Black Learners' Persistence with Mathematics: A Qualitative Metasynthesis

By

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Introduction

Black learners who take advanced mathematics courses are more likely to earn high achievement scores, enroll in college, pursue STEM majors in college, and complete a bachelor's degree (National Science Board, 2012). The literature on the course enrollment patterns of Black learners shows that the percentage of Black learners enrolled in high-level mathematics courses has not significantly changed over time. Moreover, Black learners are more likely to report enrollment in lower-level courses and less likely to report studying higher-level courses than students of other ethnicities (National Science Board, 2012). Data from the 2011 National Assessment of Educational Progress (NAEP) for eighth-grade mathematics indicate that Black learners, who make up 16% of the overall eighth-grade population, were over-represented in the lowest quartile of score bands comprising 28% of this group and grossly under-represented in the highest quartile comprising just 5% of this segment (Synder & Dillow, 2011). Despite the highly documented underachievement and low-level course enrollment patterns of Black learners, not all of them achieve at low levels. In fact, many do quite well and stand in opposition to the literature documenting failure and underachievement. There is limited research focused on Black learners' in mathematics education who experience success. For these reasons, the purpose of this paper is to present findings of a qualitative metasynthesis focused on Black learners' perseverance in negotiating the K-12 mathematics experiences that contributed towards their mathematics identities over time.

Much of the research related to Black learners is positioned to focus on the gap in achievement between Black and White learners. Focusing on an achievement gap often drives research agendas that situate Black children as deficient. The implicit message is that Black children are not worth studying in their own right and that a comparison group is necessary. Such framing situates whiteness as the norm and positions Black learners and Black culture as deviant (Gutierrez, 2008). However, there is a growing body of research that positions Black learners as

capable of achieving in mathematics at high levels (Berry, 2008; Berry, Thunder, & McClain, 2011; Jett, 2011; Martin, 2006, 2008; Noble 2011; Stinson, 2010; Thompson & Lewis, 2005). This body of research considers issues of race, racism, contexts, identities, agency, and perseverance as variables that impact the mathematical experiences of Black learners. This growing body of research is relatively small but an important contribution that challenges the dominant discourse and pushes the field of mathematics education to consider sociological, anthropological, and critical theories.

Since the late 1990s, there has been significant growth in the use of qualitative research methodologies for examining the mathematical experiences of Black learners; however, little is known about how this body of work contributes toward providing evidence for supporting positive mathematics experiences for Black learners (Berry, Pinter & McClain, 2013). There is insufficient work on how to integrate or synthesize findings across qualitative studies related to the mathematical experiences of Black learners. This paper uses qualitative metasynthesis to discuss Black learners' perseverance in negotiating the K-12 mathematics experiences that contributed towards their mathematics identities over time. This paper is organized as follows: We first describe our theoretical framework. Second, we describe qualitative metasynthesis by providing a definition and rationale for using qualitative metasynthesis. Third, we describe the methods for conducting a qualitative metasynthesis. Fourth, we describe our findings. Finally, we reflect on the findings by answering the following research question: In what ways do Black learners negotiate their experiences to persevere with mathematics across time?

Theoretical Framework

Conceptualizing mathematics learning and participation as "*racialized forms of experience"* provides space for a research approach that frames learning and participation as the intersection between race, identities, agency, and perseverance for Black learners (Martin, 2009). *Racialized forms of experience* are defined as "experiences in which the socially constructed meanings for race in society emerge as highly salient in structuring (1) the way that mathematical experiences and

opportunities to learn unfold and are interpreted and (2) the manner in which mathematics literacy and competency are framed, including who is perceived to be mathematically literate and who is not" (Martin, 2009; p. 324). Within race-based frameworks, it is necessary to consider discriminatory experiences as potentially subjugating Black learners; many Black learners resist subjugation by utilizing agency-related behaviors based on a belief that mathematics knowledge is important to helping understand and change the circumstances of their lives and communities. Thus, a high sense of agency can be conceptualized as perseverance.

Martin (2009) argues that what is needed in mathematics education are theoretical frameworks and research methods that move beyond static notions of race to acknowledge that mathematics participation can be viewed as *racialized forms of experience*. In conceptualizing *racialized forms of experience*, Martin (2009) conceptualizes issues of identity—racial, cultural, gender, mathematical—and agency as centrally important when seeking to better understand how learners make sense of, and respond to, their mathematical experiences. Martin (2009) proposes a theory that conceptualizes *racialized forms of experience* as an approach to inform research, policy, and practices in mathematics education based on four constructs:

1. Conceptualizations of race: Race as a sociopolitical construction; historically contingent nature of race; and consideration of racism and racialization.

2. Conceptualizations of learners: Consideration of the negotiated nature of identity with respect to mathematics.

3. Research, policy, and practice orientations to race: Consideration of everyday institutional and structural racism.

4. Aims and goals of mathematics education research, policy, and practice: Empowerment and liberation from oppression for marginalized learners.

Within the four constructs, identity, agency, and perseverance are central to understanding how learners make sense of and respond to ways they learn and participate within their

mathematical experiences. While identity is overtly mentioned, agency and perseverance can be conceptualized in the way marginalized learners garner a sense of empowerment and liberation from oppression. That is, as Black learners encounter resistance, how might they use agency and perseverance relative to the resistance they encounter? Using *racialized forms of experience* as a framework allows researchers to use learner-centered and identity-related conceptions of race and participations (Martin, 2009). This paper uses this framework to understand Black learners interwoven identities and how these learners exhibit agency to develop a sense of control for self-exploration. This paper also uses this framework to examine how these learners assert their own identities to consciously make decisions about ways to persevere and engage in mathematics.

Identities

Knowing the stories of learners provides the context for understanding, feeling, and interpreting their identities to which they give voice. Voice is identity—having a sense of self, a sense of purpose, and a sense of relationship to others. Learners announce to the world who they think they are, who they see themselves becoming, how others see them, and how they act as a result of these understandings, feeling, and interpretations. Identity is a dynamic and context-driven construct that changes, grows and evolves over time (Aguirre, Mayfield-Ingram & Martin, 2013). Identities include early identifications with college attendance and careers, such as doctors, scientists, teachers, engineers, or mathematicians. Such identification is important because it serves as a source of strength and motivation for explaining why some learners persevere and do well in school, and specifically, in mathematics (Martin, 2008). For example, in Berry (2008), Andre, a Black learner, stated, "I want to go to the Air Force Academy and become a pilot. You have to be good at math to get into the Academy." This short example along with other interviews and observations reveal that Andre negotiates several interwoven identities (e.g., academic identity, mathematics identity, racial identity and future occupational identity) that are important to him and that these identities serve as motivations for him to persevere and do well with mathematics.

When learners identify themselves as participatory and doers of mathematics, they make positive connections and are motivated to achieve at high levels (Martin 2009). This understanding of learners' identities gives insights to how and why some learners might make positive connections with mathematics and others do not (Aguirre, Mayfield-Ingram & Martin, 2013).

Mathematics identity includes beliefs about one's self as a mathematics learner; one's perceptions of how others perceive him or her as a mathematics learner, beliefs about the nature of mathematics, engagement in mathematics, and perception of self as a potential participant in mathematics (Solomon 2009). For example, in Berry (2008) seven of the eight Black boys in this study expressed a strong mathematics identity indicating that they were "good at mathematics." These boys were confident about their mathematics ability, and they perceived that their abilities allowed them to be among the "smart kids." By identifying themselves as being "smart kids," these boys position themselves as members of a particular group with certain behavioral and social expectations. From their perceptions, smart kids do their work, answer questions and participate in class, and are good at mathematics. These behaviors are identity-affirming by teachers, peers, and families and influenced the ways in which these boys participated in mathematics and how they saw themselves as doers of mathematics. Clayton, a Black boy in Berry's study stated, "I like being with the smart kids because that means I am one of the smartest...since I answer all of the questions in math that means I am the smartest of the smart kids." Learners who have a positive mathematics identity exhibit behaviors similar to Clayton's description. Conversely, learners who have a negative or no mathematics identity may not participate in mathematics, limit their participation, or remain silent due to the fear of being judged. Furthermore, in mathematics teaching and learning we see identity-affirming criteria emerging as learners are labeled as "smart," "gifted," "proficient," "at-risk," or "on grade-level" (Aguirre, Mayfield-Ingram & Martin, 2013). Learners will come to see themselves in particular ways relative to others in their mathematics experiences.

Identity-affirming behaviors influence perseverance with school mathematics by impacting learning experiences and social relations among learners, teachers, and family members (Cornell & Hartman, 1998). Learners who are identified and behave as "gifted" receive identity-affirming feedback from teachers and peers on the perceived ways gifted learners should behave and interact in their mathematical experiences. These learners are more likely to engage in problem-solving tasks requiring explanation and justification, work in small groups with peers, use mathematical tools and technologies, and be active participants in their mathematics experiences (Ellis, 2008). Teachers cultivate and affirm mathematical behaviors by providing opportunities for learners to make sense of and persevere in challenging mathematics. Consequently, this kind of teaching uses identity-affirming practices, such as differentiated tasks, flexible groupings, and publicly praising perseverance, to cultivate and affirm mathematical participation (NCTM 2014). On the other hand, learners who are identified and behave as "at-risk," receive identity-affirming feedback from teachers and peers that is often focused on standardized testing preparation because these learners are perceived as being at-risk of not passing standardized tests (Ellis, 2008). At-risk learners often receive identity-affirming instruction that situates them as passive in their mathematics experiences; this instruction is focused on recalling facts or definitions and executing procedures and algorithms. These learners often have limited opportunities to develop conceptual understanding, to engage as active participants by explaining and justifying their thinking, or to explore problem-solving tasks; the focus of their experiences is to pass a standardized test in which others perceive them as being at-risk of not passing.

Many influences shape learners' mathematical identity—some are directly related to in-school activities and others are in out-of-school contexts. According to Martin (2007) mathematics identities do not develop in isolation from other identities learners construct (e.g., racial, cultural, ethnic, religious, athletic, gender). Berry (2008) discussed three interwoven identities that support mathematics and academic identities of Black boys: (a) co-curricular and special academic

program identity, (b) religious identity, and (c) athletic identity. Nasir (2002) examined how Black males learn mathematics through out-of-school experiences and how those experiences help to facilitate the development of identities, goals, and learning. Berry and McClain (2009) found that parents of Black boys engaged in racial socialization practices designed to help their sons manage in a world where racial prejudice and discrimination are likely to be aimed at them. These identities are interwoven with their mathematics identity and contribute to learners' sense of agency.

Agency

Agency is the behavioral aspect of identity focusing on participation and performing effectively in contexts (Aguirre, Mayfield-Ingram & Martin, 2013). Agency is identity in action and explains why learners persevere or do not persevere in mathematics. Agency can be conceptualized in two ways: high sense of agency and low sense of agency. A high sense of agency is having a high degree of self-exploration that is associated with a high degree of self-direction in determining one's life course (Côté & Schwartz, 2002). Learners with a high sense of agency make decisions about their participation in mathematics in pursuing mathematical experiences that provide them with the broadest academic options such as being in the high mathematics group, seeking additional co-curricular and special programs, choosing to participate in positive community activities, or being associated with the smart kids. Simply put, high agency can be conceptualized as perseverance with mathematics. The boys in Berry's (2008) study chose actions and behaviors that supported perseverance, success and participation with mathematics. For example, Bilal showed a high sense of agency by stating, "I gotta excel in everything I do. Be the best that I can be…being the best means doing your work, asking questions, and being involved in class." A high sense of agency can be resistant to negative identities while at the same time supporting perseverance. Learners rely on identify-affirming feedback in order to be active participants in their mathematics experience and to maintain a positive mathematics identity.

Conversely, a low sense of agency is defined as a low degree of self-exploration that is translated into a low level of control over one's life course. Learners with a low sense of agency have limited participation in their mathematics experiences and may perceive that participation will not change their situation. These learners are passive recipients in their mathematical experiences perhaps due to negative structural and institutional forces. Learners with a low sense of agency might make a statement such as, "Why should I do my work? It won't matter anyway." This qualitative metasynthesis uses "*racialized forms of experience"* as a framework positioning learning and participation as the intersection between race, identity, agency, and perseverance for Black learners.

Methods

Qualitative metasynthesis is a procedure for qualitative research synthesis that produces interpretative results from integrating, comparing, and interpreting patterns and insights systematically across qualitative research studies while maintaining the integrity of the individual studies (Erwin, Brotherson, & Summers, 2011). A qualitative metasynthesis is not a review of literature; it is an analysis and interpretation of the findings of a selected pool of studies. Researchers conducting qualitative metasynthesis use a deliberate process of selecting studies with the emphasis on synthesizing, analyzing, and interpreting findings across the selected studies.

Qualitative metasynthesis first emerged in the 1970s and has gained considerable attention in the field of nursing (Finlayson & Dixson, 2008). Qualitative metasynthesis is sometimes referred to as "meta-ethnography" (Noblit & Hare, 1988); "metasynthesis" (Sandelowski, Docherty, & Emden, 1997); or "metastudy" (Paterson, Thorne, Canam, & Jillings, 2001). Although some focused synthesis work has been conducted in the areas of educational leadership and desegregation (Noblit & Hare, 1988) and co-teaching in the special education literature (Scruggs, Mastropieri,& McDuffie, 2007), to date, there has been only one (Berry & Thunder, 2012) qualitative synthesis of mathematics education research. Noblit and Hare (1988) were one of the first to introduce

qualitative metasynthesis to the broader field of education research by describing a method they identified as meta-ethnography or "the synthesis of interpretive research" (p. 10):

> A meta-ethnography seeks to go beyond single accounts to reveal the analogies between the accounts. It reduces the accounts while preserving the sense of the accounts through the selection of key metaphors and organizers. The senses of different accounts are then translated into one another. The analogies revealed in these translations are the form of the meta-ethnographical synthesis (p. 13).

Through a process of qualitative metasynthesis, our knowledge base can be broadened to provide insights to attitudes, perceptions, interactions, structures, and behaviors relevant for mathematics education.

Six discrete steps were followed for this qualitative metasynthesis: 1) identify a specific research question; 2) conduct a comprehensive search; 3) select initial relevant studies; 4) appraise the quality of initially selected studies; 5) synthesize findings of selected studies; and 6) present findings across the studies. Our research question was: In what ways do Black learners, who have been successful with mathematics, negotiate their experiences in order to persevere with mathematics across time? In our research question, we make the distinction of using the language "across time" to differentiate between research that is focused on a narrow period of time and research that focuses on a broad period of time. We define "across time" as studies in which learners reflect on their experiences spanning periods of time such as describing how experiences from early time periods contributed to their current position with mathematics. This is in contrast to studies focusing on a finite period of time such as a specific grade level or time spent in a mathematics club. Studies with in-school and out-of-school settings were included for this qualitative metasynthesis.

Sample

We used EBSCO to simultaneously search the following databases for peer-reviewed journal articles: a) Academic Search Complete, b) Education Research Complete, c) ERIC, d) Teacher Reference Center, and e) Education Full Text (H.W. Wilson). For a detailed description of our search terms and special limiters, please see Appendix A. Our initial search using the five EBSCO databases produced 531 documents, and the Sociological Abstracts database produced 310 documents. The inclusion/exclusion protocol from Figure 1 was used to determine which documents met the criteria to be used to investigate the research question. After reviewing and subjecting each document to the inclusion/exclusion protocol, 60 peer-reviewed articles were identified.

Insert Figure 1 Here

We recognize that qualitative research cannot be treated as a unified field due to the plurality of methodological approaches (Dixon-Woods, Shaw, Agarwal & Smith 2004); however, qualitative research studies should include basic criteria of quality for methodological aspects, such as research problem/purpose/question, data collection techniques, data analysis, report of findings, and implications/conclusions. To appraise the quality of the 60 articles, we adapted an appraisal checklist reported by Erwin, Brotherson, and Summers (2011). Figure 2 represents the adapted checklist providing points for each indicator with a maximum of 15 points.

Insert Figure 2 Here

Table 1 provides a summary of 13 qualitative articles used for this qualitative metasynthesis. The 13 articles listed in Table 1 scored in the high range (11 to 15 points) on the appraisal checklist used for this qualitative metasynthesis. It should be noted that while there are 13 articles, there are 10 distinct studies. The Berry (2008) article reports the larger study (8 Black boys) and the Berry (2005) article is a case study of two boys drawing from the larger study. Jett (2011) and Jett (2010) use a similar approach to the Berry articles; Jett (2011) is a case study drawing from the larger study, Jett (2010). Likewise, McGee and Martin's (2011a & 2011b) articles

used this format: a case study drawn from a larger study. Each of these articles was included within

the data analysis because they each reported unique qualitative data from the studies. In other

words, although the articles overlapped in studies, they did not report repetitive data.

Insert Table 1 Here

Data Analysis

The findings from each article were treated analogously as informants; consequently, the

findings were extracted into a single document to be coded. A grounded theory approach was used

to code, categorize and constantly compare data to develop a general theory (Strauss & Corbin

1997). The researchers open-coded the findings independently and then negotiated our

independent open coding to reach a shared set of initial codes and definitions to be used

consistently throughout the analysis of data. It should be noted that the theoretical framework

provided the framing for the development of the initial codes: race/racism, identities

(mathematics, academic, athletic, religious, gender, and racial), identity-affirming (behaviors,

actions, and policy), and agency. The initial codes were then categorized. We reread and re-coded

to refine and verify coding and to assure consistency. After this, we sorted the data by codes and

reread looking for themes within each code to see if there were dimensions that required the data

to be further discriminated. Through this process, themes emerged from the data. From this

categorization and classification of the data, we provide and describe the findings.

Findings

Five findings emerged to describe the ways Black learners, who have been successful with

mathematics, negotiated their experiences in order to persevere with mathematics across time.

Table 2 presents the five findings

Insert Table 2 Here

These findings are not mutually exclusive and describe defining qualities of the complex, nonlinear

experience pathways unique to the learners across the studies. Table 3 presents a sampling of data

across the 13 articles to support the findings from this metasynthesis. While all 13 articles were coded, going forward we will frame our discussion around ten studies due to the overlaps of three pairs of studies (see the earlier discussion of Berry (2008 & 2005), Jett (2011 & 2010) and McGee & Martin (2011a & 2011b). The findings and the representativeness of these data are detailed in the sections that follow.

Insert Table 3 Here

Finding 1: Values as identity-affirming and supporting perseverance

All ten studies had learners who identified and embraced particular values early in their experiences with mathematics and ongoing throughout their lives. The learners valued: (a) caring about their church, communities, and families (b) being revered, well-regarded, and admired, and (c) mathematical knowledge. The sources of these values are affirmed in: (a) the ways church, community and family members held high expectations for the learners, (b) the ways the learners experienced being revered academically and in athletics, and (c) the ways the learners developed an early understanding that mathematics is important from parents and teachers.

The learners developed early identifications and affirmation with mathematics, college, and careers. Additionally several identities—mathematics, academic, and religious— emerge in these learners' experiences. These identities were based on values affirmed by others with whom they interacted, including family, neighbors, church members, coaches, teammates, teachers, club members, and peers. In the Berry (2005 & 2008) study, Cordell, a Black boy in middle school, stated:

> My grandmother and aunts help my mother by encouraging me to make good decisions and make sure that I stay on the right track. My grandmother and mother talk to me about doing well in school and make sure I do my work. My mother is always saying I better do well in school if I plan on going to school (Berry, 2008 p. 473).

We see identity development and identity-affirmation in Cordell's statement in the ways his grandmother, aunts, and mother discussed the value of doing well and making good decisions. Roger, a Black man in Jett's (2010 & 2011) studies, which focused on the mathematics journey of Black male doctoral students, valued the role of God in his life and following God's will. Below Roger discusses issues of race and racism at his job when he was not considered for advancement:

> But I see right now that's not in God's plans for me to do. So at that point in time I was kind of frustrated, but right now I'm glad that it didn't go through. So I don't have a problem with it because they cutthroat. When it comes to hiring up in the company, they cutthroat. And as a Black man, I already know I'd a got cut (Jett, 2011; p. 1138).

Roger's statement represents the kind of everyday institutional and structural racism, perceived and real, that could potentially impact the identity of a man who identifies himself as competent and a doer of mathematics. Roger's religious identity and the associated values mediated the potential belief that God did not allow him to secure the position.

Learners valued knowledge as a means for improving or maintaining their financial situation and for earning the reverence and admiration of others by gaining status. Valuing knowledge led to a value of future options, including mathematics-related careers, and access to additional studies. Nathaniel, a Black boy in high school from Stinson's (2008) study, which focused on academically and mathematically successful males, saw academics as possibly improving is financial situation by stating: "I got a sense [from my parents] that learning was something important, it was something that...put food on our plate, and eventually led us to moving up in social standing" (p. 988). McGee and Martin's (2011a & 2011b) findings from their studies, which focused on Black college students who had successfully negotiated the mathematics pipeline, demonstrate the way values and interwoven identities support perseverance. They stated,

> The majority of the students in this study admitted to gravitating toward mathematics and engineering to be perceived as smart. The respondents recognized that excelling in

mathematics meant being the beneficiary of privileged status and having access to the

educational opportunities they need to get ahead (McGee & Martin 2011a; p. 26).

Finding 2: Negotiating Definitions of Success to Persevere

It should be noted that all of the studies in this metasynthesis focused on learners who were

successful or high achieving in academics in general and mathematics specifically. Studies that

focused on success were not intentionally part of our search criteria for this metasynthesis. The

collection of articles focusing on success is an interesting finding because it suggests that research

on identity and agency of Black learners are focusing on a narrow group of learners who are

successful. Further, success was defined by the researchers because in all the studies the

researchers' definition of success was used as selection criteria for participation. As we coded the

data, we found that learners defined success in different ways from researchers.

Learners defined success based on their values in two areas: academics (specifically in

mathematics) and life. The definition of success in academics was conceptualized as: (a)

outperforming peers, (b) enrollment in gifted and advanced course of study, (c) college attendance,

and (d) achieving career goals. The definition of success in life was conceptualized as: (a) taking

care of families, (b) giving back to community, (c) being a role model, and (d) keeping a spiritual

and religious grounding.

Some learners' definitions of success were based on the achievement of certain outcomes.

In school, Alfred (Noble, 2011) and all of the learners in the Berry (2005 & 2008) study negotiated

success as outperforming peers through class participation, grades, and testing, being labeled as

gifted, enrolling in advanced courses, and attending college. Alfred, a Black man in Noble's (2011)

study, which focused on Black men who excelled in mathematics, stated,

> I always scored a perfect score in the math section…I took this as a sign that I was a pretty
>
> good mathematician in my younger years. As the years progressed I took these scores plus

my many A's that I got in my math classes as something to be proud of (Noble, 2011; p.

197).

Berry (2008) reported:

Seven boys [out of eight] reported feeling successful in the elementary grades because they

knew their multiplication tables before their peers, were grouped with the smart kids for

mathematics, or were challenged during their pre-fourth-grade years with assignments that

were above their grade level (p. 477)

We see that Alfred defined success as doing well in mathematics and this definition was affirmed by

scores and grades that allowed him to persevere with mathematics. Derrell, a Black boy in middle

school in Berry, Thunder, & McClain's (2011) study defined success outside of the school context

but within his familial context by stating, "I realized I was good at math when my mom, brother,

sister, or grandparents were doing bills or taxes and everyone asked me, 'How did you know this

and that?' That made me feel very happy" (Berry et al., p. 16).

Success for some learners was connected to their interwoven identities as being Black and

being members of the Black community. Anita and Raheem defined success as meeting career goals

in which they gave back to their community and became role models. In Ellington and Fredrick's

(2010) study, Anita, a high-achieving Black college student majoring in mathematics stated,

There's the social obligation [to stay in the mathematics program]. Where, you know, you

feel like, as a Black female in the program, one of few, that, if you don't stay in the program,

then nobody else will. And what happens to the little Black girl who wants to be a math

major, and doesn't see anyone who's one, and then she doesn't become one...And so that's

something I feel has motivated me (p. 74)

In Anita's statement, we see the interwoven mathematics, racial, and gender identities. She appears

to be motivated to be successful and persevere through her sense of obligation to Black girls.

Similarly, Raheem, a participant in Martin's (2006) study, expresses his sense of obligation,

That's why I decided to become a teacher, because I want to help too...If I demonstrate to

children that a Black person is intelligent and they know what they are talking about, that

will help them have more confidence in themselves and their own people (Martin, 2006; p.

218)

Young learners in the midst of their elementary education as well as adult learners

reflecting back on their experiences, like those in the Stinson (2008) study, identified their

successes as acquiring knowledge that enabled them to take care of their families. Stinson stated,

No matter how participants conceptualized success, implicitly or explicitly stated

throughout their conversations was the undisputed need for education, whether it was to

pass knowledge on or to ensure that one could financially care for loved ones (Stinson,

2008; p. 988).

Although these outcome-based definitions of success permeated the data, the learners'

definitions of success were not static. Rather, across these studies and within the learners' stories

the definitions of success appear to be under negotiation and evolve over time. Consequently, as

learners' identities evolved, their definitions of success evolved and contributed to their

perseverance. Perseverance appeared to be anchored by meeting new and evolving definitions of

success across time.

Finding 3: Persevering to Overcome Issues of Access

Across all ten of the studies, learners encountered issues of access along their experience

pathways. These issues included access to gifted programs, advanced mathematics courses,

rigorous curriculum, role models, and high-quality teaching. Across these studies, gatekeepers

worked to limit learners' access while advocates worked to expand the learners' options. As they

reflected on their experiences, some learners realized critical points along their pathways that

appeared to be analogous to a crossroads. These crossroads impacted learners' experiences and

opportunities. For some, the learners' reflections suggest an awareness that they may not have

understood in the midst of the encounter. For others, reflection helped them to understand the

presence of barriers and the lack of awareness in the midst of the encounters, which resulted in

restricted access. Raheem's story represents awareness through reflection when he stated,

> I remember Ms. Berks at the end of the school year telling me that she made a mistake not
>
> putting me in the algebra class in the 8th grade. And I remember her telling me this and not
>
> realizing what algebra was and I was just, 'Oh well, no big deal to me.'…that's to me an
>
> example of the fact that Black children, even when you do well, your educational future is
>
> not planned out properly for you…I was bored as hell in that class…by the time I got to
>
> algebra in 9th grade, I had kinda lost interest in math (Martin 2006; p.210-211)

Similarly, Cordell, a Black boy identified as successful in Berry's (2008) study, described his

encounter with the issue of access to a gifted program. Identification into the gifted program is an

important crossroads in Cordell's experience because not being in the program could have

negatively impacted his participation and perseverance with mathematics. Cordell stated,

> My mother thought I was not being challenged enough and that that is why I got into
>
> trouble. The teacher and principal did not want me tested because they felt I was not gifted.
>
> My mother thinks the reason they did not want to test me was because I am Black. She
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> stayed on the teachers and principals until I was tested. I did well enough to be placed in the
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> AG [gifted] program (Berry, 2008; p. 473)

Malik, a Black boy in Thompson and Lewis' (2005) case study, gained access to advanced

mathematics courses by serving as his own advocate to alter course offerings. Malik stated,

> I want to go to one of the best colleges. I want to be something...I was looking at the
>
> required classes [for college] and I realized that where I stand right now as a junior, I don't
>
> have what it takes to succeed at that type of college...I knew I had to try to find a way to
>
> better prepare myself. So I went to Mr. King and asked him if there's any way we could add
>
> more advanced math classes to the schedule (Thompson & Lewis, 2005; p. 11).

It should be noted that Malik exhausted the mathematics course offerings at his high school. We see in his statement both academic identity and a sense of agency. He enacted a sense of agency to prepare himself for the best colleges.

Access to high quality teaching, "smart peers," enriching academic programs, and quality curricula was evident in all ten studies. The challenge for many learners was the ways in which they gained access through support and advocacy. Wynn, a Black boy in middle school, contended that access matters: "At my school, really it matters what classes I'm in…I was the only African American who was in there the whole year…It's better in the gifted classes because personally I think the teachers are nicer" (Berry, Thunder, & Mcclain, 2011; p. 18). Stinson's (2008) description is representative of what access meant to the experiences of the learners across the ten studies:

> Each of the participants had been tracked into honors programs early in his education, providing him with access to enriched schooling experiences and academic programs and access to the most credentialed and experienced teachers (p. 996)

Advocacy was evident across all ten studies. Advocacy came from parents, such as in Cordell's case, and from peers and teachers, such as in Malik's case. Alfred (Noble 2011) described peer support by stating, "When I have friends who I know are good at math, then a lot of times we'll work together. And so they help me learn more and become better" (p. 201). Karen, an undergraduate mathematics major, described teacher support and teacher quality as significant in her experience

> Our teachers expected a lot out of us…I told my teacher I couldn't do it at first. I was like, no, I'm not smart enough to do it. She's like: *yes you are!* I'm like, *no, I'm really really not.* She's like, *yes you are.* So she made me do it and I did it. Yeah, it was no problem, but I didn't think I could at first (Ellington & Fredrick, 2010, p. 69)

Tinesha, a doctoral mathematics education student, discussed managing access by overcoming the lack of support from teachers and peers, stating,

> I came to realize, like, these people [teachers and her peers] don't expect too much of me in this class...If you tell me that I can't do something, then I want to prove to you that I can. And so for the rest of the time in all my upper-level classes, that was my goal...I took that attitude from that point on in all my math classes...I sat at the front of the class. Like, I didn't come in and come to the back of the class. I sat at the front of the class. (McGee & Martin 2011a, p. 19)

It should be noted that context is important to Karen and Tinesha's experiences. Karen reflected on her elementary grades experiences. This early experience contributed to her identity development. Tinesha reflected on her undergraduate experiences in which she had a sense of isolationism. Her early, strong academic and mathematics identity helped her to persevere and overcome the isolation.

Finding 4: Using Images to Persevere

In this metasynthesis, images are defined as learners' self-identities, learners' perceptions of others' identities, and learners' perceptions of how they themselves are perceived. Learners used image-based criteria in conjunction with their values to negotiate their experience pathways. This negotiation considered two categories of images that are highly interwoven and are not mutually exclusive: academic images and racialized images. Academic images are defined broadly to include: (a) the ways learners see themselves relative to their previous academic performances, (b) their perceptions of peers' academic performances, (c) leaners' performance relative to perceived standards, and (d) role models of doers of mathematics. Racialized images are defined as: (a) images of Black learners of mathematics as anomalies, (b) stereotypes from the media, (c) role models and non-role models, (d) perceptions of peers' identities, and (e) perceptions of self by others. Central to both categories are the ways learners negotiate images of themselves and of self as a doer of mathematics; this negotiation is always under construction.

Malik, Dexter, and David are examples of learners using the images of others, perceived standards, and academic performances of others to compare with their own performance. Malik, a Black boy who attends an urban high school compares himself to others by stating,

> When you're at Garvey High School, the competition may not be as great as maybe some of the other schools...you're on this false sense of confidence. But once you start to compare yourself to kids nationwide, you're like oh, I'm kinda weak compared to these guys...so when I was going into my senior year I was like, I gotta do something now (Thompson & Lewis, 2005, p. 7).

Dexter, a Black man in Noble's (2011) study, is an example of a learner using academic images of others relative to his own performance. He stated,

> I never really felt like somebody that's in the same class as me is smarter than me. I've never really felt that way. So, when they succeed, I feel like that shows me that I could have succeeded if I didn't succeed. I realize that I should have set the bar higher (p. 201).

Similarly, David, a mathematics major in Ellington and Fredrick's (2010) study, stated,

> This is what I've been searching for all my life - I'm in a group now, I'm surrounded by a bunch of people just like me. So, now I'm not the outcast so to speak...Now I've found that niche where I'm surrounded by people who are just as competitive (p. 70).

In contrast, Spencer, a Black boy in high school, used image comparison to show that he was worthy of his status by stating, "I make sure that I raise my hand to answer the questions early…I try to prove my worth, show that I belong" (Stinson, 2008, p. 994).

Raheem, Phillip, Keeshawn and Antonio are examples of learners discussing racialized images as having an impact on the construction of their identities of self and as doers of mathematics. Raheem discussed the lack of Black teachers,

> I can count on one, just about one hand the Black teachers that I had. I look back and reflect on the way I thought, in the way I perceived things. That had an impact on the way I felt

about my own people. I saw people that were not Black as my teachers. So that made me

self-consciously come on with the thought that Black people are just not that smart (Martin,

2008, p. 209-210).

Phillip, a boy in middle school, discussed resisting and combating negative images of Black boys by

saying,

Unfortunately, many of the African American boys at my school set bad examples and make

bad reputations for African American boys. I work hard to carry myself in a mature manner

all day, everyday. My dad has talked to me and other African American boys at my church

about the importance of being a positive role model for younger boys (Berry, 2008, p. 476).

Likewise, Keeshawn, a boy in middle school, discussed his resistance to the dominan discourse and

images that situate Black boys negatively:

I know that African American males...don't achieve too well in math and stuff. But I feel that

just because like statistics show that African Americans don't do as well in math, don't

achieve more, I still feel that we can do good...that kind of gives me a boost (Berry, Thunder,

& McClain, 2011 p. 19).

Antonio, a high school student, discussed the lack of Black images in mathematics by stating, "There

ain't nobody out there for us, you know, no black males with math and all that in their heads. All we

see is gang bangers on TV, rapping and sports" (Thompson & Davis, 2013; p. 510).

At the intersection of academic images and racialized images, many learners negotiated

ways to persevere in mathematics. This perseverance is seen in several ways: (1) through

comparisons to meet the image of academic success, (2) combating negative images of Black males,

and (3) proving themselves of worth of access. Images include role models but should be

understood as something more than role models; rather, both positive and negative images

motivated these learners positively to engage and persevere academically and mathematically.

Finding 5: High Sense of Agency as Perseverance

As stated in the theoretical framework, agency is identity in action and a high sense of agency can be can conceptualized as perseverance. Learners' enactment of agency across contexts is highly connected to issues of awareness, access and images. As a result, learners either surrendered to or rejected forms of participation in mathematics. Learners with a low sense of agency followed a default pathway; for many Black learners, this meant being placed in low-tracked mathematics courses. Learners with a high sense of agency asserted their identities to make decisions about their participation in mathematics. In other words, these learners chose a pathway based on their values and negotiated definitions of success. Phillip and Elijah's voices are representative of learners with a high sense of agency. Phillip, a boy in middle school, described his interwoven identities and images to enact agency by stating, "I think God tells us to be achievers, so anything I set my mind to I can achieve. Church keeps me encouraged to do what is right, and my church has many positive Black Christian male role models" (Berry, 2008; p. 50). Elijah's mathematics identity allowed him to persevere to take mathematics courses beyond requirements; he stated, "I've taken more math courses than I've actually had to, which is something I don't mind doing...I've taken some of the more difficult classes as electives, some of the classes that people generally try to stay away from" (Noble, 2011, p. 199).

Learners with a high sense of agency chose to pursue their own pathways to success sustained by the work ethic of practice and perseverance. At decision-markers across time, learners negotiated their paths or patterns of participation in varied settings. Malik and Roger shared representative stories of such decision-markers along their paths; these served as moments when Malik and Roger enacted their high agency by choosing to change paths and patterns of participation. Malik described a critical point in his experience to focus on mathematics:

> I had always wanted to be part of the in crowd and do what was cool; and what was cool was to play sports. So I never really focused on the books...When I got to high school, I started to make a change. Math class really changed everything for me because I started

seeing myself putting the kind of effort into the classroom that I put into the field and I was

dominant...It made me realize that this is where I compete, this is my passion and it can be

just as fun as sports. This is where I can make a difference (Thompson & Lewis, 2005, p. 6-

7).

Similarly, Martin (2008) described Roger's pathway:

Roger mentioned that he did not think that he would achieve so much as it pertains to

school... He made reference to the fact that he was "lost" as it pertains to his educational

goals...He was going through the motions as a football player, not contemplating the

ramifications of his own education his life. He now, however, has a clear vision of his future

in mathematics, one that includes attracting more African American male students to the

mathematics pipeline." (p. 1140)

Encounters with nonsuccess were defining markers along each learner's pathway. Learners

with a high sense of agency demonstrated perseverance and resiliency to transform these

encounters with nonsuccess into opportunities to increase their awareness of options and

opportunities, to reevaluate their choice of pathway, and to renegotiate their identities and

definitions of success. David, Rob, and Amber's stories are representative of the learners'

descriptions of encounters with nonsuccess. Each of these learners was resilient and persevered in

the face of nonsuccess. David, a mathematics major, experienced non-success and struggle:

I had faith that I could get it [mathematics]. I wasn't going to quit, [be]cause I had a bad

feeling when I dropped that computer science class and I switched majors. And it was very

much a feeling that I didn't want again...I didn't feel like God brought me to my junior year

to have me fail a class. I just had to ultimately say that everything was going to be okay, and

that it was just only a matter of time (Ellington & Frederick, 2010, p. 73).

Similarly, McGee and Martin (2011a) described Rob's experiences of self-doubt and being perceived

by others as an "affirmative action case" at a predominately white school:

In order to preserve his racial self-esteem, he dropped out of Science Tech and moved back

to the safe haven of his childhood neighborhood, taking an entire year off from school…He

has no regrets about leaving Science Tech because that year was critical to rebuilding his

racial self-esteem. Rob eventually received three master's degrees...as well as his PhD in

applied mathematics (p. 56)

While David and Rob resolved to continue their chosen experience pathway, Amber refused to

follow the default pathway being forced onto her. Instead, she chose a new pathway that was not in

conflict with her negotiated identity and definition of success. Amber thought that her schooling

was being stunted and that the best learning opportunities were being reserved for White and

Asian-American students—despite the fact that she transferred from a private high school to a

public school in which she was one academic year ahead of her peers. Amber stated,

I knew it right away. They do that because they want to push them along and keep us back.

A lot of minority students knew this but they accepted it. I hated it. Why should I accept

this, just because I'm a Black person? This is not fair. You're advancing them and letting

them advance...So that's why I said forget it. I hate this, I'm leaving. I checked out, getting a

GED and went ahead and did what I needed to do (Martin, 2006, p.216)

Many of the learners had a forward vision and chose to continue on or redirect their

experience pathways. Their pathways can be described as complex, nonlinear experience pathways

that represent the ways Black learners negotiated their experiences in order to persevere with

mathematics across time. Figure 3 is a representation of one such experience pathway and its

defining qualities.

Insert Figures 3 Here

Conclusion

The research question that guided this metasynthesis was, "In what ways, do Black learners

negotiate their experiences in order to persevere with mathematics across time?" The answer to

this research question is found in the ways the learners enacted their sense of agency. For the learners, a sense of agency was not mutually exclusive from race and identity. Through self-exploration, these learners negotiated their values, their perceptions of success, their awareness of and access to opportunities, and forms of images to enact their sense of agency. This negotiation informed their ways of participation with mathematics. Patterns of participation in mathematics are connected to learners' sense of agency. Learners with a high sense of agency were able to negotiate and interpret participation with mathematics as a means to access opportunities, fulfill social obligations, and understand the consequences of differential forms of participation. When we consider the resources of the learners' communities and families, we find strong contributions of value, faith, and support. It is these contributions that were foundational to a high sense of agency that supported resiliency and agency.

The Black learners who persevered with mathematics across time were students with a high sense of agency. Their identity in action was characterized by self-exploration associated with a high degree of self-direction in making choices along their experience pathways. They chose actions and behaviors that embodied an active pursuit of success based on their own definitions of success. These actions and behaviors enabled them to select from the broadest academic options, particularly in mathematics, and to meet their goals for success. In order to support Black learners with a high sense of agency, educators, family members, community members, and peers should use actions and words that affirm their positive, persevering mathematical identities and values. The choice of language and practices also holds the potential to shift learners with a low sense of agency to a high sense of agency by facilitating their movement from passive to active learners.

In order to support a high sense of agency and perseverance in mathematics, educators must have an effective mindframe combined with effective instructional practices (Hattie, 2012). A mindframe is the set of assumptions, expectations, and beliefs that guide behavior and interactions. Effective mindframes are growth mindframes while ineffective mindframes are fixed (Sousa &

Tomlinson, 2010). Educators with growth mindframes believe all students can succeed, their

students' success depends on the effectiveness of their instructional decisions, and students can

change their achievement. Educators with growth mindframes avoid static labels, such as "at risk",

which can be identity-affirming language that develops a low sense of agency. Educators who

support perseverance in mathematics also implement effective instructional practices that affirm a

high sense of agency. These practices include:

- goal-setting,

- self-monitoring,

- self-evaluation,

- differentiated tasks,

- problem solving tasks that require explanation and justification,

- use of mathematical tools and technologies,

- flexible grouping,

- publicly praising perseverance, and

- cultivating and affirming participation by orchestrating productive mathematics

  discussions (Hattie, 2012; Smith & Stein, 2011).

These instructional practices facilitate students' self-exploration and self-direction, encourage

students to define and pursue success in mathematics, and cultivate identities with positive self-

efficacy.

These practices also require students to move from passive to active roles as learners in

order to shift learners with a low sense of agency to a high sense of agency. Learners with a low

sense of agency typically participate in limited ways, perceive that participation will not change

their situation, and do not persevere to overcome negative structural and institutional forces.

Educators who implement these effective instructional practices will grow students with high sense

of agency by requiring all students to participate in multiple, active ways and by facilitating students' active participation to positively change their achievement. In addition, educators in all roles (teachers, guidance counselors, administrators, and policy-makers) can grow students with a high sense of agency by serving as advocates rather than gatekeepers when students encounter structural and institutional obstacles. As advocates, educators can help all students to have access to the broadest academic options and to select challenging academic options that lead to their definitions of success.

Appendix A

To create the sample for our metasynthesis, we used EBSCO to simultaneously search the following databases for peer-reviewed journal articles: a) Academic Search Complete, b) Education Research Complete, c) ERIC, d) Teacher Reference Center, and e) Education Full Text (H.W. Wilson). We conducted subject term searches within the selected databases with this protocol: mathematics in SU Subject Terms; AND (Black or "African American") in SU Subject Terms; NOT ("black holes") in SU Subject Terms. We also conducted a search using the Sociological Abstracts database with this protocol: mathematics in All field (no full text) – ALL; AND (Black or "African American") in All field (no full text) – ALL. Previous work suggested that qualitative research on Black learners has increased since the mid to late 1990s (Berry, Pinter, & McClain, 2013); thus, we limited the dates of the search from January 2004 to January 2014. The following special limiters were used:

- Academic Search Complete database, Publication Type: Periodical and Document Type: Article.

- ERIC database, Journal or Document: Journal Articles (EJ) and Publication Type: Journal Articles.

- Education Research Complete database, Publication Type: Academic Journal and Document Type: Article.

- Education Full Text (H.W. Wilson) database, Publication Type: Academic Journal and Document Type: Article.

- Sociological Abstracts database, Source Type: Scholarly Journals and Document Type: Journal Article

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Figure 1: Inclusion and Exclusion Criteria

Inclusion Criteria :	Exclusion Criteria
• Empirical qualitative research	• Quantitative Methods
• PreK-12	• Mixed Methods
• Mathematics (STEM)	• Review of literature or Summaries of research
• Black and/or African American	• Policy documents
• Setting/Context United States	• Calls for research
Additional permissible inclusion criteria	• Book reviews
• Longitudinal qualitative with learners older than PreK-12 is included but the article had relevance to PreK-12 educational experiences (i.e. reflections).	• Op-Ed pieces
• While a study focused on learners other than learners (i.e. parents and teachers), the research had to be central to in-school and out-of-school experiences of learners.	• Not United States Setting/Context
• Studies focused on additional learning opportunities and out-of-school programs	• Pedagogical/practitioners articles describing implementation of teaching, tools, and/or practice with learners
• Most of the learners are identified as Black in cases with non-Black learners.	• Multiple publications using the same data

Figure 2: Appraisal Criteria for Assessing Quality of Qualitative Research Process

Criteria	Possible Points	Points Given
1. Research Problem, Purpose, and/or Question	2	
a) Problem is stated clearly and related to the research literature		
b) There is a clear statement of research purpose and/or question		
2. Method: Data Collection and analysis	6	
a) Study is methodology qualitative		
i) Sample plan and data collection are appropriate to the question		
ii) Data analysis plan is consistent with design and purpose		
b) Described the learners of the study and how they were selected		
c) Researcher showed an awareness of their influence on the study and its learners (describe experiences and/0r assumptions with which the researcher entered the research)		
d) Data collection procedures are fully described		
e) Steps/process of the data analysis is clear with examples		
f) Techniques for credibility and trustworthiness are described and used correctly		
3. Findings	5	
a) Interpretations of data are plausible and/or substantiated with data		
b) Overall findings address the purpose of the study		
c) Ideas (themes, categories, concepts, etc.) are precise, well developed, and linked to each other		
d) Results offer new information about or insights into the targeted phenomenon		
e) Quotes provide support/evidence for each theme/concept presented		
4. Discussion and Implications	2	
a) Return to the research questions/purpose proposed at the beginning and discuss interpretation and significant findings		
b) Recommendations for intended audience and future research issues		
Total Points	15	
• Highly overall standards of quality and credibility = 11-15 points • Moderate overall standards of quality and credibility = 6-10 points • Low overall standards of quality and credibility = 0-5 points		

Figure 3. The Defining Qualities of Learner's Experience Pathway
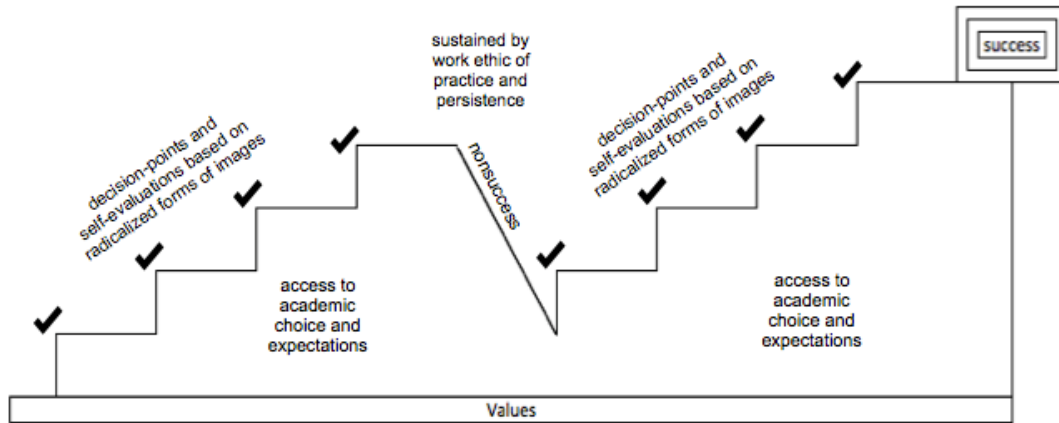
Table 1. Qualitative studies used for this qualitative metasynthesis (January 2004- January 2014)

1. Berry III, R. Q., Thunder, K., & McClain, O. L. (2011). Counter narratives: Examining the mathematics and racial identities of black boys who are successful with school mathematics. *Journal of African American Males in Education, 2*(1), 10-23.

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Table 2. *Findings from Data Analysis*

First Finding	Learners developed identities based on values, which were affirmed by others with whom they interacted; these values were identity-affirming and supported perseverance in mathematics.
Second Finding	Learners negotiated their own definitions of success; perseverance was anchored by meeting learners' new and evolving definitions of success across time.
Third Finding	Learners encountered issues of awareness and access along their experience pathways and persevered in order to overcome these issues.
Fourth Finding	At the intersection of academic and racialized images, learners negotiated ways to persevere in mathematics.
Fifth Finding	Learners with a high sense of agency persevered with mathematics across time; they chose to pursue their own pathways to success sustained by the work ethic of practice and perseverance.

Table 3. Metasynthesis Analysis of Findings Across Qualitative Studies

Finding	Berry, Thunder, & McClain (2011)	Thompson & Davis (2013)	Berry (2005, 2008)
Learners developed identities based on values, which were affirmed by others with whom they interacted; these values were identity-affirming and supported perseverance in mathematics.	Jamal: What I like about math is it's kind of complicated...I want my work to be complicated so I can actually do better when I get to higher grades. And it feels like I finished something. It's like when it's hard, like when we were doing an engineering project, I feel like I finished something really good (p. 17).	Antonio: I mean every report card my teachers would say, 'I don't expect no 85 or 89 total, I expect 100's. I don't even expect a 90.' I'm like 'okay, ya'll hold me to high expectation, well I'm going to hold myself to a high expectation, because if ya'll going to expect more from me, then that's what I'm going to expect from myself (p. 508)	Cordell: My grandmother and aunts help my mother by encouraging me to make good decisions and make sure that I stay on the right track. My grandmother and mother talk to me about doing well in school and make sure I do my work. My mother is always saying I better do well in school if I plan on going to school (p. 473).
Learners negotiated their own definitions of success; perseverance was anchored by meeting learners' new and evolving definitions of success across time.	Derrell: I realized I was good at math when my mom, brother, sister, or grandparents were doing bills or taxes and everyone asked me, 'How did you know this and that?' That made me feel very happy (p. 16).	Antonio: They [peers] influence me to do better, like all the smart students in this school. I think about them whenever I do something. I'm not here to just get a grade, I'm here to prove that I'm one of the smartest kids in the school and I wanna be at the top. I wanna show everybody that I can sit with the best and brightest at this school (p. 509)	Seven boys reported feeling successful in the elementary grades because they knew their multiplication tables before their peers, were grouped with the smart kids for mathematics, or were challenged during their pre-fourth-grade years with assignments that were above their grade level (p. 477).
Learners encountered issues of awareness and access along their experience pathways and persevered in order to overcome these issues.	Wynn: At my school really it matters what classes I'm in...I was the only African American who was in there the whole year...It's better in the gifted classes because personally I think the teachers are nicer (p. 18).	Bruce: Man, me and Mr. Lee used to get along. He used to be my buddy. I used to stay after school with him and I would come early in the morning and we would sit there and have breakfast and lunch together. He would have tutoring sessions and all types of stuff and I would be right there. He was just cool. Math was pretty easy with Mr. Lee... (p. 508).	Cordell: My mother thought I was not being challenged enough and that that is why I got into trouble. The teacher and principal did not want me tested because they felt I was not gifted. My mother thinks the reason they did not want to test me was because I am Black. She stayed on the teachers and principals until I was tested. I did well enough to be placed in the AG program (p. 473).
At the intersection of academic and racialized images, learners negotiated ways to persevere in mathematics.	Keeshawn: I know that African American males...don't achieve too well in math and stuff. But I feel that just because like statistics show that African Americans don't do as well in math, don't achieve more, I still feel that we can do good...that kind of gives me a boost (p. 19).	Antonio: There ain't nobody out there for us, you know, no black males with math and all that in their heads. All we see is gang bangers on TV, rapping and sports (p. 510)	Phillip: Unfortunately, many of the African American boys at my school set bad examples and make bad reputations for African American boys. I work hard to carry myself in a mature manner all day, everyday. My dad has talked to me and other African American boys at my church about the importance of being a positive role model for younger boys (p. 476).
Learners with a high sense of agency persevered with mathematics across time; they chose to pursue their own pathways to success sustained by the work ethic of practice and perseverance.	Tinashe: I think [being Black] hasn't affected me because it doesn't really matter what color I am...I'm addicted to math (p. 19).	Bruce: Well because I'm playing football, I plan to get recruited and get a scholarship. An athletic scholarship is what I want, but if I can't I'll definitely take an academic scholarship (p. 510).	Phillip: I think God tells us to be achievers, so anything I set my mind to I can achieve. Church keeps me encouraged to do what is right, and my church has many positive Black Christian male role models (p. 50).

Ellington & Frederick (2010)	Jett (2010, 2011)
Karen: My mom taught us how to count and everything like that. And every time we went someplace, oh, what's 1+2? And what's 2+2?...I know before [age] 5, I know I could add (p. 67).	Roger: But I see right now that's not in God's plans for me to do. So at that point in time I was kind of frustrated, but right now I'm glad that it didn't go through (p. 1138).
Anita: There's the social obligation [to stay in the mathematics program]. Where, you know, you feel like, as a Black female in the program, one of few, that, if you don't stay in the program, then nobody else will. And what happens to the little Black girl who wants to be a math major, and doesn't see anyone who's one, and then she doesn't become one...And so that's something I feel has motivated me (p. 74).	A common internal characteristic among the chosen ones was that they were all spiritually grounded and their spirituality positively contributed to their mission to fulfill their academic goals (p. 330).
Karen: Our teachers expected a lot out of us...I told my teacher I couldn't do it at first. I was like, no, I'm not smart enough to do it. She's like: *yes you are!* I'm like, *no, I'm really really not.* She's like, *yes you are.* So she made me do it and I did it. Yeah, it was no problem, but I didn't think I could at first (p. 69).	Roger: To be honest with you, I really haven't dealt with racism, but I have. It was just that it wasn't, it was more behind the scenes instead of out in the open. They did things behind my back (p. 1137).
David: To maintain [your scholarship], you must maintain a certain standard and it's very competitive...This is what I've been searching for all my life - I'm in a group now, I'm surrounded by a bunch of people just like me. So, now I'm not the outcast so to speak...Now I've found that niche where I'm surrounded by people who are just as competitive (p. 70).	Antonio: These transformative, spiritually attentive approaches also helped to validate my own academic success in that they grounded me both spiritually and academically (p. 328).
David: I had faith that I could get it [mathematics]. I wasn't going to quit, [be]cause I had a bad feeling when I dropped that computer science class and I switched majors. And it was very much a feeling that I didn't want again...I didn't feel like God brought me to my junior year to have me fail a class. I just had to ultimately say that everything was going to be okay, and that it was just only a matter of time (p. 73).	Roger mentioned that he did not think that he would achieve so much as it pertains to school... He made reference to the fact that he was "lost" as it pertains to his educational goals...He was going thorough the motions as a football player, not contemplating the ramifications of his own education his life. He now, however, has a clear vision of his future in mathematics, one that includes attracting more African American male students to the mathematics pipeline (p. 1140).

McGee & Martin (2011a, 2011b)	Noble (2011)	Stinson (2008)
The majority of the students in this study admitted to gravitating toward mathematics and engineering to be perceived as smart. The respondents recognized that excelling in mathematics meant being the beneficiary of privileged status and having access to the educational opportunities they need to get ahead (p. 26).	Corey: I was recruited to participate with the math club due to my performance in class. As we competed against other schools, I stood out and began to form a real love for the subject...It was the only subject that I didn't fall asleep through in school...Math has always challenged me, and this is what keeps me drawn to it (p. 198).	Nathaniel: I got a sense [from my parents] that learning was something important, it was something that...put food on our plate, and eventually led us to moving up in social standing (p. 988).
Valerie: My ultimate career goal is to become a professor in engineering... I'd rather be a role model, and show them like I said 'you could achieve this, you could become a professor.' I want to be a role model and help other younger people who are in engineering who need a face to put with that goal they are trying to achieve. That's my goal (p. 30).	Alfred: I always scored a perfect score in the math section...I took this as a sign that I was a pretty good mathematician in my younger years. As the years progressed I took these scores plus my many A's that I got in my math classes as something to be proud of (p. 197).	No matter how participants conceptualized success, implicitly or explicitly stated throughout their conversations was the undisputed need for education, whether it was to pass knowledge on or to ensure that one could financially care for loved ones (p. 988).
Tinesha: I came to realize, like, these people [teachers and her peers] don't expect too much of me in this class...If you tell me that I can't do something, then I want to prove to you that I can. And so for the rest of the time in all my upper-level classes, that was my goal...I took that attitude from that point on in all my math classes (p. 19).	Alfred: When I have friends who I know are good at math, then a lot of times we'll work together. And so they help me learn more and become better (p. 201).	Each of the participants had been tracked into honors programs early in his education, providing him with access to enriched schooling experiences and academic programs and access to the most credentialed and experienced teachers (p. 996).
The pressure of stereotypes, his love of mathematics, and parental expectations drove Rob to develop a strong mathematics identity. Rob has long seen himself as an excellent mathematics student - according to him "one of the best" (p. 18).	Dexter: I never really felt like somebody that's in the same class as me is smarter than me. I've never really felt that way. So, when they succeed, I feel like that shows me that I could have succeeded if I didn't succeed. I realize that I should have set the bar higher (p. 201).	Spencer: I make sure that I raise my hand to answer the questions early...I try to prove my worth, show that I belong (p. 994).
In order to preserve his racial self-esteem, he dropped out of Science Tech and moved back to the safe haven of his childhood neighborhood, taking an entire year off from school...He has no regrets about leaving Science Tech because that year was critical to rebuilding his racial self-esteem. Rob eventually received three master's degrees...as well as his PhD in applied mathematics (p. 56).	Elijah: I've taken more math courses than I've actually had to, which is something I don't mind doing...I've taken some of the more difficult classes as electives, some of the classes that people generally try to stay away from (p. 199).	Ethan: I was always...willing to learn...what I needed to do to achieve, and if the core curriculum [which included mathematics] was what they needed me to do, I was willing to do it (p. 990).

Thompson & Lewis (2005)	Martin (2006)
Malik's desire to be highly regarded as the best at whatever he does is a recurring theme throughout our interviews. It is his desire that drives him to seek admittance 'to the best colleges,' and to focus more on mathematics where he was 'dominant' and 'almost untouchable' as opposed to athletics (p. 13).	Keith: I honestly feel that through my struggles and working and living as long as I have so far, that math is an essential foundation for everything (p. 221).
The deep-seated goals that a career as a fighter pilot allow Malik to realize are: (a) to be highly regarded as the best at whatever he does; (b) to help people; and (c) to be physically active (p. 13).	Raheem: That's why I decided to become a teacher, because I want to help too...If I demonstrate to children that a Black person is intelligent and they know what they are talking about, that will help them have more confidence in themselves and their own people (p. 218).
Malik: I want to go to one of the best colleges. I want to be something...I was looking at the required classes [for college] and I realized that where I stand right now as a junior, I don't have what it takes to succeed at that type of college...I knew I had to try to find a way to better prepare myself. So I went to Mr. King and asked him if there's any way we could add more advanced math classes to the schedule (p. 11).	Raheem: I remember Ms. Berks at the end of the school year telling me that she made a mistake not putting me in the algebra class in the 8th grade. And I remember her telling me this and not realizing what algebra was and I was just, 'Oh well, no big deal to me.'...that's to me an example of the fact that Black children, even when you do well, your educational future is not planned out properly for you...I was bored as hell in that class...by the time I got to algebra in 9th grade, I had kinda lost interest in math (p.210-211).
Malik: When you're at Garvey High School, the competition may not be as great as maybe some of the other schools...you're on this false sense of confidence. But once you start to compare yourself to kids nationwide, you're like oh, 'I'm kinda weak compared to these guys'...so when I was going into my senior year I was like, 'I gotta do something now (p. 7).	Raheem: I didn't see Black people in positions of power, authority...I can count on one, just about one hand the Black teachers that I had. I look back and reflect on the way I thought, in the way I perceived things. That had an impact on the way I felt about my own people. I saw people that were not Black as my teachers. So that made me self-consciously come on with the thought that Black people are just not that smart (p. 209-210).
Malik: I had always wanted to be part of the in crowd and do what was cool; and what was cool was to play sports. So I never really focused on the books...When I got to high school, I started to make a change. Math class really changed everything for me because I started seeing myself putting the kind of effort into the classroom that I put into the field and I was dominant...It made me realize that this is where I compete, this is my passion and it can be just as fun as sports. This is where I can make a difference (p. 6).	Amber: I knew it right away. They do that because they want to push them along and keep us back. A lot of minority students knew this but they accepted it. I hated it. Why should I accept this, just because I'm a Black person? This is not fair. You're advancing them and letting them advance...So that's why I said forget it. 'I hate this, I'm leaving.' I checked out, getting a GED and went ahead and did what I needed to do (p.216).