



# Ability Signals and Rigorous Coursework: Evidence from AP Calculus Participation

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## POLICY ISSUE

Fewer Black, Hispanic, and economically disadvantaged students take rigorous math coursework and pursue careers in science, technology, engineering, and math (STEM) fields than their White and Asian peers. Implicit or explicit signals of students’ perceived ability in these subjects may be contributing to gaps in student access, engagement, and success by influencing which students choose or are assigned to rigorous math coursework in high school.

This study examines how one signal of ability—whether a student achieves “Advanced” status on Massachusetts’ 10th grade statewide standardized assessment—effects subsequent enrollment in Advanced Placement (AP) Calculus courses. The findings suggest that ability signals can positively influence choices around student enrollment, either by changing students’ and families’ course choices or by changing teachers’ and counselors’ decisions about whom to assign to such courses.

Establishing more predictive signals and increasing transparency in the course placement process may reduce perception-based biases and narrow racial and economic disparities in student enrollment.

## STUDY DATA & FINDINGS

This study compares future course-taking and performance for students that score just above and below the top achievement category (Advanced) on Massachusetts’ 10th grade math test. Students just above and below this threshold have similar demographics and mathematical skill; their only difference is whether they receive this positive signal. The authors find:

- **There are large gaps in AP Calculus course-taking by race/ethnicity and by income.** Black or Hispanic students are 8 percentage points less likely to take AP Calculus than their White peers. Students receiving free/reduced lunch are 9 percentage points less likely to take AP Calculus than their peers.
- **For Black and Hispanic students, receiving an Advanced score substantially increases their likelihood of enrollment in AP Calculus; the enrollment of White and Asian students is unaffected by this signal.** The Advanced signal

## KEY FINDINGS

Achieving an Advanced on the 10th grade math test affects students’ likelihood of enrolling in AP Calculus.

<b>1.5X</b> MORE LIKELY	Low Income Students
<b>2X</b> MORE LIKELY	Black/Latinx Students
<b>3X</b> MORE LIKELY	Black/Latinx Students with low reading scores
<b>NO DIFFERENCE</b>	White & Asian Students

raises enrollment rates of Black and Hispanic students by 2.5 percentage points—nearly twice the AP Calculus course-taking rates of students who score just below the Advanced threshold.

- **The enrollment effects are even larger for Black and Hispanic students with low reading scores.**

Students in these groups who achieved an Advanced score on the math test were two to three times more likely to enroll in AP Calculus than peers with higher reading scores. This suggests that the math ability signal carries even greater weight for students without other markers of potential.

- **The Advanced threshold may be set too low.** Students of all races/ethnicities induced to take AP Calculus as a result of an Advanced score tend to earn grades below a B or an AP exam score below a 3. This suggests the Advanced threshold may be set too low, and that future efforts

to increase AP enrollment should focus on higher-scoring students.

## POLICY IMPLICATIONS

That the Advanced signal has little effect on AP Calculus course-taking for the average Massachusetts high school student but meaningfully increases enrollment rates for Black or Hispanic students has important policy implications for state, district, and school leaders.

First, as a system, the results suggest that more attention should be paid to the positive or negative signals sent to students about their ability. Results of prior studies suggest that traditionally disadvantaged students receive, on balance, more negative signals than others. This study demonstrates that positive signals can influence the decisions of students, their families, or their teachers, and even overcome other indicators or perceptions of low ability.

The results also suggest that states and districts should consider devising signals to students and their educators that are clearer and more predictive of success towards a specific outcome. At the very least, these signals could serve as a check on biases that may exist in the current enrollment and placement processes.

## FULL REPORT

For the complete working paper, visit [wheelockpolicycenter.org](http://wheelockpolicycenter.org).

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