

The role of undergraduate mathematics faculty in the development of African American male mathematics majors

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Historically Black Colleges and Universities (HBCUs) have a longstanding legacy of supporting African American students in mathematics. The undergraduate mathematics faculty members play a unique role in supporting and developing astute mathematics students, especially African American male students. This preliminary research report highlights the experiences of a cohort of 16 African American male mathematics majors at an all-male, private HBCU by investigating the role of the mathematics faculty members. Using qualitative research methods grounded in critical race theory, preliminary data show these African American male mathematics majors benefited (mathematically and racially) by their supportive mathematics faculty members.

Keywords: Undergraduate mathematics education, HBCUs, African American men, Supportive faculty

Introduction

This preliminary research report analyzes the mathematics experiences of a cohort of 16 African American male mathematics majors at an all-male, private Historically Black College/University (HBCU) in the southeastern region in the United States. HBCUs have a historical legacy of developing mathematics majors/mathematicians, and this institution was recently recognized by the American Mathematical Society (AMS) as the Programs that Make a Difference Award for their commitment to producing African American male mathematics majors to increase diversity in the mathematical sciences (Borum, Hilton, & Walker, 2016; Jett, 2013). This research report hones in on the role of undergraduate mathematics faculty members in the development of these 16 African American male mathematics majors. The overarching research aim was to ascertain intrinsic and extrinsic factors that led to the undergraduate mathematical persistence for this cohort of students.

As it stands, this research study adds to the body of scholarship investigating the schooling experiences of African American male students (see, e.g., Duncan, 2002; Harper, 2013; Noguera, 2008; Strayhorn, 2015). In addition, this study adds to the thread of research highlighting the mathematical strengths of African American male mathematics students (Berry, 2008; Stinson, 2013). Given that a large number of these studies have been conducted at the K–12 level, it is important to gain insights from studying African American male students who are persisting in college mathematics. African American male students' stories of mathematical undergraduate persistence are largely absent in the research literature. Thus, this research project is designed to fill this void in the research literature and shift the discourse concerning the mathematics experiences of African American male mathematics collegians with respect to their mathematics faculty members.

Review of the Literature

There have been fruitful efforts designed to improve the mathematics achievement outcomes of African American students. One effort that has been successful in promoting high levels of undergraduate mathematics performance among African American students is the

Mathematics Workshop Program (MWP) at the University of California, Berkeley (Fullilove & Treisman, 1990). The MWP is cited as being successful for the following reasons: the workshops create environments that promote mathematics academic excellence among peers; the students spend more time on learning activities and learning tasks as opposed to just solving mathematics problems; and the students who participate in MWP are believed to continue in college longer than those students who do not participate in the workshop because they obtain social and study skills that can be used throughout their college matriculation.

A research team at the University of Maryland Baltimore County studied high-achieving African American men (Hrabowski, Maton, & Greif, 1998). At this institution, researchers became concerned about the status of African American male students in college science, mathematics, and engineering (SME; SME is synonymous with STEM) majors and decided to learn more about this group by studying the habits of the highest-achieving students who were enrolled in the Meyerhoff Program. Although the program now serves students from all racial and ethnic backgrounds who desire to pursue a doctorate in the sciences or engineering, the first year consisted of African American male students only. Hrabowski et al. (1998) hoped to identify attitudes, behaviors, habits, perspectives, and strategies of the highest-achieving African American male students in the program. According to Hrabowski et al. (1998), the following factors are critical for success in college among African Americans in mathematics and science: an adequate high school academic preparation, analytical skills, strong study skills, time management skills, advising, academic as well as social integration, and motivation and support.

Ellington and Frederick (2010) examined the experiences of eight high-achieving junior and senior mathematics majors to ascertain the factors that shaped their mathematical success and persistence. Their findings revealed the majors' success was informed by participation in academic programs at the K–12 level and college scholarship programs, access to advanced mathematics courses, and support from family, classmates, and teachers. In another study, McGee (2015) investigated the factors undergirding academic resilience among 23 high-achieving African American mathematics and engineering majors at the junior, senior, and graduate levels. Using the life-story interview process, she reported on a subset of two participants (one Black female and one Black male) from her larger study. McGee introduced the Fragile and Robust Mathematical Identity Framework to understand the interplay between mathematics and racial identity. Using this framework, she found that her two participants were able to thrive in these majors while grappling with various forms of racialization.

While the previously mentioned studies have moved the field forward concerning the experiences of African American students, we know comparatively little about the role of undergraduate mathematics faculty in the development of African American (male) students. This study, therefore, complements and expands existing research efforts in the field by examining the role of mathematics faculty in the development of mathematics majors for this population of students. All in all, this research report builds on scholarship from scholars who honor the mathematical talents and gifts in African American students (see, e.g. Berry, 2008; Cooper, 2004; Delpit, 2012; Ellington & Frederick, 2010; Jett, Stinson, & Williams, 2015; Leonard & Martin, 2013; McGee & Martin, 2011; Stinson, 2006; Thompson & Lewis, 2005; Walker, 2006, 2014). Moreover, this study also reveals how complexities about the constructs of race and/or gender may influence the mathematical development of African American male students given the theoretical frame.

Theoretical Framework

The experiences of African American students have been documented in the mathematics education research literature, and scholars in the field have paid attention to how their racialized experiences influence their mathematics learning (Larnell, 2016; McGee, 2015). As such, Critical Race Theory (CRT) was employed as the theoretical framework for this research project (see Bell, 1992; DuBois, 1903/2003 for comprehensive discussions concerning the country's racial history). Racism is an institutionalized force that has been used both historically and currently to dismiss and oppress people of African descent and other people of color. Solórzano and Yosso (2002) argue that "substantive discussions of racism are missing from critical discourse in education" (p. 37). As it stands, issues of race and racism have been underexplored in mathematics education research (Martin, 2009). There are, however, a contemporary group of mathematics education researchers foregrounding issues of race and racism in their analyses (see, Jett, 2016; Larnell, 2016; McGee, 2015; Stinson, 2013; Terry, 2011). In an attempt to extend analogous mathematics education research drawing from race-based frameworks, CRT was used to examine the role of undergraduate mathematics faculty members in the development of a cohort of 16 African American male mathematics majors.

With CRT, there are five foundational tenets, and these tenets are the hallmarks driving this theoretical perspective. These philosophical underpinnings include the following:

- 1) CRT asserts that "racism is normal, not aberrant, in American society" (Delgado & Stefancic, 2000, p. xvi).
- 2) CRT adheres to interest convergence, which advances that the dominant culture advances racial justice and other race based initiatives when it serves their interest (Delgado & Stefancic, 2001).
- 3) CRT asserts that race is orchestrated as a social construction (Ladson-Billings, 2013).
- 4) CRT explores the intersectionality of various constructs such as race, sex, class, gender, and sexual orientation to explore how these intersections make for broader understandings of these constructs (Delgado & Stefancic, 2001).
- 5) CRT utilizes voice to serve as a counter-narrative to the dominant discourse surrounding racial groups (Dixson & Rousseau, 2005).

These tenets of CRT were used to frame the interview questions and to analyze the data.

Research Question

The overarching research questions (RQ) for this portion of study were as follows:

- RQ1: How do undergraduate mathematics faculty members (at this particular HBCU) either help or hinder the mathematical development of African American male mathematics majors?
- RQ2: What are the (student) identified strengths and weaknesses of the undergraduate mathematics faculty members as it pertains to the development of African American male mathematics majors?

Methodology

This research study employed qualitative research methods. More specifically, the qualitative research data collection methods included the following: 1) a pre-survey, 2) a semi-structured interview, and 3) a member checking prompt (Bogdan & Biklen, 2007; Patton, 2015).

1) The pre-survey was given to the participants prior to the first interview. This pre-survey solicited information from the participants pertaining to their demographics, family dynamics, and education. The information obtained from the pre-survey was used to inform the

first interview as well as to substantiate the data for coding and analysis. 2) Next, the participants completed a semi-structured interview (ranging from one to two hours in length). The interview amplified the participants' voices by honoring and using their own words to share their mathematics experiences. The utilization of "voice" as well as narratives aligns with qualitative research methods and CRT's fifth tenet. 3) The final method included allowing the participants to member check my findings. In other words, the member checking aspect allowed the participants to verify whether I reported their words, findings, and interpretations accurately.

With regard to data analysis, I employed coding to analyze the data. After analyzing the individual interviews, I searched for similar and dissimilar patterns in the data and articulated explanations for different phenomena (Glesne, 2006). In addition, I wrote reflective notes in my researcher's notebook, which aided during both the data collection and coding processes (Bogdan & Biklen, 2007). Tenets of CRT were used to code and assist with analyzing their experiences as racialized beings. All in all, this qualitative data analysis process offered me an opportunity to verify my findings with the participants and to address questions pertinent to the analysis of data on the role of undergraduate mathematics faculty members in the development of African American male mathematics majors.

Preliminary Findings

Qualitative data have been collected for this research project, but the data are in the early stages of data analysis. However, preliminary data indicate that these 16 African American male mathematics majors were affirmed at their HBCU by their supportive mathematics faculty members. More specifically, the mathematics faculty members were dedicated to providing the mathematics majors with a challenging undergraduate curriculum. The faculty members were supporting and caring, and the majors spoke deliberately about the effective guidance and mentorship offered by these departmental members, especially the department chair (an African American male alumnus of the department). Conclusively, these faculty members had social constructions about who could be mathematically astute, and these ideological orientations informed their mathematical and racial empowerment of these African American male mathematics majors (Ladson-Billings, 2013).

A more thorough discussion of the preliminary finding concerning the role of the undergraduate mathematics faculty members will be shared during this presentation. In doing so, I will also share some ways to improve the undergraduate mathematics space as articulated by the majors. The data will be shared in light of the research questions, with connections to the previously cited literature, and with theoretical linkage to CRT.

Discussion Questions

The following discussion questions and prompts will allow participants in this session to engage in dialogue, offer feedback for strengthening the work, reflect on their own undergraduate mathematics practices, and recommend suggestions for future areas of scholarly exploration for this line of research:

- Please share any suggestions or insights from your experiences working with African American male mathematics majors that have yielded successful mathematics outcomes.
- Please share any suggestions or insights from your experiences working with mathematics majors from other marginalized groups that have yielded successful mathematics outcomes for that particular population of students.
- What are some implications of this work for undergraduate mathematics instructors?

- What are some implications of this work for undergraduate mathematics education researchers?
- What are your thoughts and recommendations concerning extending and furthering this work?

Goals

One goal of this session is to highlight the critical role of the mathematics faculty in the development of African American male mathematics majors at an all-male, private HBCU. This particular institution has a legacy of producing many African American male mathematics majors as espoused by national data and reports. Another goal is to disseminate more stories of mathematical persistence to influence and develop more African American male students into the mathematics pipeline who have a desire to explore various mathematical and mathematics-related pursuits. Finally, a goal is to generate more conversations concerning the participation and underrepresentation of African American male students in undergraduate mathematics degree programs.

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