

# Exploring the Math Journeys of Black/African American Teens: Their Math Identities, Math Mindsets, and Experiences Studying Math

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## Introduction

Workers in STEM professions make a major contribution to our nation's global competitiveness by developing innovative technologies and products and establishing new companies (Noonan, 2017). The STEM sector continues to experience rapid job growth and STEM occupations, on average, pay significantly more than the median annual wage for all occupations: \$89,780 versus \$41,950

(Noonan, 2017). Thus, jobs in STEM fields offer prime opportunities for employment and advancement. To meet the demand for STEM workers, we need more students to major in STEM subjects and pursue careers in STEM fields.

The participation of Blacks/African Americans in STEM fields in higher education and the workforce is a significant labor market issue (Rogers, 2020). Despite some efforts to recruit Black/African American students to pursue degrees and careers in STEM, they continue to make up a lower proportion of STEM graduates relative to their proportion in the adult population. For example, in 2018, when Black/African Americans comprised approximately 14% of the U.S. population, they represented only 9% of the total science and engineering degrees awarded and less than 10% of scientists and engineers who were employed full-time (NCSES, 2021).

Research indicates that differences in course-taking before college may contribute to the historical underrepresentation of some racial/ethnic minority groups in STEM fields (NCSES, 2021). For Black/African American students specifically, research has found that factors such as racialized classroom experiences, teacher biases, lower academic

expectations, tracking policies, and access to high quality math instructors and curriculum have affected their sustained academic engagement with math during their K-12 educational experience (Diemer et al., 2016; Gonzalez et al., 2020; Rogers, 2020). One potential lever for increasing the participation of underrepresented minority groups in STEM is to better understand their experiences studying mathematics and science in K-12.

To better understand Black/African American teens' experiences studying math and the factors that may influence their math course-taking and achievement, we studied the responses of teens to survey questions about the following factors:

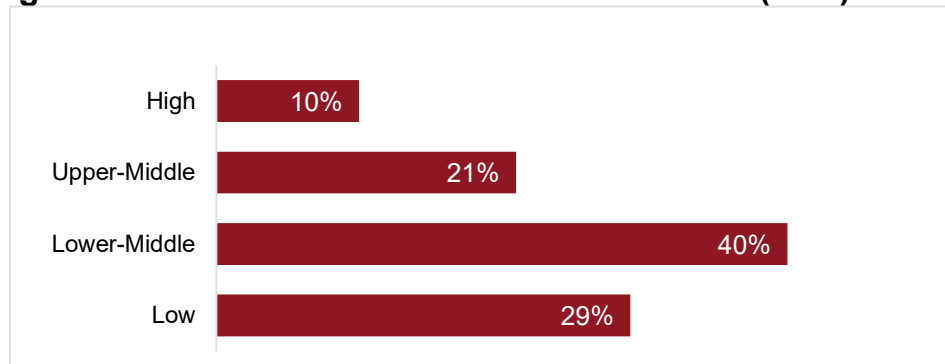
- ❖ Classroom climate (teacher and peer interactions in math class),
- ❖ Math identities and beliefs about math (teens' views of their math ability, how math ability develops, and the importance of studying math), and
- ❖ Support from parents around math learning (parental expectations and providing help).

This analysis is part of a larger study NORC conducted to explore how teens view math (math mindset), their own math abilities (math identity) and their experiences studying math (instructional contexts). The data was collected through a survey of a nationally representative sample of teens ages 13-17 and administered in the fall of 2021. Below is a brief description of our research methods followed by a summary of the findings.

**A note about our approach:** We chose to focus this brief on a subset of the population rather than make comparisons across subgroups to avoid “gap-gazing,” a term used to describe the tendency for math research to focus on differences between White students and students from marginalized groups, absent of any discussion about why disparities exist which can inadvertently promote the belief that marginalized students have inherent shortcomings and other misleading ideas about academic achievement (Gutierrez, 2008). By focusing on each subgroup separately, in this case Black/African American secondary school students, we can understand Black/African American teens' math beliefs and experiences in and of themselves, and thus support the development of research and interventions focused on creating effective teaching and learning environments for Black/African American students.

## The Study

For the larger study, teens identifying as Black/African American were oversampled due to a special interest in the experiences of subgroups who are underrepresented in honors and advanced placement (AP) coursework (Flowers, 2008) and in STEM majors and careers (NCSES, 2021). The final subsample containing 226 Black teens was balanced by gender (51% female). It was comprised mostly of students in grades 9 through 12 (82%) and was socioeconomically diverse. To facilitate comparisons, we classified the sample into four socioeconomic (SES) groups based on differences in family educational backgrounds and financial resources (see Figure 1).

**Figure 1. Black Teens' Socioeconomic Status<sup>1</sup> (SES) Groups**

Participants completed a 27-question survey where they responded to most items on a six-point Likert scale (Strongly Disagree to Strongly Agree). For this brief, we collapsed responses into three categories representing different degrees of agreement (Figure 2).

**Figure 2. Degrees of Agreement**

Degree of Agreement	Survey Response Options
Low/negative	Strongly Disagree/Disagree
Moderate	Somewhat Disagree/Somewhat Agree
High	Agree/Strongly Agree

We tabulated the responses to each survey question and conducted descriptive analysis by gender and SES group. Below is a summary of our findings.

## Findings

Consistent with prior research that highlights how students from different SES groups experience different levels of access to resources and quality of instruction when studying math (Strayhorn, 2010), we found differences in the responses of teens from different SES groups to questions about: (1) math identity and beliefs, (2) experiences in their math classrooms, and (3) perceptions of parent support.

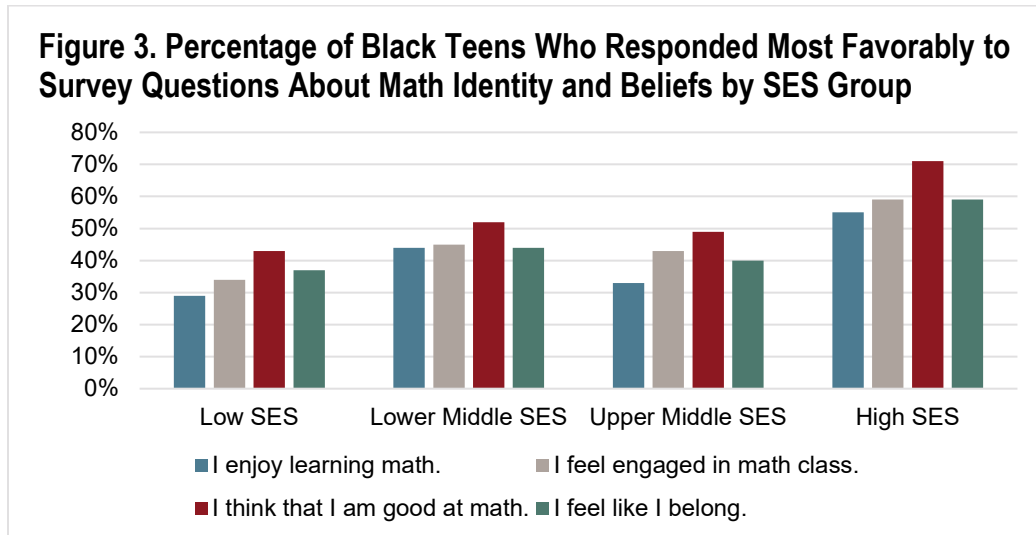
### 1. Math Identity and Beliefs: Teens from high SES groups were more positive about their math identity and beliefs.

Because beliefs about math identity reflect how teens see themselves as learners and are also associated with whether they excel in math (Miller-Cotto & Lewis, 2020), we surveyed teens about their beliefs related to their math identity. Math identity is especially important for teens from underrepresented racial/ethnic minority groups who (1) often face stereotypes related to their math ability and (2) may not develop a positive sense of

<sup>1</sup> Socioeconomic status is a composite measure of individual or group's education, occupation, and income.

their math identity or see themselves as mathematically capable as a result (Miller-Cotto & Lewis, 2020; Steele, 1997).

When we looked at differences by SES, we found that a higher proportion of Black/African American teens in the High SES group (compared to teens from the other SES groups) responded with a high degree of agreement to questions related to math identity, such as questions about enjoying learning math, feeling engaged and belonging in math class as well as thinking they are good at math. (See Figure 3.)



The data also suggested that some Black/African American teens from other SES groups responded favorably to questions about their math identity, even though the proportions may not be as high as the High SES group.<sup>2</sup> In addition, for some questions about math identity and beliefs, responses from Black/African American teens from a lower SES group were more favorable than a higher SES group. For example, when asked if they think that they can be good at math if they work hard at it, almost three-quarters of the teens from the Low, Lower-Middle, and Upper-Middle SES groups responded with a high degree of agreement while less than two-thirds of the teens in the High SES group did as well. Also, when asked if they think math is important for everyone to learn, only 59% of teens from the High SES group had a high degree of agreement, while more teens from the Low (63%), Lower-Middle (70%) and Upper-Middle (65%) SES groups responded with a high degree of agreement.

These results suggest the development of a positive math identity for Black/African American teens may have some relationship to family SES. Black/African American teens in families with high income and educational attainment may be exposed to a set

<sup>2</sup> It is important to underscore this fact as we did not perform analyses to examine whether SES status predicted responses to math identity questions for teens in our sample.

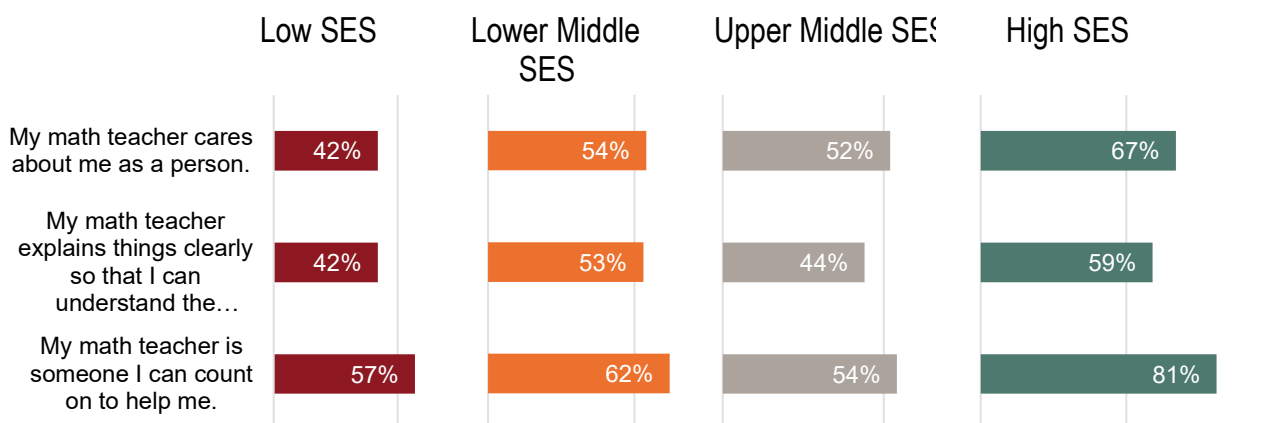
of experiences at home, school and/or in their community that reinforce a more positive sense of their math identity.

## 2. Classroom Experiences: Teens from high SES groups were more positive about their experiences in their math classroom.

Teachers undoubtedly play an important role in the academic success or failure of students, and their beliefs and perceptions of students' math abilities influences Black/African American students' math outcomes (Strayhorn, 2010). Student-teacher relationships matter as well (McGrath & Van Bergen, 2015). Several studies have found that students from racial/ethnic minority backgrounds and students from lower socioeconomic backgrounds experience more distant student-teacher relationships (McGrath & Van Bergen, 2015).

When we looked at responses to questions about teens' classroom experiences, we found that a higher proportion of Black/African American teens in the High SES group (compared to teens from the other SES groups) responded with a high degree of agreement to questions related to classroom experiences. The questions included being able to depend on their math teacher, having their math teacher clearly explain concepts in class, and feeling cared about as a person by them. (See Figure 4.)

**Figure 4. Percentage of Black Teens Who Responded Most Favorably to Survey Questions About Parent Support for Math by SES Group**



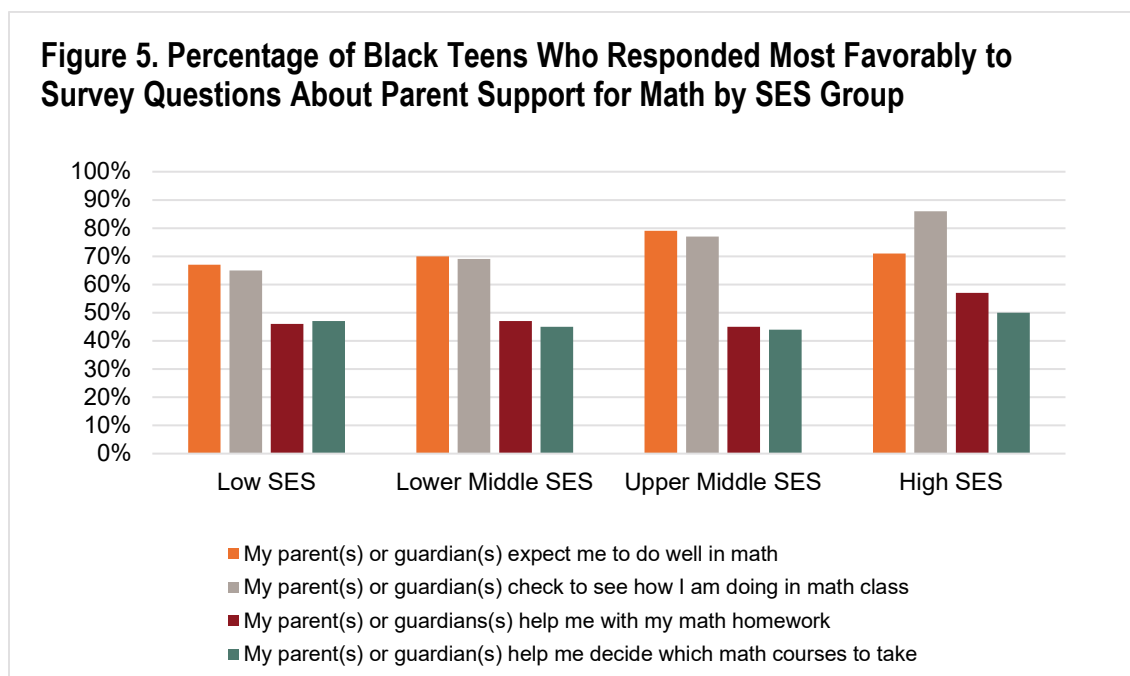
These results suggest that the classroom experiences of Black/African American teens may differ by family SES status. In other words, Black/African American teens in families with high income and educational attainment may attend schools with more positive classroom climates. It is important to note that many Black teens in our sample, regardless of SES grouping, reported feeling that their math teacher is dependable and cares about them, but fewer that their math teacher explains things clearly.

In addition, when asked about other aspects of their classroom experiences, other patterns emerged. For example, when asked whether their math teacher makes real-world connections, about half of the teens from the High SES and the Lower-Middle SES groups had a high degree of agreement compared to about one-third of teens from the Upper-Middle SES and Low SES groups. When asked whether students in their math class work together, more teens in the High SES (46%) and Lower-Middle SES (45%) groups had a high degree of agreement compared to fewer teens in the Upper-Middle SES (36%) and Low SES (40%) groups.

Interestingly, when asked if they can get extra help through school, more teens from the Low SES group (71%) and Lower-Middle SES group (69%) had a high degree of agreement compared to teens from the Upper-Middle SES group (65%) and the High SES group (64%).

### 3. Parental Support: Teens from high SES groups were more positive about the active support they receive from parents.

We surveyed Black/African American teens about their parent(s)' specific involvement with math, asking about their expectations, the help they offer with homework, and their engagement related to course-taking decisions and teen progress in math. Our analysis on how this involvement differs by SES group builds on other research exploring class differences for Black/American parents' involvement with math (Strayhorn, 2010). Overall, we found strong agreement across SES groups to questions about parents' expectations and monitoring. Agreement was not as strong for parents helping with homework and helping teens decide which math courses to take (see Figure 5).





The proportion of students who reported that their parent(s) expect them to do well in math is high – ranging from approximately 67%-80% across all four SES groups. When asked if their parent(s) check to see how they are doing in math class, responses ranged from 65%-86% and the percentage of students with a high level of agreement increased as SES group increased. While many students in our sample had a high level of agreement that parental expectations are high, fewer students had a high level of agreement with that statement that their parents help them decide what courses to take. Responses to this question ranged from 44%-50% and did not vary much across the SES groups.

#### **4. Results by Gender: Little difference in the way female and male teens responded to almost all questions about their math identity and beliefs, their classroom experiences and parental support.**

Based on prior research on the different experiences of male and female students studying math (Jacobs, 2005), we expected to see significant differences in the responses of male and female Black/African American teens to the survey questions. Instead, we found that male and female Black/African American teens responded very similarly to almost all the questions about their math identity and beliefs, classroom experiences, and parental support.

There were some exceptions. More male than female teens reported that their math teacher explains things clearly, that their parents helped them with homework and in deciding what courses to take. More female than male teens reported that they can get help outside of school.

Despite these exceptions, male and female Black/African American teens' responses were similar on the vast majority of the 27 survey questions. This suggests that the Black/African American males and females in our sample have similar views about their math identity, beliefs about math and perceptions of parent support as well as similar experiences in their math classrooms.

## **Conclusion**

Our exploration of the math journeys of Black/African American teens yielded expected results related to SES and unexpected results related to gender. Interestingly, these insights would not have surfaced if we had chosen to compare Black/African American teens to White teens or another group such as Latino teens.

More research is needed to further explore the barriers and facilitators to Black/African American teens' math journeys. One next step would be to study Black/African American

teens' math experiences longitudinally to learn more about the ways different factors influence their math journeys and identify barriers and facilitators to their successful pursuit of math and other STEM subjects in college and careers.

If the patterns we identified in this research brief were to hold longitudinally, it suggests that the differences between Black/African American teen males and females is smaller than socioeconomic differences. To be effective, interventions or policies should be designed with these differences in mind.

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