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# More Than Just Adding Courses: Evidence on Algebra and Equity from the American Mathematics Educator Study

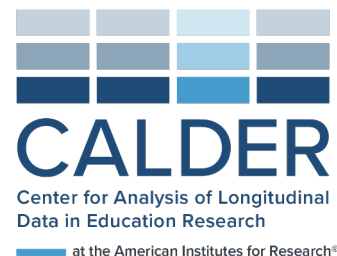
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This research brief summarizes findings from nationwide surveys of teachers and principals administered in 2023 and 2024 as part of the American Mathematics Educator Study (AMES). The brief is based on a working paper by RAND authors Lauren Covelli, Julia Kaufman, and Umut Özek, which examines how America's students access and experience algebra in 8th and 9th grade. To go deeper, [read the full working paper](#).

## KEY FINDINGS

### The Algebra Access Gap

Results from the American Mathematics Educator Study (AMES) surveys mirror findings from the U.S. Department of Education's Civil Rights Data Collection (U.S. Department of Education, 2021): the availability of algebra in the United States can vary depending on where a student goes to school.

On the AMES survey, principals in the highest-poverty schools (i.e., the top quartile) were four times more likely to report their schools didn't offer algebra in the 8th grade compared to their counterparts in the lowest-poverty schools (i.e., the bottom quartile).

While these differences may reflect schools' responses to their students' grade-level preparation, these disparities matter. Taking and passing algebra in 8<sup>th</sup> grade can impact a student's success in high school and beyond (McEachin et al., 2020; Long et al., 2012). As the late civil rights activist and math educator Bob Moses said, "Too many poor children and children of color are denied access to upper-level math classes—to full citizenship, really—because they don't know algebra" (Checkley, 2001). Although *requiring* all 8th graders to take algebra might have negative effects on unprepared students (Clotfelter, et al., 2015), not offering it at all limits opportunities for those who are ready.

### In Brief

Math achievement plays a pivotal role in students' success in school and beyond. Algebra, in particular, serves as a crucial gateway: it increases the chances a student takes advanced math in high school, which has implications for their college and career prospects.

In 2023 and 2024, the American Mathematics Educator Study (AMES) surveyed teachers and principals nationwide to learn more about how students access and experience algebra in 8<sup>th</sup> and 9<sup>th</sup> grade. A key finding from the surveys: schools serving mostly low-income students are far less likely to offer algebra in 8th grade compared to those serving more affluent students. The surveys also identified other issues that can hinder equitable access to algebra and math education, including:

- Uneven access to qualified math teachers.
- Math instruction that disproportionately focuses on remedial content in disadvantaged communities.
- Limited access to advanced math courses beyond algebra in high-poverty schools.
- Different approaches to algebra eligibility and achievement grouping (e.g., tracking) that may perpetuate inequity.

These systemic inequities—in both opportunities and experiences—suggest that making algebra more available is a necessary but insufficient step towards closing gaps in access to advanced math education.

## About the Survey

RAND administered the survey to nationally representative samples of teachers and principals from the American Teacher Panel (ATP) and American School Leader Panel (ASLP) in spring 2023 and 2024. Across all grades, the principal survey had completion rates of 33% (2023) and 29% (2024). The teacher survey had completion rates of 50% (2023) and 47% (2024). In this brief, we focus on principals and teachers responsible for 8th and 9th grades, the grades when students generally take algebra. After restricting the sample to principals in schools that serve 8th or 9th grades and to teachers who report teaching a math course, we are left with 3,102 unique principals and 999 unique teachers across the two survey years. We supplement the survey data with school-level characteristics, including urbanicity, student composition, grades served, school size from 2021 Common Core of Data (CCD), and a school-level poverty measure recently generated by the Urban Institute.

For more, see [AMES Technical Documentation \(2023\)](#). Documentation for 2024 is forthcoming.

**FIGURE 1. Schools serving students from low-income households are less likely to offer algebra in 8th grade than schools with more affluent populations.**

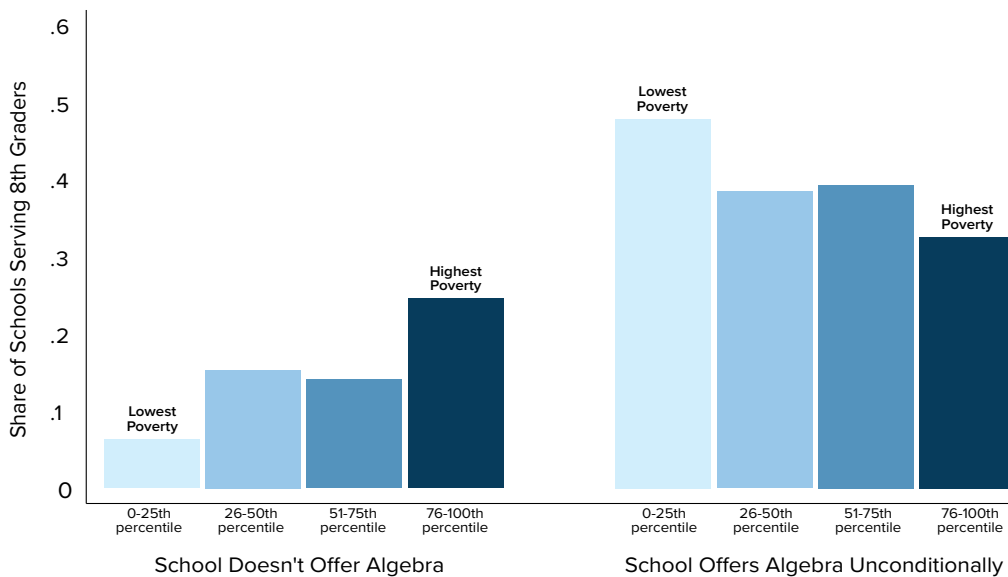


Figure 1 shows the raw differences in the likelihood that the school does not offer algebra in 8<sup>th</sup> grade (left panel) and the likelihood that the school offers algebra in 8<sup>th</sup> grade unconditionally (right panel) for all students (i.e., without needing to meet certain conditions) by school poverty quartile. We use model estimates of poverty in schools (or MEPS) developed by the Urban Institute as a proxy for school-level poverty.

## Beyond Course Availability

Besides differences in course availability, the AMES surveys identified other issues that can make it harder for students to receive a quality math education:

**Teacher Quality Gaps.** Math teachers in the highest-poverty schools were nearly three times more likely to come from alternative certification programs and 20 percent less likely to be single-subject certified in math compared to teachers in the lowest-poverty schools.

**Instructional Focus.** Teachers in high-poverty schools reported spending more time on below-grade-level topics and verbal instruction, and less time on grade-level content compared to teachers in low-poverty schools.

**Limited Advanced Courses Beyond Algebra.** The lowest-poverty high schools were more than twice as likely to offer AP Calculus and 50% more likely to offer AP Statistics compared to the highest-poverty schools.

The surveys also revealed differences in algebra eligibility and achievement grouping across schools, but their implications are unclear.

**Algebra Eligibility and Achievement Grouping.** Schools serving predominantly high-poverty students were more likely to report placing students in algebra at the principal's discretion, while more affluent schools relied on parental requests, teacher recommendations, or previous academic performance. The equity implications here are unclear—each approach could bias course assignments in different ways.

Higher-poverty schools were also more likely to use within-class achievement grouping (e.g., creating small groups in the same classroom based on student needs), while more affluent schools tended to separate students into different math courses based on achievement. These differences could signal that higher-poverty schools are intentionally avoiding tracking to support equity. But they may also reflect the fact that they may offer less varied course offerings (e.g., fewer advanced courses).

## THE BOTTOM LINE

Addressing gaps in algebra access and math achievement requires more than simply adding algebra courses in 8<sup>th</sup> grade, although doing so is an important first step. Policymakers interested in improving math access, performance, and equity also need to consider coordinated changes across multiple policy areas, for example:

- Requiring schools to use multiple, objective sources of information to place students in algebra (e.g., Dougherty et al., 2015).
- Using incentives to improve the distribution of math teachers across schools (e.g., CALDER, 2023).
- Investing in early grades math instruction to prepare students for later success (e.g., Xu et al., 2023).
- Expanding support for and access to advanced math options in high school (e.g., [SB 2124 in Texas](#)).

By addressing interconnected issues, schools could be better positioned to address persistent inequities in math access and math outcomes for more students.

To go deeper, read the full working paper:

Covelli, Kaufman, and Özek (2024). Socioeconomic and racial discrepancies in algebra access, teacher, and learning experiences. WR-A3554-1. RAND. [https://www.rand.org/pubs/working\\_papers/WRA3554-1.html](https://www.rand.org/pubs/working_papers/WRA3554-1.html).

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## SPOTLIGHT ON THREE STATES

In a prior CALDER brief (Backes et al., 2024), we looked at public data on math outcomes (and its limitations) in three states: California, Florida, and Texas. These states enroll large numbers of students from historically marginalized groups and have recently passed policies to improve math education and outcomes.

For example:

- In 2023, California passed a new K12 [mathematics framework](#). The framework provides high-level guidance on math instruction.
- In 2023, Florida's [HB703](#) required schools to identify K-4 students who are struggling in math (the bill addresses literacy as well) and provided individual interventions and support.
- In 2023, Texas [Senate Bill 2124](#) required each school district and open-enrollment charter school to develop an advanced mathematics program for middle school students that is designed to enable those students to enroll in Algebra I in eighth grade.

The AMES surveys included an oversample of teachers and principals in these three states, allowing us to look at some state-level variation that exists beneath the national results. Although differences in the states' policy environments provide some context for the results, interpretations that associate the results with policy choices are beyond the scope of this brief. For the full results see the Appendix in Covelli et al. (2024).

**The Algebra Access Gap.** Overall, schools in Florida and Texas appear more likely to offer algebra in 8th grade than schools in California. But principals in higher-poverty schools in California and Texas were, like the national findings, more likely to report their school does not offer 8th grade algebra (or offer it unconditionally for all students) than more advantaged schools. In Florida, however, algebra was offered more consistently across different types of schools.

**Teacher Quality Gaps.** In Florida and Texas, nearly one-third of 8th and 9th grade math teachers completed alternative certification programs while only 16 percent of 8th and 9th grade math teachers in California did. Math teachers in California are also less likely to report that they did not student teach as part of their teacher preparation program (21 percent

in California versus 28 percent in Florida and 27 percent in Texas).

**Instructional Focus.** 8th and 9th grade math teachers in California were more likely to report that they spend more than half of their classroom time addressing math topics below grade level, while math teachers in Texas were more likely to report that they spend more than half of their instruction time maintaining order/disciplining students.

**Limited Advanced Courses.** Higher-poverty schools in all three states are less likely to offer advanced math courses (geometry in 7th or 8th grades, or AP Calculus in high school) compared to schools serving students from more affluent families. Even when students have access to algebra, they may not have opportunities to take more advanced courses.

**Algebra Eligibility.** Most principals in Florida reported using standardized test scores (84%) and prior course grades (82%) to place students in algebra. Both practices appear to be less common in Texas and California. Looking across school settings, standardized test scores and prior course grades were significantly less likely to be used in higher-poverty schools in California and grades were less likely to be used in schools serving higher-shares of Black/Hispanic students in Texas.

**Achievement Grouping.** Principals in Florida were significantly more likely to report tracking students by achievement across math courses (52 percent in Florida compared to 23 percent in California and 21 percent in Texas). Consistent with the national findings, principals in higher-poverty schools were less likely to engage in achievement grouping across math courses (especially in California and Texas), although in almost all cases, these differences are not statistically distinguishable from zero at conventional levels.

Overall, the survey results for the three states suggest algebra access, placement policies, and instructional practices vary across contexts.

Florida, for example, generally offers more consistent access to 8th grade algebra, uses more standardized placement methods, and uses achievement grouping more heavily. One possible explanation is that the state's school accountability system incentivizes schools to offer algebra in 8th grade and enroll students who are more likely to pass the course (Florida Department of Education,

2023).

California and Texas show greater disparities in algebra access based on school poverty. Teacher preparation also varies, with Florida and Texas employing a higher proportion of alternatively certified math teachers compared to California. California teachers were also more likely to spend time on below-grade-level topics and Texas teachers said they dedicated more time to classroom management.

Consistent with broader findings, higher-poverty schools across all three states tend to offer fewer advanced math courses—although the specific patterns and magnitudes of the disparities vary.

The broader point from the national results remains: these problems are interconnected and require multi-faceted solutions.

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