The Education Trust

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Opportunities Denied

High-Achieving BLACK AND LATINO STUDENTS Lack Access to Advanced Math

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BY MELODIE BAKER, National Policy Director at Just Equations, IVY MORGAN, Director of P-12 Research and Data Analytics at EdTrust, and GIZELLA WADE, Graduate Student at UCLA

EXECUTIVE SUMMARY

For this brief, EdTrust and Just Equations partnered to explore differences in patterns of math course enrollment for high school students using data from students who participated in the 2009 High School Longitudinal Study (HSLS:09). Like other research has shown, we find that high-achieving Black and Latino students and students from low-income backgrounds who take and pass Algebra I in eighth grade still end up taking advanced math courses in high school at lower rates than their peers. The data also points to the likelihood that students who did and did not take advanced math courses in high school have different experiences with math teachers' and counselors' practices and perceptions. Below are the key findings:

- High-achieving underrepresented students who took advanced math courses had higher four-year graduation rates and high school GPAs, as well as higher postsecondary matriculation and persistence rates, STEM credit-earning, and GPAs than their high-achieving underrepresented peers who did not.
- Among high-achieving underserved students, there are meaningful differences in the school experiences of those who took advanced math courses, compared with peers who did not take advanced math courses. Notable differences include:
    - High-achieving, underserved students (i.e., Black and Latino students and students from low-income backgrounds) who took advanced math courses differed from peers who did not take advanced math courses in that they more commonly had math teachers who set clear goals and school counselors who set high standards.

- Among high-achieving Black students, those who took advanced math courses differed from peers who did not take advance math courses in that they more commonly had math teachers who cared about students of all academic levels, and school counselors who spent more time on college preparatory activities.
- Most students who took advanced math courses more commonly reported that they felt safe in and proud of their school — but that was not true for Black students.

The report concludes with recommendations that federal and state policymakers can take to address the longstanding, institutional challenges that deny high-achieving Black and Latino students and students from low-income backgrounds access to the higher level math courses that will put them on a path to achieving their dreams.

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INTRODUCTION

> ***"The few Black students at my school, they're not in these [advanced] classes because of perceived biases. They just don't get a chance. … I had to work very hard to be put in these classes and advocate for myself. I feel like I have to work twice as hard to get half as much as some of my White peers"***
>
> – WILL, HIGH SCHOOL STUDENT IN NEW YORK.[1]

A SOLID FOUNDATION IN ALGEBRA, GEOMETRY, AND TRIGONOMETRY IS THE PREREQUISITE FOR PLACEMENT IN HIGHER-LEVEL MATH COURSES THAT LEAD TO COLLEGE OPPORTUNITY. However, too often, it is not ability, but student characteristics (such as race, wealth, and privilege) and/or school-based resources (such as instructional resources, placement practices, school culture, and teacher and school counselor behavior) that contributes to the stratification of higher-level learning opportunities by race and income. As such, narratives that imply that placement in advanced math coursework is earned suggest that underserved students perpetuate their own inequitable learning experiences, rather than acknowledge that systemic injustices facilitate these inequities in educational opportunities. Such assumptions do not explain the vast disparities in course access for students who are equally brilliant, have demonstrated achievement, but come from lower socio-economic backgrounds or are Black or Latino.

The impact of quality high school mathematics instruction supported by a challenging curriculum cannot be understated. In fact, the U.S. Supreme Court's recent ban on affirmative action in college admission highlights the urgency to better prepare marginalized students in high-level mathematics considering the role that math course-taking plays in admissions decisions. A robust body of research points to consistent positive correlations linking the highest math course taken in high school with postsecondary outcomes.[2] College preparedness, postsecondary opportunities, and access to science, technology, engineering and mathematics (STEM) programs are linked to the type of math courses students take.[3] Indeed, underserved student groups — namely, Black and Latino students and students from low-income backgrounds, regardless of proven mastery and eligibility — are less likely to be assigned AP math courses, matriculate into STEM majors, or attend top-tier colleges than their wealthier, White or Asian peers.[4]

While the link between math course access in high school and future opportunities has been well-established, the factors that lead to these disparate patterns are less well-understood. Prior Ed Trust work suggests that students of color are more likely to attend high schools that do not offer robust advanced coursework opportunities. And the schools that serve predominantly Black and Latino students that do offer advanced math options have fewer resources to support higher-level math skill development.[5] Other explanations include peer influence and a student's sense of belonging that contributes to uneven course enrollment.[6] But what is the role of school leaders — including school counselors and teachers — in contributing to these patterns, especially in schools where high-level courses are available but Black and Latino students are not fairly represented?

As federal, state, and local advocates and decision-makers work to promote equity in access to advanced courses, the need for research that explores the nuances of inequitable access to advanced coursework becomes more evident. Yet current research exploring the impact of institutional practices and policies on student experiences and advanced math course-taking is insufficient. Existing studies, while insightful, are limited in that they either use non-nationally representative samples, use samples that date back nearly decades (e.g., 1980-90s), or do not clearly focus on race or socioeconomic status.[7] Moreover, the studies that do include race, too often over-emphasize the underachievement of students of color and students from low-income backgrounds rather than the inadequate performance of the institutions tasked with facilitating their education. To address this notable gap in the literature, our aim is to highlight the differences in school factors (e.g., school climate, expectations, and school counselors' beliefs and practices) that high-achieving Black and Latino students, and students from low-income backgrounds experience when they do and do not access advanced coursework in high school.

Studies that include race often over-emphasize the underachievement of students of color rather than the inadequate performance of the schools that educate them

RESEARCH QUESTIONS

This brief addresses the following research questions:

- Among high-achieving underserved students, are there differences in postsecondary outcomes between students who did and did not take advanced courses while in high school?
- Do institutional, school-level factors (e.g., school climate, advice and expectations, school counselors' and educators' beliefs and practices) play a role in perpetuating inequities in advanced math course-enrollment for high-achieving underserved students?

METHODOLOGY

To examine high school math course-taking patterns, we analyzed data from the High School Longitudinal Study (HSLS), which began in fall 2009 and followed students over the course of eight years, throughout their high school and postsecondary experiences, and explored their course-taking patterns, academic achievement, and occupational outcomes. The study is based on a nationally representative sample of over 23,000 ninth grade students from more than 900 public and private high schools in the United States. The HSLS data provide a unique opportunity to explore high school and postsecondary trajectories for a nationally representative sample of students — overall and for different student—groups that is not available otherwise.

Survey questions used for this study focused on math course-taking; post-secondary outcomes (post-secondary enrollment, college GPA, number of STEM credits earned, and postsecondary completion as of June 2016);[8] as well as institutional factors that may have contributed to students' opportunity to take advanced math courses in high school. Data on students' race/ethnicity and socioeconomic background were also included. Specifically, we examined data for Black and Latino students and students from low-socioeconomic (SES) backgrounds.[9]

The main findings compare outcomes of high-achieving students who did and did not take advanced courses in high school. We apply sampling weights when calculating percentages and focus findings described in this paper on differences that are meaningfully large. When differences are statistically significant, we clearly note those in the discussion of findings below.

The HSLS data provides a unique opportunity to explore high school and postsecondary trajectories for a nationally representative sample of students — overall and for different student groups that is not available otherwise

DEFINITIONS

To conduct the analysis, we created several composite indicator variables to identify specific groups of students and schools:

- High-achieving students refers to students who passed — with a grade of A, B, or C — Algebra I or higher (i.e., Algebra I, Algebra II or trigonometry, geometry, integrated math, or "other advanced math course, pre-calc/calculus") in middle school or scored in the top quintile on a math assessment given to students in ninth grade.
- Students who took advanced math courses in high school refers to students whose highest math course taken in high school was either one of probability and statistics, other AP/IB math, precalculus, calculus, or AP/IB calculus.
- Students who felt safe in and proud to be a part of their school refers to students who reported that they strongly agreed or agreed with both of the following statements:
    - You feel proud being part of this school
    - You feel safe at this school
- Schools that offered advanced courses refers to high schools where an administrator indicated that one of the following courses was offered on site or offsite: calculus, AP calculus (AB or BC), calculus IB, statistics or probability, or AP statistics.

LIMITATIONS

The HSLS study started in 2009, and followed students throughout high school and into their postsecondary trajectories. As such, it does not reflect more recent changes in graduation policies in many states that mandate more years of math for all students. Finally, as is the case with descriptive data analysis, it is not possible to establish causal relationships between factors such as teachers' instructional practices or students' sense of belonging and course-taking patterns.

FINDINGS

Math Course-Taking Patterns for High-Achieving Students

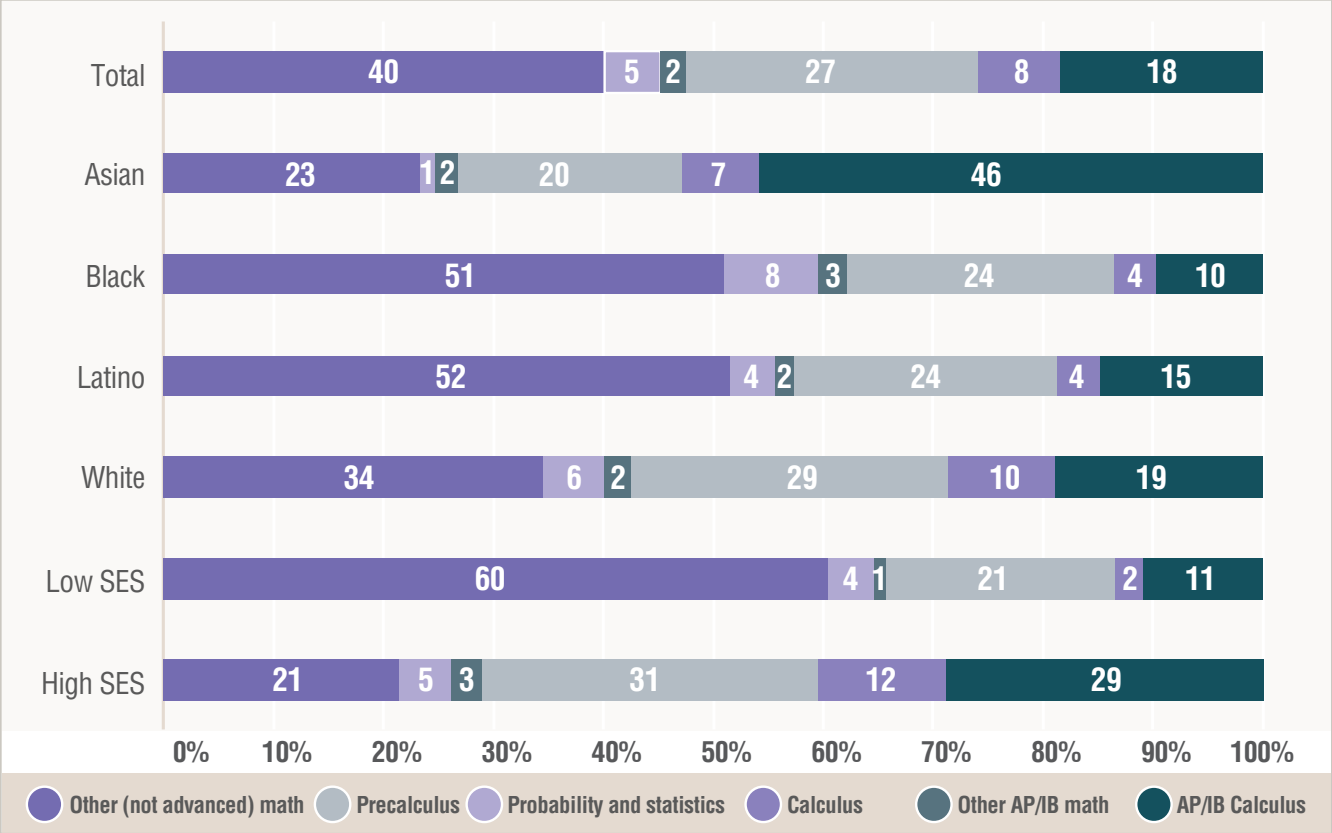
As noted earlier, research and data — including EdTrust's and Just Equations'— show that Black and Latino students and students from low-income backgrounds have inequitable access to advanced coursework. The HSLS data is no different: it shows statistically significant differences between student groups in course-taking in middle and high school. Specifically, just 24% of Black students, 34% of Latino students, and 25% of students from low-socioeconomic (SES) backgrounds took Algebra I or higher in eighth grade, compared with 39% of White peers, 64% of Asian peers, and 57% of students from higher SES backgrounds. Then, by the end of high school, just 28% of Black students, 31% of Latino students, and 22% of students from low SES backgrounds took advanced math courses, compared with about 46% of White peers and 70% of Asian peers and students from higher SES backgrounds.

Many would argue that these differences are due not to systemic inequities, but rather to differences in prior preparation (which *is* a systemic inequity) and/or motivation. But as shown in Ed Trust's 2022 report, *Shut Out: Black and Latino Students and Students from Low-Income Backgrounds are Denied Access to AP STEM opportunities*, even when Black and Latino students are interested in pursuing STEM fields, they are often denied the necessary prerequisite course-taking opportunities. In the rest of this analysis, we focus on the differences in experiences of high-achieving students who did and did not take advanced math courses by the time they finished high school. We focus specifically on high-achieving students in public schools that offered advanced math courses to reduce bias from selection effects and systemic differences in resource allocation.

Even for high-achieving students, unacceptable gaps in advanced math course-taking in high school emerge

We focus on Black and Latino students and students from low-income backgrounds who had taken and passed Algebra I or higher in eighth grade or scored in the top quintile on math assessment in ninth grade. Though these students have shown their potential for high achievement in mathematics, they were not given equal opportunities compared to their peers of other races or higher-income backgrounds to complete advanced courses by the end of high school. While 46% of high-achieving Asian students, 19% of White students, and 29% of students from high-SES backgrounds took AP/IB calculus by the end of high school, the same was true for just 10% of Black and 15% of Latino high achievers, and 11% of high achievers from low-SES backgrounds.

FIGURE 1: Highest Level Mathematics Course Taken in High School for High-Achieving Students, by Student Demographic Characteristics



Reading this figure: Overall, 18% of all students took AP/IB Calculus as their highest-level math course in high school.

Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

Advanced Math Course-Taking and Postsecondary Outcomes

Taking advanced math courses is crucial for post-secondary academic success. For example, researchers have found significant and positive effects associated with taking advanced courses on 12th grade math and science scores;[10] likelihood to graduate high school and to matriculate to college, overall college success;[11] and likelihood of entering and completing college.[12]

The studies cited above highlight the important role of advanced courses in helping prepare students for success at the postsecondary level. Yet, they have limitations, including non-nationally representative samples that do not allow for generalizability beyond their studied context, very outdated data that goes back as much as three to four decades (e.g., 1980-90s), and lack an explicit focus on outcomes disaggregated by race or socioeconomic status. [13]

This analysis of data from HSLS — which is nationally representative, newer, and highlights outcomes for students of color and students from low-SES backgrounds — addresses some of those limitations and confirms the influence that taking advanced courses has on secondary and postsecondary outcomes for high-achieving underserved students.

TO THE POINT The secondary and postsecondary outcomes of high-achieving students who took advanced math courses differ from the outcomes of peers who did not take advanced math courses in the following ways:

- High school GPAs and four-year high school graduation rates were higher[14]
- Postsecondary education matriculation and persistence rates were higher
- Rates of attendance at highly selective institutions were higher
- STEM credit-earning in college was higher[15]
- Postsecondary GPAs were higher[16]

HIGH SCHOOL GPA[17]

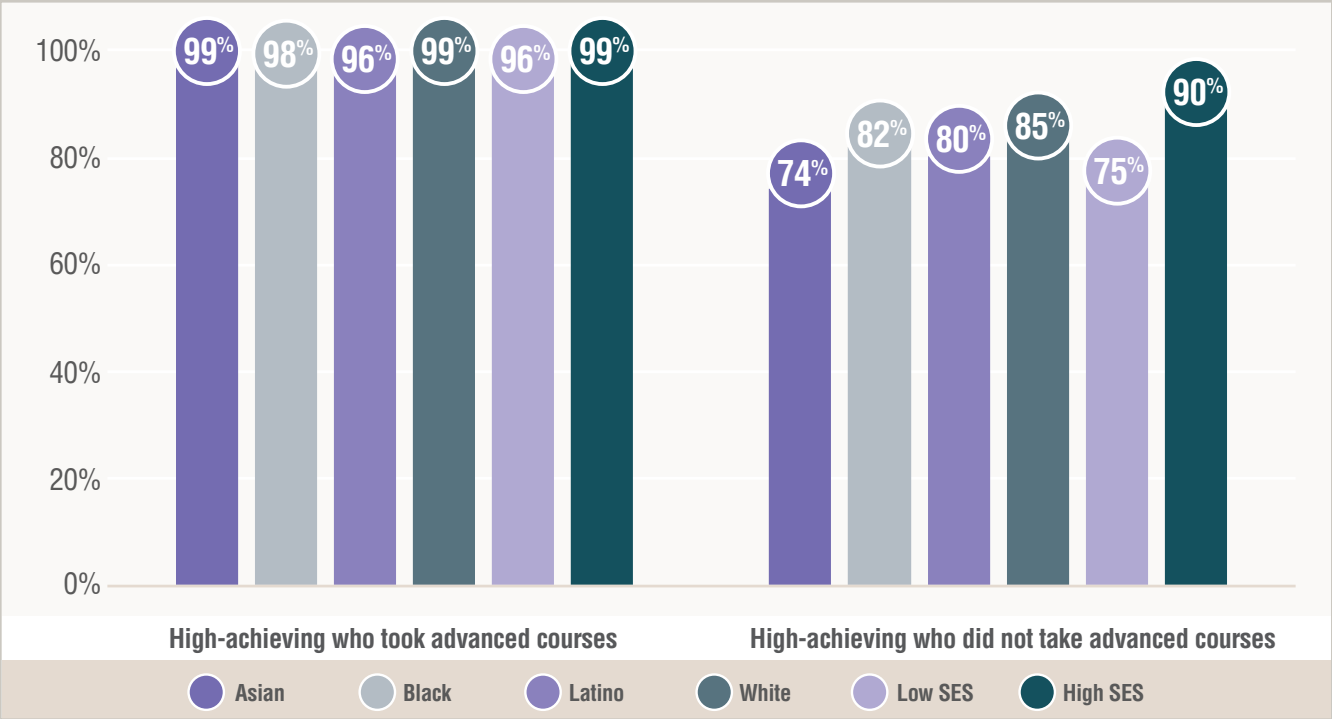
High-achieving students who took advanced math courses had higher (unweighted) GPAs than their high-achieving peers who did not take such courses in high school. For example, the average high school GPA for high-achieving Black students was 2.9 for students who did take advanced courses and 2.3 for students who did not take advanced courses. Similarly, the average GPA for Latino high achievers with advanced coursework was 3.1, compared with 2.3 for those without advanced coursework.

FOUR-YEAR HIGH SCHOOL GRADUATION[18]

High-achieving students who took advanced math courses also graduated from high school within four years at higher rates than their peers. In fact, among high-achieving students who took advanced math courses, there are minimal differences in graduation rates across race — 99% of Asian and White students, 98% of Black students, and 96% of Latino students and students from lower SES backgrounds graduated in four years. On the other hand, among high achievers who did not take advanced courses, graduation rates vary by 10 percentage points across race/ethnicity groups and 14 percentage points between students from high- and low-SES backgrounds.

Among high achievers who did not take advanced courses, graduation rates vary by 10 percentage points across race/ethnicity groups and 14 percentage points between students from high- and low-income backgrounds

FIGURE 2: High School Graduation Rates for High-Achieving Students, by Advanced Course-Taking Status and Student Demographic Characteristics



Reading this figure: Among high-achieving students who took advanced courses, four-year high school graduation rates range from 96% to 99%.

Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

POSTSECONDARY ENROLLMENT

Across student groups examined in this analysis, "standard" postsecondary enrollment rates[19] are 17 to 31 percentage points higher for high-achieving students who took advanced courses than they were for similar students who did not take advanced courses. Among high-achieving students who took advanced math courses, 74% of Black students and 81% of Latino[20] students experienced "standard" matriculation to and through postsecondary schooling; while the same was true for only 58% of Black students and 53% of Latino students who did not take advanced math courses in high school. That pattern is similar for high-achieving students from low-SES backgrounds: 77% of those who took advanced math courses experienced "standard" postsecondary enrollment compared with 53% who did not take advanced math courses.

STEM CREDITS[21]

Taking advanced math courses in high school puts students on a path to earning more STEM credits in college. High-achieving Black and Latino students and students from low-SES backgrounds who took advanced math courses in high school earned credits for almost five more STEM courses (14, 13, and 14 credits, respectively) than their high-achieving peers who did not take advanced math course.

POSTSECONDARY GPA

It should be no surprise by now that students who took advanced math courses in high school also had higher GPAs in their first year of college. For Black and Latino high-achieving students who took advanced math courses in high school, first-year college GPAs were about 0.5 points higher (for students from low -SES backgrounds the difference was about 0.6 points).[22]

School-Level Factors and Advanced Math Course-Taking

Even though students may be high achieving, many are still unable to take advanced math courses in high school. So, how do we get more students of color and students from low-income backgrounds enrolled in advanced math courses? One way is to continue to investigate how school-level factors contribute to and promote inequity, particularly for underserved student groups.

Research continues to underscore that student success is not solely the product of individual merit and effort, but rather the byproduct of a confluence of factors, chief among which are climate/culture, school counseling practices, and educator beliefs. Scholars have found positive effects of school culture and school climate on initial enrollment in college and persistence through college.[23] Other scholars have also found positive relationships between principal support for teachers, teachers' willingness to hold themselves accountable for student success, teachers' expectations for student achievement, and math achievement.[24] In this analysis, we examined a series of factors related to math teacher practices, beliefs, and characteristics; school counseling and college preparation practices; and student experiences.[25] We restrict the analysis to students in public schools that offer any of the math courses that we consider advanced.

TO THE POINT Among high-achieving underserved students, there are meaningful differences in the school experiences of those who took advanced math courses, compared with peers who did not take advanced math courses. Notable differences include:

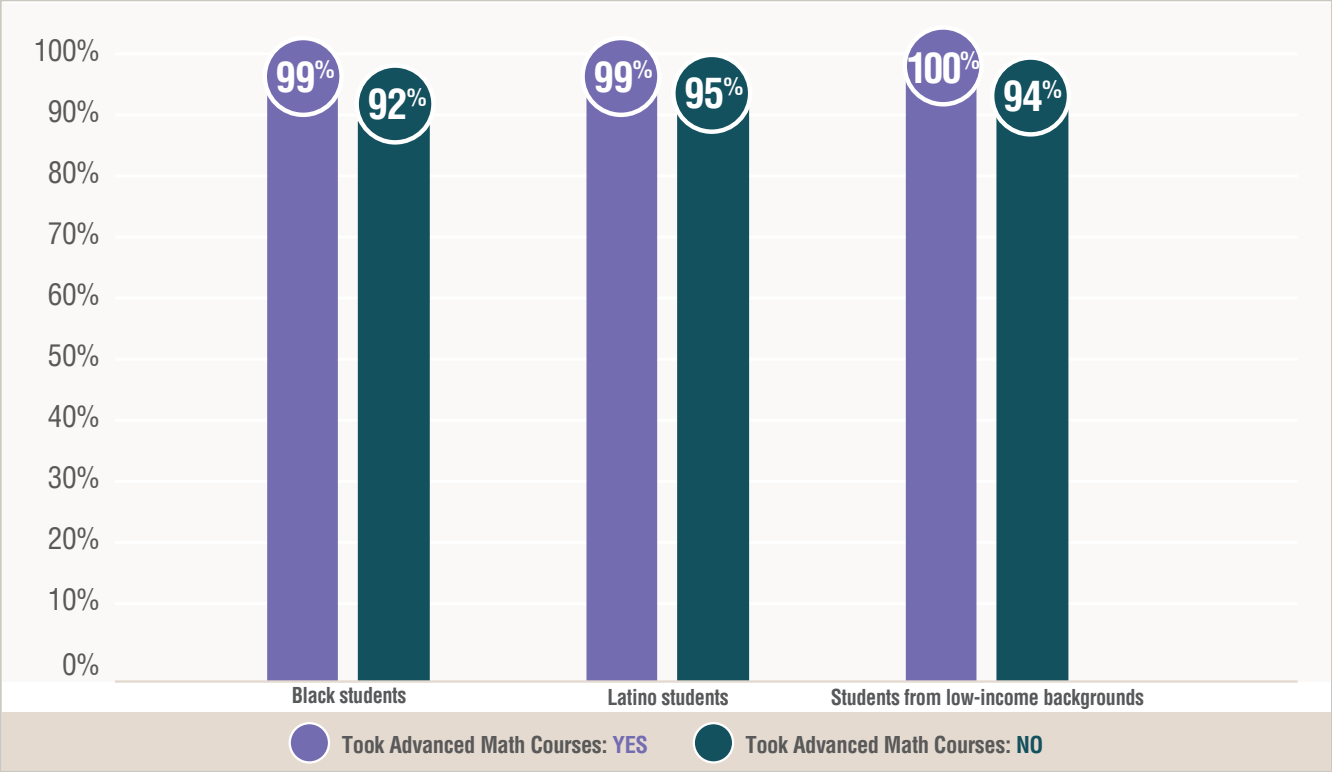
- High-achieving, underserved students (i.e., Black and Latino students and students from low-SES backgrounds) who took advanced math courses more commonly had:
  - Math teachers who set clear goals than peers who did not take advanced math courses[26]
  - School counselors who set high standards than peers who did not take advanced math courses
- Among high-achieving Black students, those who took advanced math courses more commonly had:
  - Math teachers who cared about students of all academic levels
  - School counselors who reported spending a substantial amount of time on college preparatory activities
  - Most students who took advanced math courses more commonly reported that they felt safe in and proud of their school — but that was not true for Black students.

MATH TEACHER BELIEFS AND PRACTICES

High-achieving, underserved students who took advanced math courses more commonly had math teachers who set clear goals than peers who did not take advanced math courses

Specifically, among high achievers, nearly 100% of students who took advanced math courses (of each group of interest — Black and Latino students and students from low-SES backgrounds) had math teachers who agreed or strongly agreed that math teachers make goals clear to students, compared with 92% of Black students, 95% of Latino students, and 94% of students from low-SES backgrounds who did not take advanced math courses.[27]

FIGURE 3. Percentage of Students Whose Teachers Agreed or Strongly Agreed That Math Teachers Made Goals Clear to Students, by Student Characteristics



Reading this figure: 99% of Black high-achieving students who took advanced math courses in high school had math teachers who agreed or strongly agreed that math teachers made goals clear to students; compared with 92% of high-achieving Black students who did not take advanced math courses.

Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

Among high-achieving Black students, those who took advanced math courses more commonly had math teachers who cared about students of all academic levels

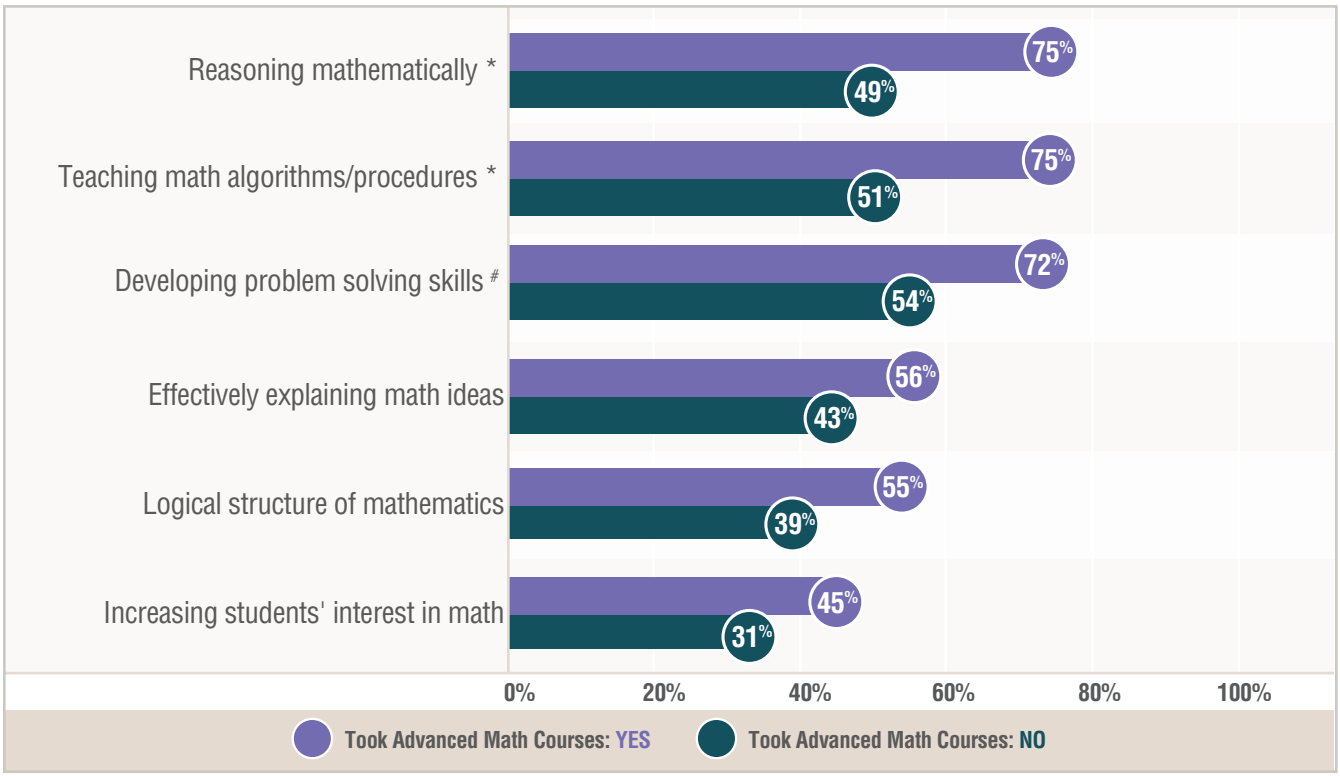
Specifically, compared to peers who did not take advanced math courses, high-achieving Black students who did take such courses were less likely to have teachers who disagreed or strongly disagreed that teachers cared *only* about smart students (90% vs. 98%).[28]

High-achieving underserved students who took advanced math courses more often had math teachers who focused on deepening students' understanding of and interest in math, compared with peers who did not take advanced math courses

For example, underserved high achievers who took advanced math courses more frequently had math teachers who emphasized the logical structure of math, explaining math ideas, and increasing students' interest in math. In addition, high-achieving Black students and students from low-income backgrounds who took advanced math courses more frequently had math teachers who focused on increasing students' problem solving and math-reasoning skills, or algorithms and procedures.

Underserved high achievers who took advanced math courses more frequently had math teachers who emphasized the logical structure of math, explaining math ideas, and increasing students' interest in math

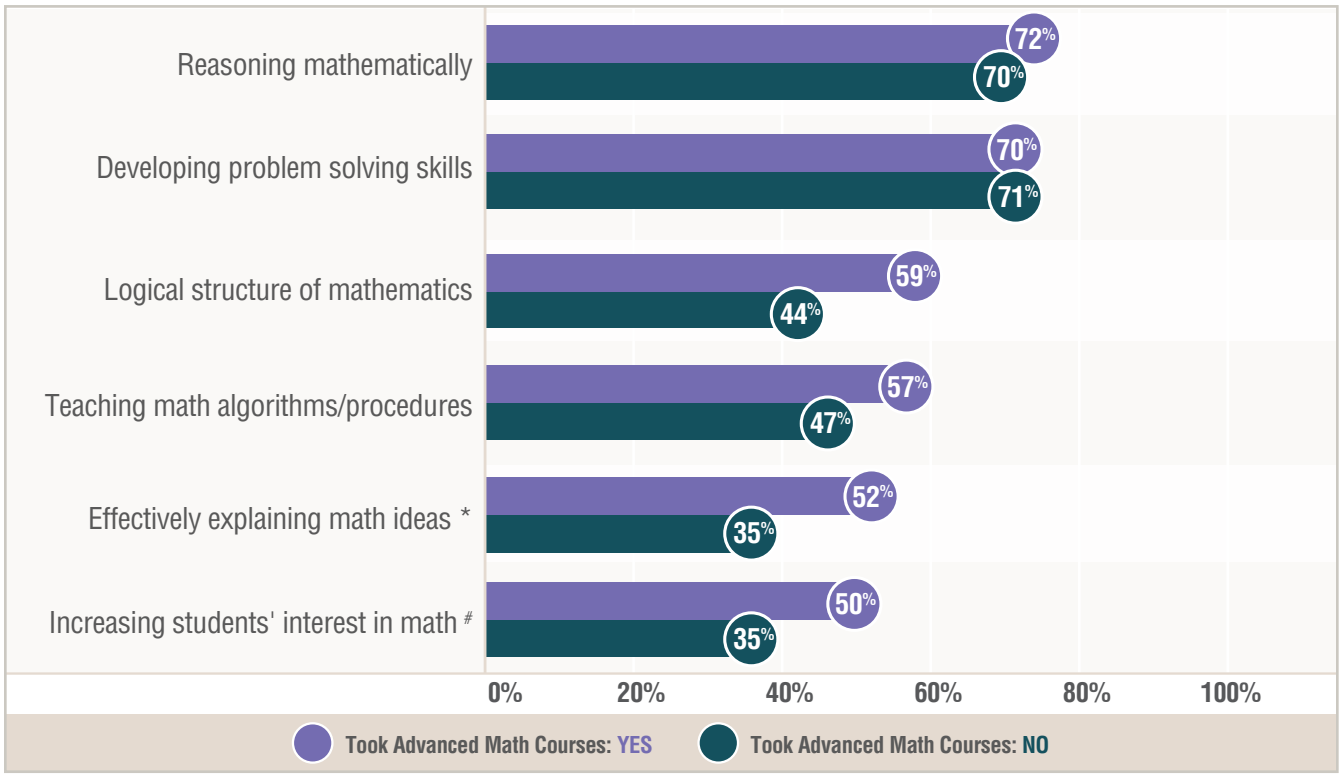
FIGURE 4A. Percentage of Black High-Achieving Students with Math Teachers who Reported Placing a Heavy Emphasis on Certain Math Concepts, by Advanced Math Course-Taking Status



Reading this figure: 75% of Black high-achieving students who took advanced math courses in high school had math teachers who reported placing a heavy emphasis on reasoning mathematically, compared with 49% of high-achieving Black students who did not take advanced math courses.

Note: *#: statistically significant at .1 level; *: statistically significant at .05 level.*
Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

FIGURE 4B. Percentage of Latino High-Achieving Students with Math Teachers Who Reported Placing a Heavy Emphasis on Certain Math Concepts, by Advanced Math Course-Taking Status



Reading this figure: 72% of Latino high-achieving students who took advanced math courses in high school had math teachers who reported placing a heavy emphasis on reasoning mathematically, compared with 70% of high-achieving Latino students who did not take advanced math courses.

Note: *#: statistically significant at .1 level; *: statistically significant at .05 level.*
Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

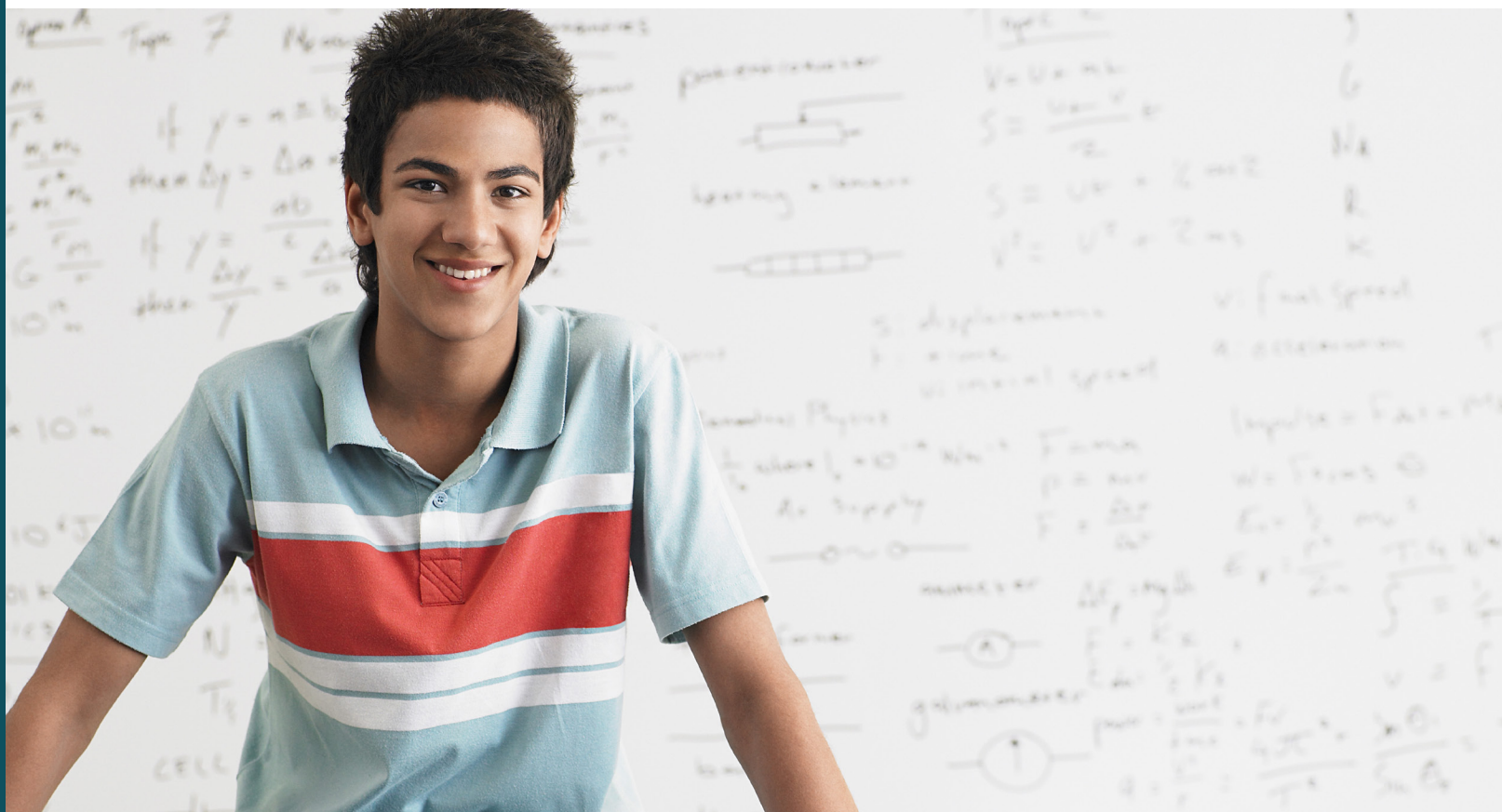
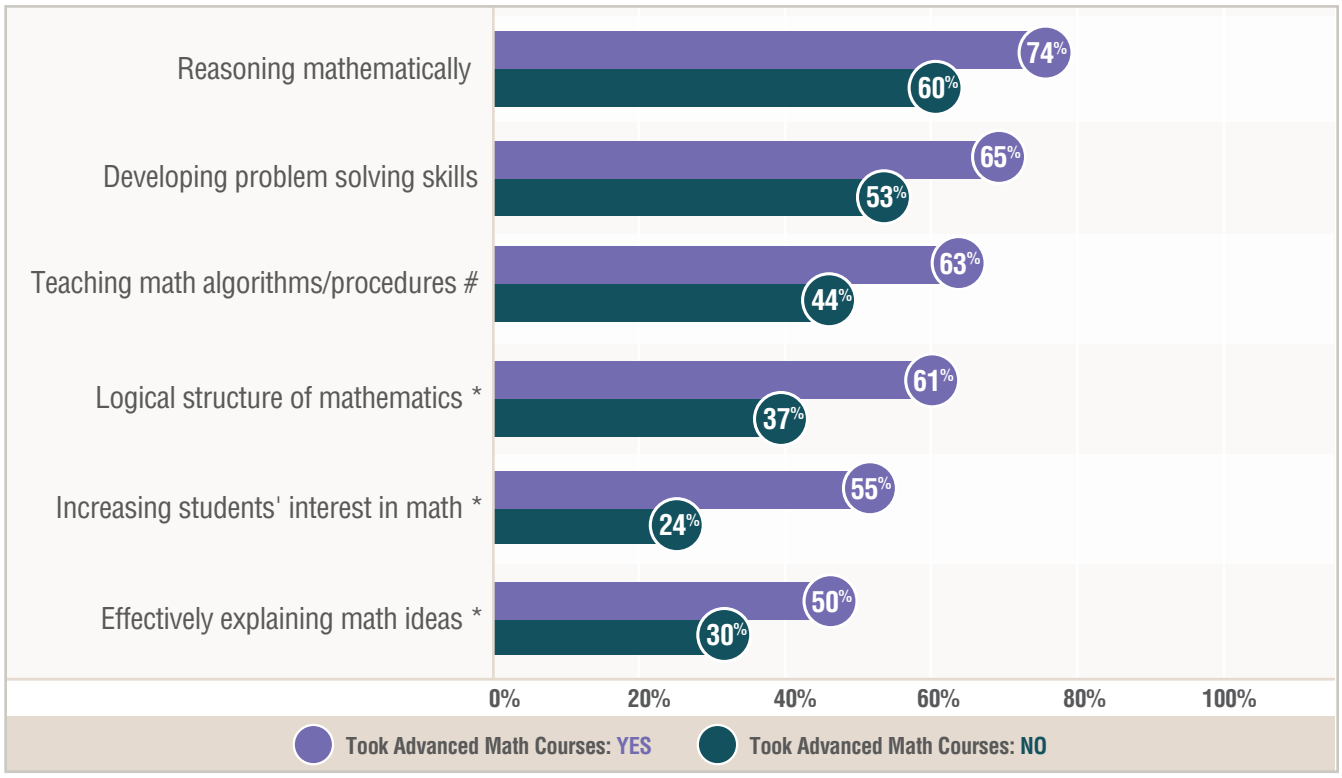


FIGURE 4C. Percentage of High-Achieving Students from Low-SES backgrounds with Math Teachers Who Reported Placing a Heavy Emphasis on Certain Math Concepts, by Advanced Math Course-Taking Status



Reading this figure: 74% of low-SES, high-achieving students who took advanced math courses in high school had math teachers who reported placing a heavy emphasis on reasoning mathematically, compared with 60% of high-achieving students from low-SES backgrounds who did not take advanced math courses.

Note: *#: statistically significant at .1 level; *: statistically significant at .05 level.*
Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

SCHOOL COUNSELING AND COLLEGE PREPARATION PRACTICES

High-achieving, underserved students who took advanced math courses more commonly had school counselors who set high standards than peers who did not take advanced math courses

Most notably, 60% of high-achieving Black students in advanced math classes had school counselors who strongly agreed that they set high standards for students' learning, compared with 48% of peers who didn't take advanced math courses.[29]

Among high-achieving Black students, those who took advanced math courses more often had school counselors who reported spending a substantial amount of time on college preparatory activities

Specifically, 63% of these students who took advanced math courses had school counselors who spent more than 20% of their time helping students with college readiness, selection, and applications, compared with 38% of peers who did not take advanced math courses.[30]

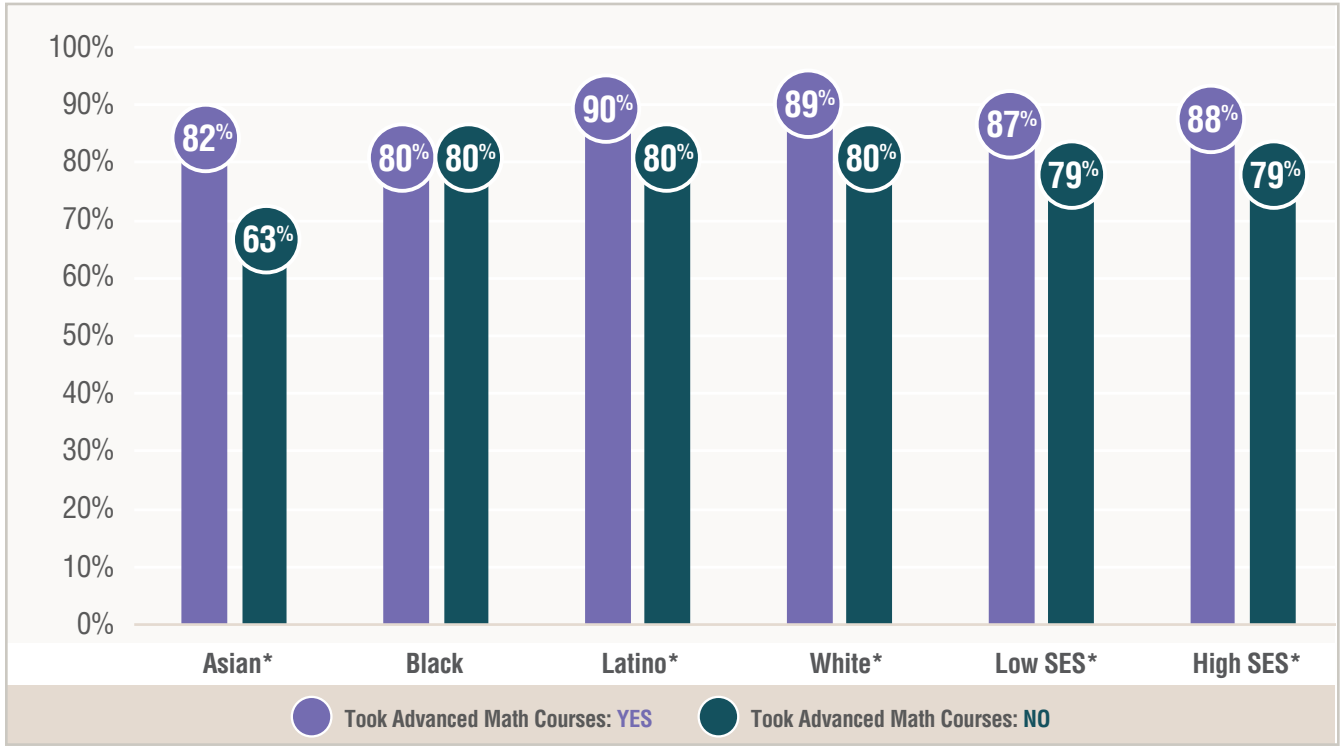
STUDENT EXPERIENCES

Most students who took advanced math courses more commonly reported that they felt safe in and proud of their school — but that is not true for Black students

About 80% of high-achieving Black students reported feeling safe and proud to be in their schools — regardless of whether they took advanced math courses. This contrasts with the pattern for all other student groups — where students who *did* take advanced math courses reported feeling safe and proud in their schools at higher rates than students who did not take advanced math courses**.** For example, among high-achieving Latino students, 90% of those who took advanced math courses reported feeling safe and proud in their schools, compared with 80% of peers who did not take advanced math courses.

Black students in advanced math feel a greater sense of belonging when they see more peers of their race in class.[31] When considered with the fact that high-achieving Black students who took advanced math courses were less likely than their peers to indicate (in ninth grade) that they were planning to take more math courses because "most students like them do" or because "their friends are going to," this data suggests that Black students may not have felt a sense of belonging in their schools or in their advanced math courses.

FIGURE 5. Percentage of High-Achieving Students Who Reported Feeling Safe in and Proud to Be in Their Schools, by Advanced Math Course-Taking Status and Student Demographic Characteristics



Reading this figure: 82% of high-achieving Asian students who took advanced math courses reported feeling safe in and proud of their school, while only 63% of Asian high achievers who did not take advanced math courses reported the same.

Note: *#: statistically significant at .05 level.*
Source: *U.S. Department of Education, National Center for Education Statistics, High School Longitudinal Study of 2009 (HSLS).*

CALL FOR BETTER DATA

There are well-documented achievement gaps caused by well documented opportunity gaps, including those highlighted in this report. However, researchers need better data to deepen our understanding of the institutional, school-level factors that perpetuate inequities in advanced math course-taking for students of color and students from low-income backgrounds. One of the reasons some of our findings are meaningfully large, but not statistically significant, may be due to small sample sizes. For example, HSLS oversampled Asian students to ensure sufficient size for analysis, but it did not oversample other student groups. Future longitudinal studies should also oversample Black and Latino students and students from low-income backgrounds.

This kind of approach should be part of a stronger effort from the U.S. Department of Education to produce and analyze data that helps understand the in-school experiences of underserved student groups. As Congress continues to consider reauthorization of the Education Sciences Reform Act (ESRA), we share two recommendations to ensure that understanding and addressing inequities in opportunity for students of color and students from low-income backgrounds is core to the federal government's K-12 education data and research agenda:

1. Ensure all the work conducted and supported by the Institute for Education Sciences (IES) and its centers prioritizes addressing inequities in educational opportunities and outcomes for students of color, students from low-income backgrounds, English learners, students with disabilities, LGBTQ+ students, students experiencing homelessness, students in the foster care system, and students who are impacted by the justice system.
2. Strengthen the Statewide Longitudinal Data Systems (SLDS) program to improve linkages of early childhood education data to K-12 student data. As necessary, this expanded program should require the National Center for Education Statistics (NCES) to develop stronger relationships with other departments, especially the Department of Health and Human Services, and should require NCES to work with those departments to provide technical assistance to states to improve similar intrastate, interagency collaboration.

POSSIBLE SOLUTIONS AND PROMISING PRACTICES

There are many actions that federal and state policymakers can take to address the longstanding, institutional challenges that deny high-achieving Black and Latino students and students from low-income backgrounds access to the higher-level math courses that will put them on a path to achieving their dreams.

WHAT SHOULD DISTRICT LEADERS DO?

District leaders have a clear role in this work because they are responsible for how federal and state policies and programs are implemented. For more information on the ways that district leaders can probe their data to understand root causes and address inequities in access to advanced coursework, see the Alliance for Resource Equity's guidebook on empowering, rigorous content.

RECOMMENDATIONS FOR FEDERAL POLICYMAKERS AND DECISION-MAKERS

The Advanced Coursework Equity Act would support efforts to increase enrollment and support the performance of student groups in advanced courses and programs.

Through the Advanced Coursework Equity Act and/or other means, Congress should support and incentivize state and district leaders to advance equity in access to and success in advanced coursework, including in math, in the following ways:

1. Require states to set goals

States should be required to set goals and create meaningful action plans for increasing access to and success in advanced coursework, including STEM coursework.

2. Create or increase funding for preparatory programs

Such programs should help students of color and students from low-income backgrounds access and receive credit for advanced courses and prepare for postsecondary STEM pathways. This could include Title IV in the Every Student Succeeds Act (ESSA), or a new competitive grant program for states and school districts to increase enrollment opportunities and success of underrepresented students in advanced courses and programs such as the Jumpstart on College Act.

3. Support higher education institutions to train teachers and school leaders of color

Increased funding for historically Black colleges and universities (HBCUs), minority-serving institutions (MSIs), Hispanic-serving institutions (HSIs), and tribal colleges and universities (TCUs); increased funding for the Higher Education Act (HEA) Title II-Part A; and funding for the Augustus Hawkins Centers of Excellence Grant program all provide crucial funding to HBCUs and MSIs to provide increased and enhanced clinical experience and increased financial aid to prospective teachers of color.

4. Support and incentivize states and districts to prioritize safe, equitable, and positive learning environments

Increased funding for whole-child supports will allow district and school leaders to hire adequate and well-trained support staff (restorative justice coordinators, school counselors, psychologists, nurses); provide professional development and coaching on topics such as reducing bias and anti-racist mindsets; provide curricular resources that are affirming of individual identities; engage and support families; and develop a positive school climate through alternatives to punitive and exclusionary discipline practices.

In addition, the Department of Education should support knowledge building to:

1. Improve equity in access to advanced coursework opportunities

Issuing guidance and providing technical assistance to state and district leaders and continuing implementation of the federal YOU Belong in STEM initiative can help improve access to advanced coursework for students of color, students from low-income backgrounds, and undocumented students.

2. Increase the racial and linguistic diversity of the teacher workforce

Disseminating guidance and reinstating a strengthened version of the guidance issued by the Departments of Education and Justice in 2014 related to the nondiscriminatory administration of school discipline, will provide state and district leaders with tools to help work toward hiring more teachers from diverse backgrounds.

3. Measure Advanced Placement (AP) course-taking and exam success

The Civil Rights Data Collection must include data on AP participation and passing, disaggregated by race and ethnicity, English learner status, disability status, and gender.

RECOMMENDATIONS FOR K-12 STATE POLICYMAKERS

State policymakers play a key role in expanding opportunities for underserved students to participate in advanced math programs that lead to equitable college opportunity. Here are some steps they can take:

1. Address institutional culture and low expectations

States can implement policies that require districts to offer professional development programs explicitly focused on shifting teachers' perception of math capability. Teachers can better understand the influence of high expectations on student achievement through professional learning opportunities dedicated to confronting implicit bias, adopting culturally responsive instruction, and applying data-driven decision-making. For example, California's 2023 Mathematics Framework provides guidance to help educators make math instruction culturally relevant, enabling marginalized students to see themselves in the curriculum and in STEM-related careers. New York's State Education Department developed culturally responsive guidelines to support school districts in developing and implementing policies that explicitly emphasize high expectations and rigorous instruction to promote improved outcomes for all students.

2. Update math standards to make learning more relevant and engaging

While high expectations and culturally responsive curricula can bolster student confidence and achievement, these practices must be supported by high-quality instruction to prepare underrepresented students to take high-level math. For example, instructors can use the history and nature of math in the curriculum to support the development of critical thinking and problem-solving skills. A study of the use of history in mathematics found that teachers who used historical examples, such as teaching the volume of pyramids, cones, and spheres, improved students' self-efficacy and math success. Georgia's new math standards, which is being implemented in fall 2023, aim to make math more applicable to the real world.

3. Reduce school counselor-to-student ratios in school districts with higher enrollments of Black and Latino students

From course-taking recommendations to career and postsecondary planning, school counselors play a key role in addressing disparities in college opportunity for students of color — yet underserved students face disparities in access to school counselors. Considering that high-achieving Black and Latino students are less likely to apply to selective intuitions that they qualify for, it's important for school counselors to make Black and Latino students aware that can be successful in such environments and encourage them to pursue elite college opportunities. Reducing caseloads can create opportunities for increased individualized attention for students, especially those from marginalized backgrounds that may be less informed about math course-taking requirements for their field of interest and the college landscape. Investing in school counselor support should also include ongoing professional development to help them understand the benefit of setting high standards for all students.

Teachers who used historical examples, such as teaching the volume of pyramids, cones, and spheres, improved students' self-efficacy and math success

4. Adopt automatic-enrollment policies

To address disparities in participation of students of color in accelerated math, forward-thinking states have implemented default placement programs that automatically enroll students in higher-level math courses based on prior achievement or demonstrated proficiency on standardized assessments. After North Carolina passed House Bill 986, approximately 8,000 students gained access to advanced math and were "placed-up" after previously being placed in regular or remedial math. Under a similar premise, Illinois introduced new legislation for the 2024-25 school year that includes automatic enrollment and teacher diversity goals designed to broaden access to AP and dual-enrollment courses to ensure that more Black and Latino meet University of Illinois admissions standards.

5. Support positive school climates and a student's sense of belonging in advanced classes

Underrepresentation of students in advanced math programs can contribute to feelings of isolation or a lack of belonging among the few Black and Latino students who take these courses in a majority White classroom. While an apparent step to boost diversity would be placing more high-achieving students of color in advanced math programs, schools can promote a positive school and classroom climate in other ways. State leaders should support districts in recruiting and retaining Black and Latino higher-level math educators and adopt curricula that encourage the full engagement of students of color. Reaching out to families in middle school can raise awareness of advanced math-learning opportunities. School leaders can also encourage peer mentoring and student-led math study groups designed to foster a sense of community for underrepresented students. Such initiatives can engage students in real-world learning opportunities and improve math learning experiences for high-achieving students of color.

RECOMMENDATIONS FOR HIGHER EDUCATION POLICYMAKERS

1. Don't just preach. Practice, update, and clarify

Higher education institutions need to take the lead in updating their math admissions practices to align with their policies. Students should feel confident that advanced math courses they are interested in taking (and meet the program or institutions' requirements) will receive equal credit and full consideration in admissions decisions. For example, Harvard University explicitly states that calculus is not a requirement for admissions and encourages students to take math courses that align with their program of study.

2. Provide early academic support programs

Academic enrichment programs geared toward competitive programs such as STEM can prepare promising students for math coursework essential for success and expose students to the institution's academic culture and expectations. Harvard University recently initiated a yearlong program to support incoming freshmen who attended lower-resourced schools. The program provides academic enrichment to enhance their skills, connections to scholars to foster a sense of community, and other supports to strengthen students' confidence and sense of readiness.

3. Analyze students' math courses in the context of their school's resources

Students' prior preparation and math learning experiences should be considered comprehensively. This ensures that their applications are assessed considering math course-taking opportunities available to them rather than traditional math requirements and assumptions of rigor. For example, The California Institute of Technology recently updated its long-standing calculus requirement for students with limited access to the course. A free online course is now offered through a partnership between the college and Khan Academy to prepare students and offer an alternate route to demonstrate mastery of the material. Some states have implemented top-percent plans to expand opportunities for promising students who attend lower-resourced schools. Texas, for instance, guarantees students who graduate in a top percentage of their high school class automatic admission to its state universities.

CONCLUSION

Every child deserves a high-quality education that addresses their unique needs and provides them with the resources they need to reach their full academic potential. Research continues to show that when students of all backgrounds feel welcomed and supported, classrooms become positive learning environments, where students are eager to learn more. Unfortunately, in too many schools across the country, this is not the case. There are many Black and Latino students and students from low-income backgrounds who have demonstrated an aptitude and are yearning for more — yet they are systemically denied access to advanced math courses. This practice — and mindset — must change. Right now, estimates show that nearly 80% of jobs over the next decade will require STEM skills. Ensuring that high-achieving students have access to advanced math courses is paramount — both for the students themselves and for our nation's economy.

Our analysis shows that students of color and students from low-income backgrounds who took advanced math courses have experiences with their math teachers' and school counselors' practices and perceptions that are different from their peers who did not take such courses.This adds a new facet to understanding how systemic biases can suppress the talent and performance of even high-achieving Black and Latino students. These findings provide further justification to reject the deficit-based, student-blaming explanations — such as prior preparation and socioeconomic status — of the disparities in math course placement. In other words, it is not the student, but the support they do — or do not — receive that determines their future success.

Education and policy leaders have the power to improve educational opportunities for underserved students and set them on the path to success. Our report lists several policy and recommendations for decision-makers at the federal and state level, as well as those in higher education. Each student's needs and experiences are different — so let's ensure that our leaders give all students the education they deserve.

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Endnotes

1. This quote is from interviews conducted in a separate study by the Monroe County suburban school districts to understand the disparities faced by students of color.
2. Clotfelter, et al., 2016; Long et al., 2012; Gottfried, et al., 2014
3. USDOE, 2016 & Berry, 2008
4. Cooper, 2009; Ma et al., 2019; Niehaus & Adelson, 2014
5. Morgan et al. 2022
6. Morales-Chicas & Graham, 2021
7. Attewell & Domina, 2008; Leow et al., 2004; Long et al., 2012
8. Findings for postsecondary completion are not presented because the coefficient of variation – a standard measure of stability – was too high. In addition, the available data are from 3 years after the 9th grade cohort's anticipated high school graduation year and therefore does not capture the end of what would have been students' senior year in college.
9. The SES measure is a composite variable that is based on parents' income, education, and occupation
10. Attewell & Domina, 2008
11. Long et al., 2012; Wainstein et al. 2023
12. Attewell & Domina, 2008
13. Attewell & Domina, 2008; Leow et al., 2004; Long et al., 2012
14. Statistically significant
15. Statistically significant
16. Statistically significant for Latino students and students from low SES backgrounds
17. All differences are statistically significant.
18. All differences are statistically significant.
19. Respondents were classified as a "Standard Enrollee" if they (1) enrolled in postsecondary education within 1 year of high school completion, and (2) were still enrolled as of February 2016, or had completed a postsecondary credential as of February 2016.
20. The difference among Latino students is statistically significant.
21. All differences are statistically significant.
22. Statistically significant for Latino students and students from low SES backgrounds.
23. Knight & Duncheon, 2020
24. Park et al., 2019
25. Teacher data is from students in ninth grade; many factors about students' experiences can change between the beginning and end of high school. However, examining educator practices in ninth grade provides an understanding of the foundations and could be indicative of other educator practices/beliefs in their schools.
26. Statistically significant.
27. All differences are statistically significant (chi-square test, $p<.05$).
28. Difference is statistically significant (chi-square test, $p<.05$).
29. Not statistically significant.
30. Differences among Black students were statistically significant; differences among Latino students and students from low SES backgrounds were neither significant nor meaningfully large.
31. Morales-Chicas & Graham, 2021

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EdTrust is committed to advancing policies and practices to dismantle the racial and economic barriers embedded in the American education system. Through our research and advocacy, EdTrust improves equity in education from preschool through college, engages diverse communities dedicated to education equity and justice, and increases political and public will to build an education system where students will thrive.

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