls within classrooms – on one hand they did not want to ask for help like other Black students and they also felt invisible because of the attention boys received in their math class - noting the low confidence of girls and sitting quietly hoping the teacher calls on them. Black girls also perceived that the disciplinary actions towards them differed in comparison to boys. For example, Fatima and Jamiya noted that when boys were misbehaving, they received an in-class deduction – remaining in the class. Yet, when girls were misbehaving, they were sent in the hallway (losing instructional time) because the teacher assumed they wouldn't do the work.

Overall, Black girls expressed the varied ways in which boys are privileged in their math classes and the role of teachers in this process. Most importantly, these narratives suggest the ways in which Black girls are relegated to the margins in math classes and made invisible by ignoring their efforts to participate and removing them from the classroom when their behavior does not comply with the teachers' expectations. It is also in this setting that we see the hybrid phenomenon of being a Black and a girl that captures the unique racialized and gendered experiences of Black girls (Essed, 1991).

### **Resistance for Liberation: Relational Support and Belief in the Self** ***“If They Weren't in my Class I Would Have All F's.”***

Although the young women reported that they act White and use silence to cope with their racialized-gendered schooling experiences, they also reported relying on the support of other Black girls to excel academically. Specifically, the young women stated that they often support each other academically by working together on in-class assignments and by sharing their answers with each other. For instance, when Layla was asked if her Black girl friends supported her in class, she said, “depending on how hard it is, they just give me the answers and I will go over it.” Ke'era further highlights the extent of the peer support the young women provided to each other in the following comment:

“Well I only have like a few friends that come to this school, and it's Layla, Jessica, Tomika– Tekise ... science is my worst class ever. My science teacher probably hate me like right now [laughs]. But Layla got good grades. So it's like whenever I'm going crazy. As a matter of fact, I'm going crazy the whole class period. I finish my work because of her. ... It's like if they weren't in my class I would have all F's.”

While the above example refers to a supportive peer experience in a science class, it illuminates the peer support these young women provide to each other given the racialized and gendered experiences and interactions they contend with. However, while the girls typically viewed their Black female peers as an initial source of academic support, this coping strategy, in some instances, disconnected them from the learning process.

For instance, Jessica stated:

“Ke'era and me look and be like you get this? And we would forget what she [the teacher] was talking about, and we would try and put it together ourselves. But since we talking trying to figure it out, we missing what she saying.”

Also, Black girls are learning from those who care, those who are connected to them. The lack of connection to teachers drives girls to forge these relationships where they can learn and be supported. In other words, teacher's inability/refusal to let Black girls be Black and to support them in the ways that are congruent with their needs is the problematic as some of them noted

that they would fail without the support. Nevertheless, although the peer support the young women provided to each other might serve as a barrier to them obtaining the academic instruction needed, they all acknowledged that the support they received from other Black girls served as protective mechanism against academic failure corroborating previous literature (Gholson et al., 2014; Joseph et al., 2017).

### **Beliefs and Attitudes about Mathematics**

#### ***“You have to work for it and prove yourself”***

Girls also held the belief that they had to prove themselves in order to excel academically in mathematics. In most cases, this meant that they had to work harder than non-Black students in academics, as they felt that they had to demonstrate to themselves and others that they belonged in this school setting. The following two responses from participants in one focus group provides a clear example of the girl’s belief that they had to prove themselves:

Interviewer: Okay. Do you all think that people perceive you all as being smart?

Tekise: If you show it.

Layla: Right if you show it – If you happen to be smart. But you have to prove it.

Given that the young women’s belief about what was expected of them academically in this school context, they often engaged in negative self-talk about not wanting to be in a challenging math class. In many ways, this negative self-talk highlights the low confidence some of the girls had in their mathematic abilities. In the example below, Ke’era talks about not wanting to go to honors math because of the perceived difficulty:

Interviewer: Do you want to be in honors math? Why?

Jessica: Why not?

Ke’era: It just seemed hard; I want to stay with the regular people.

Interviewer: Anybody in honors math in here?

Aaliyah: She is [referring to Layla].

Interviewer: Is it hard?

Tomika: I ain't doing it yet. It's ninth grade.

Interviewer: Oh it's coming up.

Ke’era: That's who helped me-I had to change all my classes and stuff. She help me with everything [referring to Layla].

Despite Ke’era not wanting to be in honors math because of the perceived difficulty, she seems to have support in some of her math classes with her friend Layla. Additionally, although the young women did not generally believe that math was their strongest subject, some participants, such as Kendall, Layla, and Tekise talk about how much they like math.

Interviewer: So, do you guys like math?

Jessica: Yeah.

Kendall: Yes.

Layla: That’s my subject

Interviewer: Why?

Layla: 'Cause it's easy.

Tekise: I don't like math, 'cause I liked math, but this one teacher that I had last year.

Fantasia: Ms. Sanders

Tekise: Yeah

- Ke'era: I don't like her.  
 Tekise: She talked to me like I'm retarded.  
 Then, Tomika stated:  
 Tomika: No, sometimes my teacher treats us all the same, but at one point I felt that she would answer all the White people questions and not mine and she pulled me out and she apologized for me feeling that way, because she didn't mean to.

Here, the young women talk about how they like math. However, Tekise points to the mistreatment the girls often described they received from their teachers. In most cases, they described being treated by their teachers as if they had a learning disability in mathematics, in which Ke'era, in one focus group, expressed that her racialized and gendered experiences and interactions with her teachers made her feel as if she was receiving "special" attention." The participants later explained that "special" attention from teachers meant having a developmental or learning disability. While, Tomika notes feeling invisible at one point during the class. Our findings also corroborate Carter Andrews et al., (2019) in how Black girls are profiled in classrooms as they are often expected to have stricter discipline and control within the classroom and are viewed as less intelligent in comparison to White girls.

Additionally, although many young women felt as if they had to prove themselves in order to excel academically in their math classes, often due to their racialized and gendered experiences, their interest in math varied. These findings corroborate previous literature. Morton and Parsons, (2018) also found that among undergraduate Black women that they felt that they had to prove themselves more than others do. For instance, when asked how they feel about mathematics, those interested in the subject expressed that they liked math because they "like solving problems," "it comes easy," "it is fun," and because it challenges them. On the other hand, Sanaa, Tekise, Amora, and Simone note the relative importance of mathematics, despite the fact that some did not care much for the subject or found it difficult, while others did not like math. They state:

- Sanaa: I like math because it's something I'll need for life, and I am going to have to like it one way or another, so...  
 Tekise: I kinda don't and kinda do because I know math would be something I would have to learn.  
 Amora: I won't say I hate it, but I need it in my life, so I guess I like it.  
 Simone: It basically helps you in real life.  
 Sahar: I don't like math because it is boring. Like the teachers make it boring.  
 Charletta: Hmm, I don't like math because it gets really confusing at times.  
 Rasheeda: I like math because it comes easily to me.  
 Regina: I don't like math because it gets really hard and confusing.  
 Akelee: I like math because it's fun.  
 Rochelle: I love math. I like solving problems  
 MaKayla: I don't like math because it's sort of complicated to me. You have to go through steps, so that's what confuses me. I get confused a lot in math.  
 Bianca: I don't like math because it is hard.

These findings corroborate Robinson and Ward's, "Resistance for Liberation" this second theme, in which Black girls are acknowledging the problems that exist in their environment but have persevered and found adaptive coping strategies. For instance, Ke'era noted the support she

receives from other Black girls in the classroom and the ways that they provide support for each other. Tekise and Layla also note the importance of believing in themselves and being academically persistent. Thus, despite the negative influence their racial and gendered experiences has on their beliefs and attitudes about mathematics, the participants still perceived math to be important. What is evident from listening to Black girls describe their experiences in math classes is that while they know the critical value of believing in yourself, many seemed to lack the socialization and affirmation within the classroom and have chosen strategies to cultivate and maintain such a belief in the self with persistent racism and exclusion part of their daily classroom experiences. Although older, Morton and Parsons (2018) note that Black undergraduate women who majored in STEM felt that they had to prove themselves more than others do.

## **Discussion**

In the present qualitative study, we were interested in exploring Black girls' affective connections to math, as well as how they describe their racialized-gendered experiences in math classrooms, and how these experiences influence their attitudes and beliefs about their math performance. Overall, several themes were noted throughout the interviews that centered the girls' social identities (i.e., race, gender, and social class) in relation to their attitudes and beliefs about mathematics. We found four major themes: whiteness as a mathematics identity, gender differences in teacher support, the importance of Black girl peer networks, and proving yourself to counter negative racialized gendered stereotypes. In all, these interdependent themes build on extant literature regarding how we can make Black girls' learning experiences in math more equitable and humanizing (e.g., Gholson et al., 2014; Joseph et al., 2019).

### **Whiteness as a Mathematics Identity**

When discussing the use of language, Black girls felt they had to adapt their behaviors and mannerisms within the setting to get help with their math. This often led to these students adopting a race-less persona, similar to Fordham's (1993) conceptualization, which describes how Black girls in predominantly White schools silenced themselves in class to be more accepted by peers and teachers. In our study, for example, some girls mimicked the language choices and behaviors of students who received the most attention and assistance – White students. While these findings corroborate the “raceless persona” identified in Fordham's (1993) paper, there were several girls in the study who refused to adhere to such dehumanizing expectations, and instead, embraced their Black girl identity in the classroom.

Indeed, a number of studies document the promotive role of racial identity in Black students' achievement (e.g., Carter, 2008; Oyserman et al., 2011). While less of this work has focused on the intersection of multiple identities (for exception, see Gholson et al., 2014), these studies demonstrate that students' social identities can be a central part of their achievement ideology. In line with this, our findings revealed that Black girls who viewed their race and gender as part of their mathematics identity demonstrated a stronger sense of academic self-efficacy. Still, prior work highlights the important role of context. For example, McGee and Martin (2011) found that while Black students in STEM classes were keenly aware of their racial identity at the beginning of class, over time, they became less concerned with how others perceived them and more able to focus on their academic success. In other words, their race was

highly salient in that specific context, but the relevance and implications of their racial salience changed over time based on whether they felt stigmatized within that classroom.

In the present study, several of the girls adopted strategies to adapt and cope within the educational setting, which included language switching, to try and make teachers see them more positively and as efficacious math learners. In their case, they recognized that the salience of their racial identity cultivated poorer treatment from teachers, and they had to make a conscious choice to modify their language and behaviors to participate in the classroom. This does not imply that the girls are not proud to be Black but highlights how they made sense of the emergent social norms in the classroom, as well as their devaluation as math learners within those social structures (Joseph, 2017). Future research should continue to understand the use of language, race, and gender in mathematics classrooms, as well as the possibilities of how to create inclusive math learning spaces both within and outside the classroom (Jones, 2003).

### **Gender Differences in Teacher Support**

The girls also reported gendered differences in how their behaviors were perceived and responded to by teachers. For instance, it was clear to participants that boys were more active and confident in the mathematics classroom. However, the girls mentioned that boys were not necessarily smarter or more likely to have the correct answers, but the boys felt a stronger sense of confidence in speaking aloud – even with the chance of being incorrect. These dialogues corroborate previous findings that speak to the qualitative differences in learning between boys and girls in mathematics – which may be based more on treatment within the mathematics classroom than on students' academic ability (Geist & King, 2008; Hyde et al., 2008). Else-Quest, Hyde, and Linn (2010) conducted a meta-analysis on the cross-national gender differences in mathematics and found that boys reported more positive mathematics attitudes and beliefs. Our findings suggest the ongoing need to address gender equity in math classes, which include day-to-day interactions between teachers and peers, as well as institutional reforms such as ensuring that girls have equitable access to advanced math courses. Their narratives suggest that one reason boys may demonstrate greater confidence in the classroom involves more positive teacher expectations (Joseph et al., 2017).

There are also other factors that may help explain these behavioral differences in classroom engagement, ranging from gender-role socialization on occupational choice to the development of stereotype threat for girls in STEM. For instance, girls reported liking mathematics as a subject, yet were unhappy with their teachers and often equated mathematics to teachers liking them. Additionally, some girls, such as Ke'era, displayed self-defeating talk, as she stated, "I want to stay with the regular people," when explaining why she did not enroll in an honors math class. Thus, although some of the girls knew they were smart, they did not want to be in advanced mathematics classes because of the perception of it being hard. We speculate that mathematics teacher's comfort level with Black girls in this context may influence their attitudes about math. For instance, Beilock and colleagues (2009) found that female teachers' anxiety level in teaching mathematics was associated with girls' mathematics anxiety level. Thus, it is especially important to continue this research to understand the unique experiences of Black girls utilizing a Black feminist lens to identify factors that may impede their mathematics success.

### **Importance of Black Girl Peer Networks**

Our findings suggest that Black girls' experiences within the classroom matters and that just *being* a Black girl (without support systems) put them at academic risk. Future research should therefore identify strength-based assets and resources that assist Black girls with coping with negative school experiences (see Holland, 2012). In part, our findings highlight Black girls' peer networks as a significant form of resistance in math learning classrooms, consistent with hooks' (1986) conceptualization of the importance of sisterhood and solidarity among Black girls and women. The girls note the solidarity they have with other Black girls in order to feel whole, get their math work done, and proactively cope with the ways that teachers and peers devalue them in the learning space. Our findings highlight the importance of sisterhood within mathematics classrooms. Similar to our study, positive peers increase a sense of belongingness and promotes mathematics success (Gholson et al., 2014; Joseph et al., 2017).

In addition to positive peer networks with other Black girls, Joseph and colleagues (2019) interviewed Black girls in mathematics classrooms and found that the importance of culturally relevant teaching and/or mathematics education was beneficial for Black girls. Collective learning from others within mathematics classrooms is imperative. This corroborates findings from Joseph et al., (2019), in that Black girls value working in teams. In a synthesis of studies that include programming centered on Black girls (i.e., Go-Girl; Reid & Roberts, 2006), Joseph and colleagues (2017) found that community influences (e.g., peer support and social networks as important), and resilience strategies (persistence, gender pride, & sense of belongingness) are important within the P-20 college pipeline in identifying key areas in supporting Black girls in mathematics. Their work demonstrates that in addition to creating an atmosphere of warmth and positive social networks among Black girls, we must promote equitable environments by disrupting structural barriers, promoting culturally responsive pedagogy, and develop programming that centers the needs of Black girls.

### **Proving Yourself**

In line with Black feminist theory (Collins, 2000), the girls in our study talked about how their intersectional race and gender identities provided a different viewpoint regarding their experiences in the mathematics classroom compared to Black boys and White students. In particular, the girls articulated the need to disrupt the false narrative that Black girls are not intelligent. This is similar to previous studies where teachers viewed Black girls as less intelligent (Carter-Andrews et al., 2019; Gholson et al., 2014; Jones-DeWeever, 2009; Joseph et al., 2018). Their narratives highlight "the complexity of Black girlhood – including the pain, pleasure, inclusion, exclusion, competence, struggle, recognition, and silencing – of being a young Black girl doing school mathematics" (Gholson et al., 2014, p. 20).

Noted throughout these interviews were Black girls expressing how they felt about mathematics, which for some was generally positive, but their experiences within the classroom were often negative with some noting gender preferential treatment from teachers, negative teacher support and their peers perceiving them as not good in math. This was clearly articulated by Jessica, who loved math, but felt that others viewed Black people as not smart in math. These experiences have the potential to shape student's motivation beliefs and this treatment is a result of Black girls and their social positionality. Noted also was being treated differently based on gender, while others noted the lack of culturally responsive word problem examples. These omissions of "ethnic" names were salient to Black girls. These experiences may have detrimental

impact on development of a mathematics identity and positive socialization (Martin, 2000; Tate, 2005; Ukpokodu, 2011).

### **Limitations and Considerations**

The present study centered the experiences of Black girls and extended the findings of a growing body of literature on Black girls' experiences as mathematics learners. However, there are a few limitations worth noting, such as the uneven distribution in the racial composition of our participants' schools. Our sample mostly included Black girls attending predominately White schools through desegregation programs. Only a few of the girls attended predominately Black schools or private schools. Although we recruited from various school settings, we received fewer participants from these school settings. Because of the small number of students across schools (e.g., predominately Black, predominately White, racially/ethnically diverse) it was difficult to determine how school racial context shaped Black girls' educational experiences.

In the future, it would be useful to conduct a representative sample that included Black girls attending racially and socioeconomically diverse schools (e.g., predominantly Black, racially and ethnically diverse, predominantly White, and private schools) to better understand the intersection of race, gender, and social class in girls' mathematics experiences. Further, a longitudinal mixed-methods design would allow us to examine the effects of the school context on academic achievement and socioemotional well-being (Carter, 2008). Thus, we caution against over-interpreting the findings. Black girls are not monolith in their experiences as mathematics learners. Future research should consider the between and within diversity of Black girls. Also important are classroom observations – which can assist in understanding teacher behavioral interactions that can be assessed through standardized protocols. Also, noting mathematics teachers' gender and racial ethnic group membership may also explain some of the classroom interaction (Dee, 2007; Riegle-Crumb et al., 2012; Strayhorn, 2010). For instance, Riegle-Crumb and colleagues (2012) found that among a nationally representative sample from the Education Longitudinal Study of (2002), they found that White teachers favored White males over minority males and females. So, including information about teacher experiences and expectations for students will provide further information about Black girls learning opportunities in the mathematics classrooms.

### **Conclusions and Implications**

Overall, at the national level Black girls are less likely to be enrolled in Advanced Placement (AP) mathematics classes (Civil Rights Data, 2014), are the lowest performing on mathematics standardized tests (NAEP, 2015), and are less likely to earn degrees in mathematics (National Science Foundation, 2017). These alarming statistics indicate the deleterious impact of Whiteness and patriarchy within mathematics classrooms that places Black girls at a disadvantage. Our findings center the experiences of Black adolescent girls within mathematics classrooms and reveal that Black girls perceive differential treatment, negative support from teachers, and that they must work harder to prove their worth, corroborating previous literatures (e.g., Carter Andrews et al., 2019; Joseph et al., 2017). All of these negative experiences impact mathematics identity. It is imperative that the teaching of mathematics deviate from the heteronormative structure of Whiteness and patriarchy. That said, it is imperative to have intentional programming that 1) disrupts racist and sexist structural barriers that prevent Black

girls from being owners and learners of mathematics knowledge, 2) centers Black girls' experiences, increasing informal networks, developing culturally responsive pedagogy, and 3) dismantling and disrupting Whiteness and patriarchy in mathematics classrooms (Battey et al., 2016; Johnson et al., 2019; Joseph et al., 2017).

In summary, the findings of the current study build onto extant literature (e.g., Gholson, 2016; Gholson et al., 2014) on Black girls' experiences in math learning contexts by providing a Black feminist lens on the importance of "voice" in describing their experiences. Although Black girls generally loved math and understood the importance of math education, their experiences within the mathematics classroom inhibited many of the girls from developing a positive mathematics identity. It is imperative that future research continues to investigate how access to support systems within these contexts (e.g., peer assistance and extracurricular math mentoring programs), and how Black girls' cultural identities (e.g., racial and gender identity) and personal characteristics (e.g., self-efficacy) counter these negative school-based experiences. Our findings indicate that school racial climate is one area to consider in trying to increase representation of Black girls in STEM, which must include cultural competency workshops for teachers, staff, and administrators at the school and district level. There is also a need to ensure that Black girls are being identified for equitable participation in STEM programming (Evans-Winters, 2014; Patton et al., 2016; Young et al., 2017). Math programs that center Black girls in their recruitment and programming effects can build integral skills and confidence among Black adolescent girls. In other areas of STEM (e.g., computer science), scholars have noted the importance of combatting the underrepresentation of girls of color by investing in culturally responsive computing programming (Scott et al., 2009). Without engaging in intentional programming centered on the lived experiences of Black girls and mathematics learning, STEM participation will continue to be dominated by the norms of Whiteness and the exclusion of Black girls, thus limiting the opportunities for Black girls.

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Table 1.

*Participating School Demographics*

	# of Students	Black	American Indian	Latinx	White	Asian	Multiracial	Other
<b>Predominately White Schools</b>								
Sledge Middle School (Public)	8	2%	1%	0%	80%	13%	1%	0%
Poppins Middle School (Public)	7	2.2%	0%	.6%	92.3%	3.9%	0%	1%
Montessori School (Private)	1	3.5%	0%	3.5%	22.5%	10.5%	11.9%	47.8% (n.s.)
<b>Predominately Black Schools</b>								
Hillman Middle School (Public)	1	99%	0%	0%	0%	0%	1%	0%
Scholars Middle School (Public)	1	99%	0%	0%	0%	0%	0%	1%
Jefferson Middle School (Charter)	6	98%	0%	0%	0%	0%	2%	0%
<b>Racially and Ethnically Diverse Schools</b>								
Hope Middle School (Public)	4	27.1%	0%	3.4%	64.4%	1.6%	3.4%	0%
Warner Middle School (Public)	2	43.5%	1%	15.4%	32.8%	2.2%	5.5%	0%

*Note.* Number of students that participating in the current study from the specific school. The racial ethnic composition of the participating school is noted. Other is comprised of American Indian, Pacific Islander, and multi-racial. N.S. = race/ethnic background not specified.

Table 2.

*Demographic Characteristics*

Participant name	Age	Family Income	Parents Educational Level	Mathematics Class
Jessica	14.34	\$30,000 - \$39,999	High School Diploma	Pre-Algebra
Layla	14.15	\$50,000 - \$59,999	Some Graduate School	Pre-Algebra
Kendall	14.34	\$30,000 - \$39,999	High School Diploma	Pre Algebra
Ke'era	13.01	\$20,000 - \$29,999	Some College	Algebra 1
Tomika	13.24	\$30,000 - \$39,999	High School Diploma	Pre-Algebra
Tekise	13.49	\$30,000 - \$39,999	Master's Degree	Algebra 1
Rochelle	12.96	\$70,000 - \$79,999	Master's Degree	Pre-Algebra
Sia	13.39	\$20,000 - \$29,999	Some Graduate School	Pre-Algebra
Natasha	12.51	\$10,000 - \$19,999	College Diploma	Pre-Algebra
Tamala	12.53	\$60,000 - \$69,999	Some College	Pre-Algebra
Tia	12.72	\$30,000 - \$39,999	Some College	Pre-Algebra
Summer	13.37	\$80,000 - \$89,999	College Diploma	Pre-Algebra
Fantasia	13.90	Less than \$10,000	Some High school	Pre-Algebra
Rihanna	14.42	\$30,000 - \$39,999	College Diploma	Pre-Algebra
Nicole	13.46	\$30,000 - \$39,999	College Diploma	Pre-Algebra

Table 2

*Demographic Characteristics cont'd*

Participant name	Age	Family Income	Parents Educational Level	Mathematics Class
Whitney	12.33	\$80,000 - \$89,999	PhD/MD/JD	6 <sup>th</sup> grade Math
Kristen	12.45	\$80,000 - \$89,999	PhD/MD/JD	Pre-Algebra
Taraji	12.96	\$80,000 - \$89,999	PhD/MD/JD	Pre-Algebra
Charletta	11.75	\$30,000 - \$39,999	Some Graduate School	6 <sup>th</sup> grade Math
Sanaa	14.46	\$60,000 - \$69,999	Master's Degree	Pre-Algebra
Regina	14.27	\$30,000 - \$39,999	Received College Diploma	Algebra 1
Tamika	13.83	\$30,000 - \$39,999	Received College Diploma	Pre-Algebra
Simone	10.08	\$20,000 - \$29,999	Some Graduate School	6 <sup>th</sup> Grade Math
Parker	12.61	\$10,000 - \$19,999	Received High School Diploma	Pre-Algebra
Akelee	12.62	\$40,000 - \$49,999	Some Graduate School	Pre-Algebra
Amora	13.52	\$40,000 - \$49,999	Received College Diploma	Pre-Algebra
Jamiya	12.06	\$40,000 - \$49,999	Some Graduate School	Pre-Algebra
MaKayla	12.08	\$40,000 - \$49,999	Some College	Pre-Algebra
Aaliyah	12.31	\$50,000 - \$59,999	Master's Degree	Pre-Algebra
Rasheeda	12.54	\$30,000 - \$39,999	Some College	Pre-Algebra

Table 3. *Coding Themes and Definitions*

<i>Code</i>	<i>Definition</i>
Behavioral Differences in Math Class based on Gender	Student's behavior in class based on the students' gender. Boys are more active and exert more confidence in math as compared to girls.
Gender Preferential Treatment	Treatment from teachers differs based on if students are a boy or girl. This primarily involves disciplinary actions from teachers, administration, and staff.
Gender Pride	Statements regarding feeling proud about being a girl (gender identity). This can include statements about academic or personal accomplishments.
Importance of Mathematics	Beliefs and attitudes about mathematics. This also involves the importance of being studious in mathematics, seeking resources to assist them academically in mathematics, and the importance of grades in mathematics.
Negative Teacher Support	Negative or lack of support from teachers in the academic setting. This involves teachers whose actions are perceived as intrusive on students.
Peer Support	Student's ability to support each other academically.
Proving Themselves	Students feeling like they had to constantly prove themselves in the school setting. At times this meant working harder than non-Black students in academics. Students have this responsibility to prove themselves and to others that they belong.
Racial Microaggressions	Being self-aware and self-conscious of the negative treatment of the student based on their racial group membership. Students are aware of messages that are offensive to them because of their racial group membership.
School Racial Climate	School culture and environment around racial and ethnic minority issues as it pertains to the well-being of students of color. This includes statements about institutional racism, differential treatment based on race and gender, and how Black culture is embraced in school settings.
Self-Awareness of Stereotypes	Being aware of the stereotypes without internalizing the beliefs.

Table 4. *Coding Themes and Quotes*

<i>Code</i>	<i>Quotes</i>
Behavioral Differences in Math Class based on Gender	“At our school, the same people are called on over and over, and they’re always the boys, and they always have the answers. I just sit there with my hand up.”
Gender Preferential Treatment	“My teacher, Mr. Gates, so it’s only like two girls in my class. It was like eight of us, and only like two girls and every time me and Morgan would raise up our hands, he wouldn’t choose on us, so I just had to start sitting there to get called on. But then my report card says I don’t pay attention.”
Gender Pride	“Girls can do the same thing as boys” and “Yes, boys act like they know more than girls but actually boys and girls can both be good in math if they put they mind to it.”
Importance of Mathematics	“I do and I don’t. Well, I kinda do and I kinda don’t because I know math would be something I would have to learn.”
Negative Teacher Support	“They hear the White kids talking about us. I mean, like there are teachers around, but the teachers, they don’t really notice or care or understand, and they think it’s just some silly situation. But it actually hurts me.”
Peer Support	“If we like mess up on something, if they mess up on something, they’ll be like, T, how do you do this question? We help each other out, because like we’re trying to get our stuff done, get into high school, get into college. My friend is trying to get into Julliard, so she ain’t playing.”
Proving Themselves	“You have to work extra hard. It’s like harder for us. It’s already harder for girls, but then when you’re a Black girl, it’s way harder.”
Racial Microaggressions	“Some of my peers treat me differently. One example is like me and couple of friends, we were playing tag one day, and we made up nicknames for each other. And someone like made up a nickname like – like Black Thunder or something. They just represent me as dark all the time. It’s doesn’t make me feel good.”
School Racial Climate	“Students at my school are treated differently based on their racial group membership because for example when Whites and Blacks get in heated arguments it seem like only the Blacks get in trouble or only get punishment.”
Self-Awareness of Stereotypes	“It’s hard sometimes to be proud to be Black, because of like the stereotypes, maybe, or how people feel about African Americans. But I keep my head up and keep pushing,”