

## USING NOVEL APPROACHES TO BETTER UNDERSTAND BLACK MATHEMATICS TEACHER RETENTION

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*We used a mixed method research design to address the complexity of interrogating issues related to retention of Black mathematics teachers. The research design includes oral history interviews with retired Black mathematics teachers and large-scale survey data collected and analyzed from a Critical Race Quantitative Intersectionality approach. It is our position that the contemporary reality of the dwindling numbers of Black mathematics teachers cannot be fully understood without unpacking the issue with a critical, historical lens. Otherwise, we run the risk of perpetuating the longstanding issue of lack of diversity in the field. Thus, this paper presents preliminary findings of a 3-year research project that advances knowledge of the historical influences, with focused attention to sociopolitical forces, that impede retention of Black mathematics teachers.*

Keywords: Equity and Justice, Research Methods

### Purpose

Within educational circles and in public discourse regarding teacher retention, stakeholders are having what appear to be two seemingly distinct conversations, at least on the surface. One conversation highlights the need to recruit mathematics teachers to improve American students' achievement outcomes all in the name of increasing global competitiveness and employment in STEM-focused professions (National Math & Science Initiative, 2016). The other conversation calls for the retention of a diverse teaching force for an increasing multi-racial, multi-ethnic and culturally-diverse student population (Casey, DiCarlo, Bond, & Quintero, 2015). These conversations are rarely held simultaneously, meaning few conversations address the need to increase the numbers of teachers of color in mathematics. We contend that these conversations are not mutually exclusive. Further, we argue that these conversations, while well meaning, often commoditize teachers of color. Conversations about "filling pipelines" often treat teachers as data points to meet diversity requirements or to simply achieve demographic matches between students and teachers. Further, the ultimate goal of increasing mathematics teachers and teacher of color tends to always rest on US economic competitiveness rather than goals related to social justice, the public good, and the wellbeing of Black teachers.

Black mathematics teachers are one-third of one percent of all teachers and approximately 6 percent of all secondary mathematics teachers (Neil, 2015). An emergent body of literature highlights the promise of learning with and from Black mathematics teachers based on their unique pedagogical practices that honor Black students' ways of knowing (Birky, Chazan, & Morris, 2013; Clark Badeschter, & Napp, 2013a; Clark, Frank, & Davis, 2013b; Johnson, Nyamekye, Chazan, & Rosenthal, 2013) and also improve achievement for Black students (Dee,

2004; Klopfenstein, 2005). Addressing retention of Black mathematics teachers is key, as Neil found that they have the highest rate of turnover among all mathematics teachers across all racial demographics.

This limited amount of scholarship with respect to Black teachers of mathematics highlights the need to establish a line of research that lies at the nexus of increasing teacher diversity and increasing the numbers of mathematics teachers entering the field. Further, we push back on the notion that recruitment of teachers of color, and specifically Black teachers, is solely a contemporary issue. We posit that the dwindling number of Black teachers noted in the current news cycles and public discourse stems from a long history of systemic marginalization. Historical analyses of Black teachers in mathematics provide a meaningful foundation for understanding the contemporary racialized experiences, perspectives and practices of Black mathematics educators.

We used a mixed method research design to address the complexity of interrogating this broad issue. The research design included oral history interviews with retired Black mathematics teachers. To capture the experiences of current Black secondary mathematics teachers, the research team administered a large-scale survey and will be conducting focus groups. The research questions that guide this work are as follows:

1. What are the mathematical, racialized, and educational experiences of Black mathematics teachers who taught during the periods of *de facto* desegregation in the United States and those who are currently teachers?
2. How do the experiences of former and currently practicing Black mathematics teachers contribute to theorizing about the role of Black mathematics teachers and the content, intellectual, cultural, and social resources they bring to their practice?
3. How do the experiences of former and currently practicing Black teachers inform how schools, policy makers, and teacher preparation programs recruit and retain a diverse mathematics teaching force?

We see this work as an effort to illuminate issues that may not be at the center of either discourse related to retention of Black teachers or retention of mathematics teachers.

This National Science Foundation-funded research project advances knowledge of the historical influences, with focused attention to sociopolitical forces, that impede the retention of Black mathematics teachers. Ultimately, this work informs research methodology in mathematics education by integrating untapped, yet appropriate methodologies suitable for challenging issues of recruitment, retention, and praxis of other underrepresented racial and ethnic groups across time periods and school contexts. The proposed project will also contribute to theories of mathematics teaching, with respect to the role of race and racialized experiences.

### **Theoretical Perspective**

It is important that we acknowledge that race is socially-constructed and historically contingent, not biological, fixed, or causal despite harmful social discourses (Omi & Winant, 1994/2014). As race is socially constructed, humans become part of what Omi and Winant refer to as racial projects, which do the ideological work of shaping and reshaping what race means and how social structures are organized based on that meaning. In the context of mathematics teacher education, this means that Black mathematics teachers' work is informed by the faulty discourse of Black people as mathematically inferior to their non-Black peers. Racism occurs

when society buys into racial projects and reproduces structures of domination based on essentialist categories of race. Within this system, individuals have racialized experiences, i.e., social experiences shaped by racism. We posit that teaching mathematics, in a similar fashion to learning it, is a racialized experience influenced by multi-level external forces (Martin, 2000). Further, due to social, historical, political, and cultural forces, teachers at particular social intersections (e.g., racial, socioeconomic, linguistic) Black teachers may experience teaching mathematics differently than those from dominant communities (Clark, Johnson, & Chazan, 2009).

Research on both recruiting a diverse teaching force and increasing the mathematics teaching force often focus on recruitment issues such as college completion, standardized testing, financial concerns, or the need to create viable pipelines (e.g., Nettles, Scatton, Steinberg, & Tyler, 2011). With respect to retention, researchers cite site workforce conditions like autonomy over curriculum (Ingersoll, 2011; Neil, 2015). While acknowledging the importance of these issues, we assert that much of this work neglects how racism impacts each of these issues. For instance, Achinstein, Sexton, Ogawa, and Freitas (2010) noted that teachers of color highlighted issues such as “low expectations or negative attitudes about students of color, lack of support for culturally relevant or socially just teaching, and limited dialogue about race and equity” (p. 96) as deterrents to retention.

We used critical race theory (CRT) as our guiding theoretical perspective. CRT has its origins in the Derrick Bell’s (1980) legal scholarship. Bell’s work was expanded to the field of education by Drs. Gloria Ladson-Billings and William Tate (1995). CRT rests on the premise that racism is endemic, pervasive, and is normalized through social and institutional structures and practices in public spaces such as schools (DeCuir & Dixson, 2004; Ladson-Billings, 1998, 2013; Ladson-Billings & Tate, 1995; Milner, 2008, 2017). CRT tenets include (but are not limited to): (a) the permanence of racism; (b) whiteness as property (Dixson & Rousseau Anderson, 2018, Harris, 1993); and (c) intersectionality (Crenshaw, 1989; 1993; Ladson-Billings, 2013). Some of these tenets will be addressed in detail in the findings. These tenets hold explanatory power for understanding how race and racism shape mathematics teacher education and impact retention of Black teachers.

## Methods

Integrating oral history and critical quantitative analysis via mixed methods research accommodated our interdisciplinary research questions. Specifically, we collected oral history interviews of retired Black mathematics teachers and large-scale survey data of currently practicing Black teachers. Combining what may seem like disparate methodologies, the collected data is helping us identify issues that are intractable across time periods and schooling contexts. We are planning focus groups for summer 2019, which we believe will further corroborate our preliminary findings.

### Participants

**Survey participants.** The results presented in this paper are from two data sets, results from large-scale survey and oral history interviews. We surveyed 555 currently-practicing Black teachers of mathematics nationwide (women, 53%) using a survey we developed, the Black Teachers of Mathematics Perceptions Survey (BTOMPS). We were intentional in aiming to recruit a sample of Black teachers of mathematics that is representative of the Black teaching population in the United States. We also partnered with the Benjamin Banneker Association to garner participation and used social media and teacher social networks to recruit. The participants

who participated in the survey ranged between the ages of 21 and 65 years ( $M = 34.9$ ,  $SD = 8.6$ ). A majority of the teachers identified as African American (98.2%). Other teachers specified their ethnicity as Caribbean (1.1%), African, Afro-Latino, and bi-racial/multi-racial (all  $< 0.5\%$ ). Teachers reported a minimum of a Bachelor's degree (50.1%), Master's degree (17.5%), doctoral degree (2.9%), and a specialist degree (2%). The teachers taught mathematics and/or other subjects between 0.5 and 34 years. The teachers taught mathematics and/or other subjects for less than five years (38.7%), between 5 and 10 years (45.6%), and 11 years or more (15.7%). The percentage of years teaching mathematics only are marginally different: less than five years (39.6%), between 5 and 10 years (45.4%), and 11 years or more (15%). They taught regular scheduled classes (at least one class weekly) at elementary (22.2%), middle (45.2%), and high schools (31.9%). The majority of participants (97.6%) taught at public schools, including traditional, public charter, and public magnet schools, and the rest taught at parochial/religious and independent schools (2.4%). The teachers represented more than half of the US states and the District of Columbia, with significantly less representation from the Rocky Mountain states. Most teachers in the sample (64.1%) took a traditional route to licensure for mathematics teacher certification.

**Oral history participants.** To date, our team has interviewed 13 retired Black female teachers who taught mathematics beginning as early as 1953. With the exception of two participants who came to teaching from other professions, all experienced teaching mathematics in (a) segregated community schools; (b) schools that were undergoing desegregation; and/or (c) schools that had been desegregated within a few years of their arrival. The majority of the participants began their careers in 1960s-1970s, with the exception of the two career changers who began in 1986 and 1991, respectively. We decided to narrow our participation regionally, opting to interview in the Washington, D.C. and Atlanta Metro areas because of the regions' rich histories of Black education due to their booming Black middle classes and thriving Historically Black Colleges and Universities (HBCUs). Snowball sampling procedures (Babbie, 2001) proved to be the most effective means of recruiting participants. We used social media and teacher social networks to recruit senior participants.

### **Data Collection and Analysis**

**Survey.** All participating teachers completed the BTOMPS, which was designed to align with the literature on Black teachers of mathematics with respect to mathematics teaching and learning, beliefs and awareness, perceptions of race and racism, and working conditions. BTOMPS includes research team-written 4-point likert-style items, with responses ranging from strongly disagree to strongly agree. The research team-written questions were developed from the analysis of about two dozen interviews with Black teachers of mathematics and pre-service teachers (see Frank, Khalil, Scates, & Odoms, 2018 for more on these interviews). We included original and revised questions from the Mathematics Teachers of African American Students Beliefs Instrument ([MT-ASBI], Howse, 2006), designed to capture and measure the beliefs of Black high school mathematics teachers as they relate to teaching. Building on earlier work, the research team also included questions from a mathematical beliefs and awareness survey developed by Campbell et al. (2013). This survey measured teachers' beliefs about mathematics content and pedagogy as well as their beliefs and awareness about students' identities and dispositions toward mathematics. Finally, we amended a microaggressions scale that was initially developed by Harwood, Choi, Browne and Mendenhall (2015). These items were used to assess teachers' perception of race and racism in their school/districts. These items used a six-point Likert-type response scale ranging from 'never' to 'once a week or more'. For example,

one question is: *People have made me feel intellectually inferior at my school/district because of my race.* To ensure content validity, the research team conducted cognitive interviews with currently practicing Black teachers of mathematics and mathematics teacher leaders. During the first wave of administration, the research team completed psychometric testing to reduce the overall number of items on the survey. Each participant participated in the survey using an online format that was administered via Qualtrics. In this report, we report descriptive statistics in this report and share implications for future quantitative analyses

By foregrounding race, racism, and intersectionality, we chose to frame this issue of attrition of Black mathematics teachers within CRT in order to disrupt how statistical data are interpreted, and to (re)tell, through the lenses of participants, the experiential knowledge and counterstories behind the data (Solórzano and Yosso 2002). Critical Race Quantitative Intersectionality (CRQI), informed by CRT, uses quantitative methodology to frame research, policy, and practice for the purpose of social justice and educational equity in a field dominated by qualitative research methods (Covarrubias & Velez, 2013, Sablan, 2019). Using a CRQI lens, we surveyed the participating teachers about their perspectives on mathematics content and pedagogy, racialized experiences as teachers, and current working conditions.

**Oral history interviews.** Each participant was interviewed twice, once without formal videography to help them recall their experiences and to familiarize them with the oral history process. The second interviews were recorded using a professional videographer. All interviews, formal and informal, lasted from 1.5 to 3.5 hours. In the tradition of oral history, collected data from primary sources such as newspapers, school board archives, yearbooks, mathematics texts, pictures, and other artifacts pertinent to the participants' lived experiences. Many of our primary sources were shared by the participants.

We used Firouzkouhi and Zargham-Boroujeni's (2015) 4-step analytic process for rigorously analyzing oral history data: (1) data gathering with participants and first-level, inductive coding based on researchers' impressions and memos; (2) second-level coding to determine sub-categories within the first-level codes; (3) third-level coding and determining the main categories; and (4) connecting the main categories to each other to develop a strong narrative. These steps are complementary, connected, and related in a cyclical fashion, such that the final stage connects to the first to form what the authors call an analytic "circuit." Our analysis of this data is also informed by knowledge of the literature about Black teachers from historical and contemporary perspectives. In our analysis of the oral history data, we identified themes that inform connections to, implications for, and divergent experiences from contemporary recruitment and retention issues for Black mathematics teachers.

Post-analysis, we began to identify in the qualitative data set what Sisson called "critical incidents" with respect to race and racism in the mathematics teaching experiences of our teachers, meaning instances are pivotal to the identities and lived experiences of the participants. These critical incidents highlighted the salience of race within the themes generated during the initial oral history coding process. Because we adopted a CRQI quantitative approach (Covarrubias & Velez, 2013; Sablan, 2019), we identified findings in the descriptive data that mirrored the experiences of our oral history participants, and vice versa. Seeking out these reflexive relationships between the qualitative and quantitative data allowed us to begin to put together a narrative about the intractability of racism in the experiences of Black mathematics teachers over time.

## Results

Using three tenets of CRT to frame this section, we present preliminary findings and highlight how integrating novel methodologies helps to paint a more complete picture of recruiting and retaining Black mathematics teachers.

### The Permanence of Racism

As noted earlier, for critical race theorists, racism is commonplace in the U.S. (DeCuir & Dixson, 2004; Ladson-Billings, 1998, 2013). It follows that it is endemic in education as well (Delgado and Stefancic, 2001). Thus, the one of the goals of critical race theorists in mathematics education is the unmasking of racism when “denotations [of racism] are submerged and hidden in ways that are offensive though without identification” (Ladson-Billings, 1998, p. 9). Our data point to the veiled permanence of racism and the inherent racist structures of district- and school-level practices contribute to the Black mathematics teacher shortage and attrition. We use examples from the qualitative and quantitative data of our study to point out instances of veiled racism. When asked about instances of microaggressive experiences in their schools/districts, the survey participants reported the following: (a) 60.4% responded that people have made them feel intellectually inferior because of their race at least once monthly; (b) 58.2% indicated that at least once per month their contributions were minimized due to their race; and (c) 54% reported having their academic ability or intelligence minimized once monthly or more frequently.

This data was collected in the spring-summer of 2018, yet it mirrors the sentiments of the retired teachers in the study who also shared microaggressive experiences related to having their intelligence questioned. Experiences included those like Mrs. Joyce Lyons, a retired teacher who taught over 40 years in the mid-Atlantic region. She shared an experience from one of her first teaching jobs in the 1960s:

I just felt like the white teachers thought that we [Black teachers] were not smart as they were. One [fellow teacher] even told me, ‘You just don't have the experience to teach math...I don't know what he meant by that, but he kept telling me that.

The qualitative data set is filled with examples such as these that mirror what the quantitative data tells us about microaggression trends related to Black teachers who are currently teaching. Other examples included being doubted and disrespected by administration and parents. These data point to the longstanding, inherent, and overlooked nature of racism that plagues mathematics teaching.

### Whiteness as Property

The whiteness as property tenet states that those who are identified as white are guaranteed rights that are equal to, if not more valuable than, material resources that position them in power (Harris, 1993). Often, these rights are so inherently normalized, they are difficult to recognize (Milner, 2017). It is important to note that whiteness is not simply a fixed characteristic of a particular group of people. In the context of mathematics teacher education, teaching advanced mathematics courses is the material property that is withheld from Black teachers. In fact, Neil (2015) found that Black mathematics teachers overwhelmingly teach lower-level mathematics. In her study, she found only 3% and .3% of Black teachers taught calculus and statistics, respectively. Connecting the contemporary to the historical, the teachers in our oral histories consistently recounted being relegated to teaching lower-level mathematics when teaching in more racially-diverse teaching settings. We noted that only when their student populations were

predominantly Black were they afforded the opportunities to teach advanced mathematics courses. We see this tenet as interconnected with the previously-discussed tenet of the permanence of racism, as the phenomenon of denied opportunities to “property” like teaching advanced mathematics courses occurs when the racial project of Black inferiority is played out in ways that lead to the minimizing of Black teachers’ intelligence and contributions.

### **Intersectionality**

Intersectionality calls for the examination of race in tandem with gender and its performances and expressions, sexuality, social class, nationality, and numerous other systems of oppression or privilege in various settings (Crenshaw, 1989, 1993; Delgado & Stefancic, 2001; Ladson-Billings, 2013). Race structures the lives of Black people in ways that often make it difficult to differentiate how multiple and overlapping systems of oppression impact lived experiences (Crenshaw 1989; 1993). Black people across the diaspora share a collective Black experience, *and*, simultaneously, the Black experience is multifaceted and diverse; i.e., it is intersectional. We knew that the experiences of teachers with respect to gender varied. For instance, Neil (2015) reported that Black female teachers make 32% less than their Asian male mathematics teaching counterparts. She also found that Black female mathematics teachers had the highest rate of turnover in her dataset, across men and women of all demographics.

With respect to the literature, researchers have pointed to how Black male teachers are expected to perform tough love and be disciplinarians, often at the expense of their content and pedagogical expertise (Frank et al., 2018; Bristol & Mentor, 2018; Brockenbrough 2012, 2015). On the other hand, Black female teachers are presented in the literature as caring surrogate mothers, coined othermothers by Dixson (2003) and Dixson and Dingus (2008). Intersectionality, and in particular, the intersection of race and gender are of particular salience to our findings. Our work points to gender differences such as We hypothesized that the BTOMPS microaggression responses would likely vary by gender given what we have learned from the literature about the dominant masculinist perspective of mathematics (Hottinger, 2016) and how it is compounded by race for Black women and girls in STEM (e.g., Joseph, Hailu & Boston, 2017). This research helped us interpret the survey finding wherein half as many Black men (10.3%), compared to Black women (20.4%) believed their intellectual contributions were minimized.

The oral history data point to comparable experiences. Gracie Kenon, retired veteran mathematics teacher of 38 years in Georgia and Washington, D.C. recounted the struggles of majoring in mathematics as a Black woman, even at an HBCU. Inherent in the all of the interviews with our oral history participants, who were all women by coincidence, was the care, both interpersonal and academic, that they poured into their students. Mrs. Gail Radcliffe, former mathematics teacher and administrator, described the othermothering (Dixson, 2003; Dixson & Dingus, 2008) techniques she and the other Black women teachers employed like buying alarm clocks to get their students to school on time and advocating for more rigorous mathematics curriculum for their students. While these women othermothered, many of them also discussed the balancing act of mothering their own children and being present for their students. We anticipate collecting oral history interviews from male teachers in the near future to further analyze how gender intersects with mathematics teaching for Black teachers.

One unanticipated finding with respect to intersectionality was how years of teaching impacted our survey results. The veteran teachers in our sample, i.e., those who taught for more than 10 years experienced significantly less microaggressive behaviors than those who had less experience in the field. For instance, over half of them reported having never felt intellectually

inferior due to their race, when compared to over a quarter of teachers with 9 or fewer years reported feeling intellectually inferior by others due to race a few times a month or weekly. We have generated two plausible conjectures for why this pattern may be emerging in the data. First, we wonder if teachers who have taught for an extended number of years are simply more respected for their content and pedagogical knowledge and experience. We draw on our findings from the oral history component of our grant project to arrive at our second conjecture. In our ongoing interviews with retired Black teachers of mathematics we are finding that they do not name racism and oppression in ways that the currently practicing and pre-service teachers do (Frank et al., 2018). For instance, the retired teachers have shared incredible stories of persistence during the desegregation of schools, and yet when asked directly about how race impacted their teaching practice, many said they do not think that it did.

Second, we conjecture that, perhaps, in this current sociopolitical climate in which race is central to national discourse, the teachers in our study who have less teaching experience (and are likely, but not necessarily, younger) are able to name racism and the associated microaggressions in ways that our more senior participants do not, or maybe cannot. In essence, we wonder if generational differences are at play in the data. In all, these results from the microaggression scale highlight the necessity of unpacking quantitative through a CRQI lens to think about mathematics teachers' experiences at the intersections of interlocking systems of oppression and/or privilege. These findings warrant continuing examination of retention factors with respect to how intersecting identities, oppressions, and markers of privilege make mathematics teaching complex for Black teachers.

### Conclusion

Clark et al. (2013a, 2013b) proposed that the study of Black mathematics teachers' experience is essential to the field of mathematics education as the field broadens to account for sociocultural (Lerman, 2000) and sociopolitical (Gutierrez, 2013; Nasir & McKinney de Royston, 2013) perspectives on teaching mathematics. They went on to theorize the role of Black mathematics teachers as "boundary spanner[s] with membership in multiple communities, a mathematically proficient and intellectually powerful African American person within a historically disempowered African American community with a history of inaccessibility to and underperformance in mathematics" (p. 1). To better understand the role of Black mathematics teachers as boundary spanners, we propose using mixed methods as described above. In this era of rapid technological advances, with Betsy DeVos at the helm of the U.S. Department of Education, charter schools with "No Excuses" mottos dominating the education of Black children, and a dwindling mathematics teaching force, coupling oral history with other methods of data collection and analysis holds promise for unpacking how critical points in history impact still resonate in the present and hold promise for understanding a pressing issue like retention that the field treats as a contemporary issue despite its longstanding presence in the field.

Our future work will continue to unpack the complexities facing Black mathematics teachers with a nod to intersectionality by considering how race is impacted by gender, region, years teaching etc. We are working on predictive statistical models of Black teacher attrition based on the microaggressions data. Furthermore, the study continues to gather and share the oral histories of retired Black teachers of mathematics who taught Black students in functionally segregated schools pre- and post-*Brown*. We intend to map the intractability of negative racialized experiences over the generations of Black teachers, as well as the persistence of African American Pedagogical Excellence, defined as an ideology, set of beliefs, and instructional



practices held by Black teachers that affirm and uplift Black students and their families toward high levels of academic achievement (Acosta, Foster, & Houchen, 2018). Further, we will use the oral history and quantitative data with focus groups of currently-practicing Black mathematics teachers across the country to deepen our understanding of the issue they face and what the field can do to address these conditions.

### Acknowledgments

We acknowledge that this work is possible through National Science Foundation funding, Grant #1660733. Opinions expressed in this report are those of the authors, not necessarily NSF.

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