

“I’m Going to Prove Somebody Right”: Deconstructing African American Male Identity in Mathematics and Science

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African American males’ participation in science, technology, engineering and mathematics (STEM) majors and careers is often explained through a deficit lens, focusing on decontextualized academic achievement statistics that suggest persistent underperformance. This article describes how one African American male student at a Research 1 university developed a mathematics and science identity in K-12 schooling and how this formed identity impacted his participation in STEM at the post-secondary level. Evidence from this study suggests when developing African American males’ identities in math and science, policy makers and educators must be aware of inequities embedded in K-12 and postsecondary institutions that encroach upon persistence and achievement. Findings indicate the need for societal and institutional reframing of the culture of math and science in the United States.

Academic [under]achievement frames most research seeking to explain the underrepresentation of African American males in science, technology, engineering and mathematics (STEM) majors and careers. Research highlighting the achievement gap of African American students in math and science in comparison to White and Asian students fails to properly contextualize research within an “education debt” framework (Ladson-Billings, 2006). An “education debt” framework explains the achievement gap by acknowledging the historical, economic, sociopolitical, and moral debt that contributes to the marginalization of African American students in K-12 and postsecondary institutions, thus narrowing their ability to develop positive identities in math and science. Utilizing the “education debt” framework, the conversation can move beyond racial group comparisons and test scores to one that examines the foundation of K-12 and postsecondary institutions.

In developing K-12 institutions that support African American males’ participation in STEM, research must prioritize student experiences which address opportunities to learn (Noguera, 2009). The participation of minoritized populations in STEM has gained momentum among policymakers simply as a means to maintain the United States’ global competitiveness (National Science Foundation, 2014); however, policymakers fail to address the culture of K-12 math and science education in the United States that positions African American males at the bottom. Color-blind policies such as No Child Left Behind of 2001, passed during the Bush administration, and Race to the Top during the Obama administration fail to address inferior math and science curriculum and instruction that disproportionately affect minoritized populations (Darling-Hammond, 2007; Oakes & Lipton, 2012). The objective of this research is to give voice to African American males in STEM in understanding how the culture of math and science education in K-12 schooling impacts their math and science identity development. Such inquiry is necessary to prepare future scholars of color in STEM.

Literature Review

The cultural discourse of math education in the U.S. is framed as being academically rigorous, only for the highly intelligent, and reserved for White and Asian males (Ladson-Billings, 1997; Noguera, 2009). In the recent past, K-12 federal and state educational policy de-emphasized science instruction and prioritized math instruction, resulting in no accountability

system for elementary science instruction (Tate, 2001). By de-emphasizing elementary science instruction (Mensah, 2010), this limited the opportunity for students to understand the complementary nature of math and science – the way in which math and science work in tandem in STEM. Therefore, the current culture of K-12 math and science education problematizes African American males' STEM participation when research explicitly states that African American males must develop math and science identities during the early stages of their K-12 schooling (McGee & Pearman, 2014; Varelas, Kane & Wylie, 2011). Factors contributing to empowering math identities for African American males are computational fluency by third grade, math engagement, extrinsic recognition, and relational connections between teachers, families and out-of school activities (Berry, Thunder, & McClain, 2011). In empowering science identities, Emdin (2011) explains that K-12 institutions must begin to value the human existence of African American males as they exhibit key science skills outside of the classroom that are important in science achievement - such as making observations, critical thinking, and peer dialogue. The development of empowering math and science identities within the current structure of K-12 schooling may prove problematic for African American males because of systemic and institutional racism and discrimination (Boykin & Noguera, 2011; Guiton & Oakes, 1995; McGee & Martin, 2011; Tate, 2001; Warren & Rosebery, 2011).

By focusing exclusively on counter-narratives in math and science, the notion of individualism persists which supports the neo-liberal agenda in education – standards-based and color-blind rhetoric (Ravitch, 2013). By focusing only on failures, research will miss the salience of agency used by African American males to achieve empowering math and science identities within an imperfect and often hostile educational system (Jett, 2011; McGee & Martin, 2011).

The research presented here adds to this scholarly conversation by exploring the totality (positive and negative experiences) of one African American male undergraduate STEM student's identity development in math and science in K-12 schooling, and how this formed identity impacted his participation in STEM. Questions that guided the study were:

1. What were the structures and supports during one African American male student's K-12 education that helped to guide him into pursuing a STEM major?
2. What were the student's experiences in post-secondary education pursuing a STEM major?

Theoretical Framework

The theoretical underpinning of this study was informed by the work of McAdams' (2001) life story model of identity. The life story model of identity explains that individuals make meaning of their lives by constructing internalized and evolving narratives of self that “reflect cultural values and norms, including assumptions about gender, race, and class” (p. 101). An additional assumption is that this internalized and evolving narrative of self for African American males is influenced by and formed in K-12 institutions.

In *Ethics of Identity*, Appiah (2005) explains that labels applied to people can have social and psychological effects. The author makes connections between identification and identity and describes that collective identity follows a certain structure. Collective identity encompasses: 1) terms in public discourse that are used to describe the bearers of the identity, so that some people are recognized as members of a group; 2) the internalization of those labels as parts of the individual identities; and 3) the existence of patterns of behavior toward a group – e.g. discrimination, media imagery, mass incarceration, and poverty. In developing math and science identities, African American males are faced with collective identities that devalue them as human beings through racist labels (Bonilla-Silva, 2014), which has the potential to prevent them from seeing themselves as mathematicians and scientists (Aschbacher, Li, & Roth, 2010).

To deconstruct the terms used in public discourse which shape collective identity, it is important to use critical race theory (CRT). Critical race theory provides an analytic perspective that examines how inequality embedded in institutional and social structures directly impacts how African American males are viewed, thus impacting their schooling experiences. While the historical foundation of CRT started with the work of Frantz Fanon, W.E.B. DuBois (Kumasi, 2011), and Derrick Bell through legal scholarship (Brown & Jackson, 2013), CRT has entered the field of education (Ladson-Billings & Tate, 1995). The positioning of CRT in education is to understand the social construction and context of racial hierarchies in which children learn in K-12 institutions and how to change them (Ladson-Billings, 2005). To explore African American male identity development in math and science using CRT, this research focuses on the concept of social construction, which purports racism is a product of social thought and relations (Delgado & Stefancic, 2012). The research presents the story of one African American male university student from a larger study on African American male math and science identity development as it relates to STEM education and participation.

Methods

Yin (2014) explains a case study as “an empirical inquiry that investigates a contemporary phenomenon (the ‘case’) in depth and within its real world context” (p. 16).

A case study approach is traditionally used

when the objective of the research is to include different sources of information such as quotes from key participants, anecdotes, narratives composed from original interviews and other literary techniques to create mental images that bring to life the complexity of many variables inherent in the phenomenon being studied (Hancock & Algozzine, 2006; p. 23).

The case study methodology is being employed in this study because it provides an opportunity for an intensive description and analysis of African American male students’ math and science identity development within K-12 and postsecondary institutions (Yin, 2014; Merriam, 2002).

Setting and Participants

The setting for the study was a large, western research university with a student body of more than 40,000. Participating students in the larger study were identified through an engineering outreach center as STEM undergraduate or graduate students. Five participants were undergraduate students and one was a graduate student. The class standing of the participants ranged from sophomore to doctoral students. Three participants identified as Black or African American, one Caribbean, one Biracial (African American and White) and one African. The student, Andrew, the subject/focus of this paper, identified as an African American, senior, mechanical engineering undergraduate student. Andrew’s experience was chosen for n=1 depth study because of his schooling experiences in public, homeschooling, and private K-12 institutions, which is beneficial in understanding the culture of math and science education in the U.S. This differed from other students’ experiences as their schooling experiences were solely in public or private K-12 institutions. The students were a minoritized population within the context of their university and within the broader STEM community.

Data Collection and Analysis

In the larger study from which Andrew’s experience is drawn, face-to-face semi-structured interviews were conducted with each of the students, building rapport with participants to elicit depth and detail about their K-12 and postsecondary experiences in math and science (Rubin & Rubin, 2012). Utilizing a social constructivist approach, interview questions were open-ended to allow for active listening in what participants say and do in their everyday life settings (Creswell, 2013). Each interview was audio-recorded, transcribed and

coded for analysis (Creswell, 2013; Wilcott, 1994b). Notes taken during the interview were used to clarify statements or ask follow up questions. The participant Andrew was also observed during a non-participant observation in an undergraduate mechanical engineering course and a course syllabus was obtained for document analysis.

Findings and Discussion

The Role of Agency and Parental Involvement in Math Identity

"It didn't feel like I was great at math. Math was something you had to do, you had to learn." In the initial stages of Andrew's math identity formation in the first grade, he recounts:

There was a [White] kid in our class and I remember how annoying it was how much the teacher complimented him on his math skills. So I decided I'm going to be good at math. My [White] 1st grade teacher to this day, I think she's kind of still racist or at the very least she's not very race conscious.

The teacher's exclusion of positive math experiences for Andrew was in direct conflict with the expectations that his parents had set for him, which encompassed, "If you can do math and science, you will always have a job." To support Andrew in developing an emerging math identity, Andrew's parents removed him from the neighborhood school and decided to homeschool him during fifth through eighth grades. Homeschooling offered a unique experience for Andrew as it provided an opportunity to develop his math identity through intrinsic motivation:

You have to get it. The work must be done and you must understand it. If that means going to the library looking at textbooks, using the Internet and Google searching how to do a quadratic equation, if that means talking to your parents, you must understand it. Teaching math to yourself is hard.

Not only was intrinsic motivation impacting Andrew's learning, but he was also developing an emerging math identity through inquiry learning and communicating with his parents. These skills would prove to be useful as Andrew re-entered the traditional school environment. Andrew returned to a private high school in 9th grade but attributes the evolution of his math identity to the homeschooling experience which strengthened his confidence and success in math.

When I went back to high school with other students and started geometry, at that point I realized I was good at math. I was so used to staring at textbooks to figure out how to solve equations that it felt natural to me.

Since his first encounter with an unsupportive teacher in first grade, Andrew felt that while high school teachers were "somewhat supportive and encouraging", he did not consider teachers a factor in his academic performance. In fact, incorrect advice from a teacher caused Andrew to enroll in an advanced placement physics course that he was unprepared for:

I actually didn't pass. I had never taken physics before and [a teacher] told me you're smart, you'll do fine. Everyone else in the class was a senior who had taken physics before. Physics was rough; it was not pleasant. There were pacing issues and certain topics we didn't get to cover. Feeling a lot of times unsupported and looking up [content] on the Internet can only get you so far. I pulled a two on the AP exam, which means I wouldn't have passed a college level course with my then current level of knowledge.

While Andrew's emerging math and science identity could have been impacted by this experience, he continued to persist and enrolled in an R1 university as a mechanical engineering major.

The Impact of K-12 Math Identity Within Postsecondary Institutions

“You get a sense that you don’t belong here, and so some of us have to put a chip on our shoulder to remind the world everyday that, yes, I do.” This quote sums up the trajectory of Andrew’s K-12 and postsecondary experiences. Andrew was made to feel that he didn’t belong in first grade, and now he is made to feel that he doesn’t belong in his postsecondary institution. Andrew recalled his first experience as an undergraduate mechanical engineering student:

In my incoming freshman class, I was one of two Black mechanical engineering students.

The other person who started with me switched to math and graduated early. I’m used to being the only Black student [in my courses], it’s entirely disagreeable and I wish it wasn’t so. This is one of the reasons why I tutor [Black] kids so frequently.”

Even though Andrew is faced with another oppressive learning environment, he remains committed to his major (through agency and parental support) and inspiring other Black youth to pursue STEM majors. The complexity of his experience reveals systematic and structural racism within STEM majors, which explains why African American students may not participate and also explains the strong sense of self needed to continue to persist. Andrew attributes color-blind policies as the reason for the lack of Black students in his courses and at the university at large which has a major impact on college experiences for not only him, but all races of people. “I’m used to walking into a room and having to prove I belong here, or walk through the engineering halls and have people ask me if I am lost.” Andrew also stated language barriers between faculty and students impact social interactions, as well as the lack of Black faculty to counteract negative stereotypes and images of African Americans in STEM.

There is no full-time Black engineering faculty member. I think it would make a difference because it would prove there are people who look like you in this field, it proves you wouldn’t necessarily be the first, and it is a tacit reminder that, hey, this is your space; no one can take this away from you because you obviously belong here. But when you’re constantly reminded that all the equations you’re using have names from

Europeans or East Asians, you’re reminded this isn’t your space, and it never will be.

Andrew explains his perseverance in postsecondary education as a STEM major is because of his intrinsic motivation, parental support, peers and a campus minority-engineering program. Andrew stated, “I’m going to prove somebody right, I’m either going to prove the people that said I couldn’t do it right, or I’m going to prove the people who believed in me right. I know which crowd I’m eager to please.” Andrew’s math and science identity in K-12 and postsecondary institutions has been positioned within the current context of math and science education within the U.S, which subscribes to the collective narrative that African Americans are not mathematicians or scientists (Ladson-Billings, 1997).

Implications

In reshaping the culture of math and science education in the U.S., it becomes evident based on Andrew’s K-12 and postsecondary experiences that pre-service teacher training must be established to dismantle preconceived notions, stereotypes and the deficit lens regarding African American achievement in mathematics and science. In Andrew’s K-12 educational experiences, he had to negotiate two competing realities – his parents’ encouragement for him to do well in math and science, and a hostile K-12 environment and non-supportive teachers. In his first grade experience where the teacher was praising the White student, the teacher implicitly established a racial hierarchy in the classroom by failing to disrupt an assumption of African American students and math by privileging White students’ math identity and marginalizing students of color, in this case Andrew, which enables the deficit view of African Americans in math and science to continue through Andrew’s peers.

I'm Going to Prove Somebody Right

In developing his math and science identity, Andrew relied on a combination of intrinsic motivation and parental support. The culture of math teaching and learning in K-12 institutions does not provide African American students with the opportunity to see themselves as “doers” of math or expose them to other successful African American men in math (Jett, 2011). If the culture of math and science education in the U.S. is to change, math and science education must move beyond the walls of K-12 institutions and include African American families and communities. In transitioning Andrew to homeschooling, his parents were seeking to eliminate the injustice faced through an unsupportive environment and lack of academic rigor in math – which is common in urban schools (Fisher 2015; Huseman, 2015).

Conclusion

The implication of this research suggest that policy makers and educators must address the culture of math and science in K-12 institutions that impact math and science identities for African Americans. K-12 educational policy must include an institutional reframing of collective identities in math and science within teaching and learning that benefits all students. Andrew was adamant in his statement, “I’m going to prove somebody right.” The unfortunate reality is that far too often, African Americans have to navigate an educational system that does not support them in developing positive academic and disciplinary identities. In reframing the collective identity in math and science in K-12 institutions, Andrew would not have to prove anybody right because his academic and disciplinary success would be supported, encouraged and welcomed.

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