Getting Down to FACTS

Research Brief | May 2026

Mathematics in California: Gaps, Capacity, and Implementation

Elizabeth Huffaker, Dion Burns, Desiree Carver-Thomas, Linda Darling-Hammond, Kramer Dykeman, H. Alix Gallagher, Danielle M. Gomez, Shira Haderlein, Jacob Jackson, Tara Kini, Michal Kurlaender, Beryl Larson, Melanie Leung-Gagné, Yiwang Li, Susanna Loeb, Susan K. Patrick, Morgan S. Polikoff, Heather Price, Sean Reardon, Sherrie Reed, Thomas M. Smith, Lucy Sorensen, Tiffany S. Tan, Lisa Towne

Stanford | SCALE Initiative
Accelerator for Learning

Getting Down to FACTS

Introduction

California's math and literacy trajectories have diverged over the past decade in two important ways. Achievement gaps have widened in math while narrowing in reading, and math has received less consistent state and district attention than literacy. The income-based gap in math grew by roughly 40 percent between 2009 and 2024, while the comparable reading gap narrowed by about 5 percent (Reardon). Districts rank math a distant third priority behind English Language Arts and social-emotional learning (Gallagher et al.). California is now at a consequential moment: the state adopted a new Mathematics Framework in 2023, released its first aligned instructional materials list in November 2025, and is entering a period in which decisions about implementation are likely to shape K–12 math for the next decade.

Key Findings

1 Math achievement gaps by income, race, and gender have grown in California over the past decade..

These disparities emerge early and continue to widen as students move through K–8. The math gap is already visible before third grade and grows within cohorts over time, suggesting that both where students begin and how they progress through math instruction contribute to widening inequality. Reading shows no comparable pattern of within-cohort widening (Reardon).

2 Districts deprioritize math, and the state's instructional vision has not connected strongly with local practice.

District leaders rank literacy as a much higher priority than math, and most districts have not treated the 2023 Mathematics Framework as a central driver of their work. While literacy operates with dedicated funding, assessment emphasis, and a clearer implementation chain, math lacks a comparable policy architecture (Gallagher et al.).

3 Districts lack the capacity to support strong math instruction across staffing, professional learning, and system coordination.

Highest-need districts face the greatest difficulty hiring and retaining prepared math teachers, and the dominant credentialing pathway compresses preparation into a single post-baccalaureate year. Professional learning in math is limited and usually voluntary, while districts must navigate a fragmented materials-adoption process and more than 50 state

initiatives without clear signals about quality or priority (Gallagher et al.; Leung-Gagné; Smith and Li).

4 **Advanced math course-taking has declined, even though it remains strongly associated with college enrollment.**

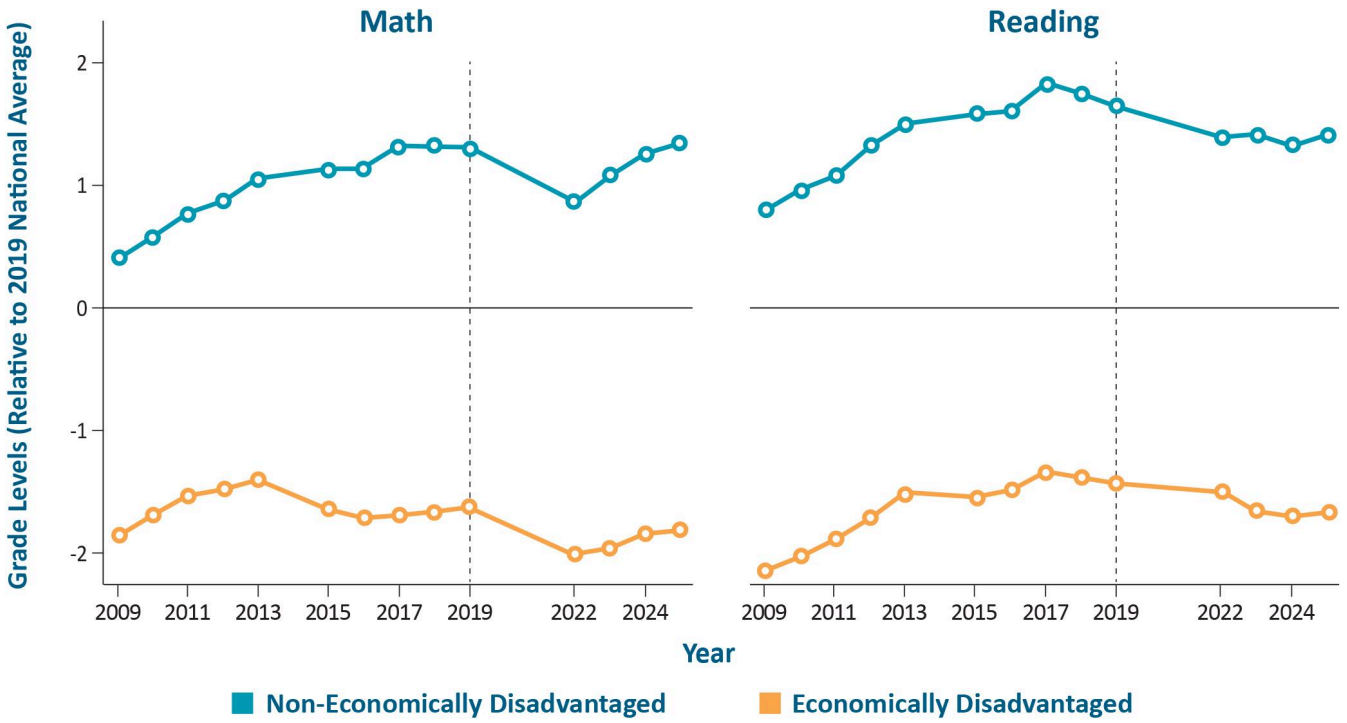
As many California districts reduced access to eighth-grade algebra, participation in advanced math later in high school also fell, especially in calculus and precalculus. Although the URM/non-URM gap narrowed, it did so largely by reducing access among more advantaged students rather than expanding access among those historically underrepresented. Students who complete advanced math courses continue to enroll in four-year colleges at substantially higher rates, with especially large returns for low-income students (Huffaker; Kurlaender; Reed; Burns and Price).

The Evidence Behind These Findings

Math achievement gaps by income, race, and gender have grown in California over the past decade

California has made gains in K–12 math. CA students' scores improved more than the national average between 2003 and 2019, declined less during COVID, and remain well above 2003 levels (Reardon). However, this has been driven primarily by continued growth in high-SES districts. Low-SES districts saw declines in two windows — 2013–2015 (likely tied to the SBAC and Common Core rollout) and 2019–2022 (COVID) — with partial recovery by 2024 that tracks the national pattern (Reardon; Huffaker). The gap between students from the highest- and lowest-income California districts grew from roughly 1.9 grade levels in 2009 to 2.7 in 2024, a 40 percent increase (Reardon). The analogous reading gap has narrowed by about 5 percent since 2015 and is essentially unchanged since 2009. California's between-district math gap is now about 0.4 grade levels (roughly 17 percent) larger than the analogous gap nationally, while the state's reading gap between districts tracks the national pattern. On the most recent state assessment, fewer than one in five California eighth graders met grade-level math standards, compared with roughly two in five in English language arts (Gallagher et al.).

Figure 1: Math gap widening vs. ELA gap narrowing, California 2009–2024 (Reardon)

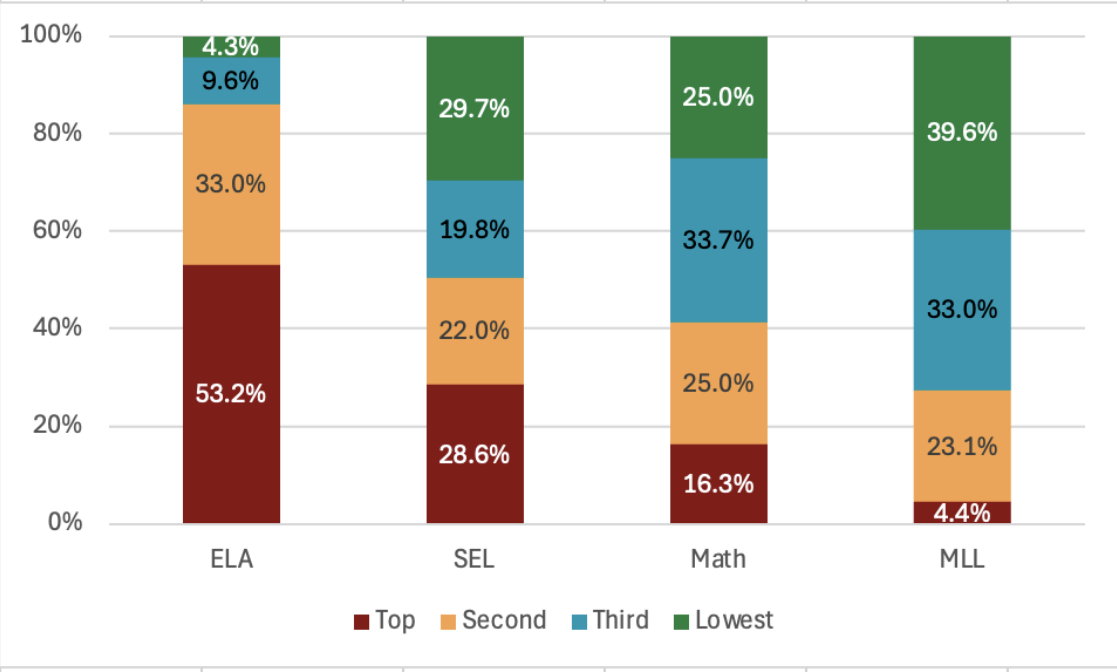


Disparities have widened along multiple dimensions since 2019: the economic math gap grew by 6 percent, and the White–Hispanic and White–Black math gaps each grew by roughly 10 percent (Reardon). A new gender gap has also opened: girls now perform 0.4 grade levels behind boys, after roughly a decade of parity. Reading shows none of these patterns. The math gap widens actively as students move through K–8: between-district gaps grow within cohorts from third through eighth grade (Reardon), meaning students in higher-SES districts learn more math over this stretch. Reading shows no analogous within-cohort widening. The widening also takes hold early — the 3rd-grade math gap between high- and low-income districts is about 50 percent larger in 2024 than in 2009.

Districts deprioritize math, and the state's instructional vision has not connected strongly with local practice

The gap between California's stated math priorities and what reaches districts and classrooms is significant and operates at both the state and district levels.

Figure 2: Share of districts naming each content area as top priority (Gallagher et al., Figure 1; n=91)



Math ranks below both literacy and social-emotional learning as a priority. California's literacy investments operate through a structured implementation chain (including SB 114, AB 1454, AB 121, and the AB 181 Literacy Coaches Grant); math has no equivalent legislative or funding architecture, a pattern one superintendent described in terms of sequential, mutually exclusive reform windows: "We were all in on literacy. It's really hard to do literacy and math at the same time" (Gallagher et al.).

The 2023 California Mathematics Framework (CMF) was the state's ambitious attempt to set a common direction for K–8 math instruction, but district practice has not aligned with this vision. Only one quarter of district leaders cite the Framework as a major driver of their math work, and 30 percent say it is not a driver at all; more than three-quarters cite the standards as the primary driver (Gallagher et al.). District leaders cite the CMF's overwhelming 900-page scope and misalignment with current educator content knowledge as major challenges, while a few noted disagreement with recommendations and political controversy as additional reasons it struggled to connect. One district leader captured the capacity-mismatch plainly: "Sometimes we design for maybe the top 10% of teachers who really can do this. Meanwhile there's 90% of teachers who are just like, 'I don't know what you're talking about'" (Gallagher et al.). Another illustrated substantive disagreement: "We wholly disagree that providing advanced math pathways at the middle school level creates inequity… the framework is not something that we're spending much time working with as a tool on purpose" (Gallagher et al.). However, the disengagement does not seem to be primarily philosophical. Rather, the scope of the CMF, and its primary engagement at the level of "big ideas," presents a challenge for

classroom implementation even to teachers enthusiastic about its emphasis on conceptual and problem-solving approaches. This implementation challenge is consistent with the most named supplementary program across the interviews being *Building Thinking Classrooms*, a book and consultancy broadly aligned with the CMF's inquiry-oriented vision but focused on providing scaffolded, concrete routines that teachers can translate directly into classroom practice (Gallagher et al.).

Leaders also grapple with whether the CMF's emphasis is implementable given typical teacher skill, especially in elementary districts. One explained: "Many of our elementary teachers do not have deep content knowledge in math, which makes it difficult to teach conceptually" (Gallagher et al.). Others question whether the CMF strikes the right balance between inquiry and foundational practice, with several pointing to substantial heterogeneity in students' prerequisite knowledge as a key challenge. One superintendent summarized: "we've been really focusing on [a conceptual] approach. We've also learned that there's a lack in terms of just math fluency for our students— making sure that there is that balanced skill for our students to be successful" (Gallagher et al.). One district profiled by Gallagher and colleagues models a deliberate pairing of procedural fluency and reasoning: it features short daily routines focused on problem solving, while leaders remain "really big on math facts" and computational accuracy. In this district's theory of action, an emphasis on procedural skill grounded in automaticity with math facts is treated as a foundation for the multi-step reasoning the CMF envisions.

Operating without a coherent interpretive frame, districts navigate consequential decisions about acceleration, materials adoption, and pathway design with substantial state investment but limited direction. The 2025 SBE-approved K–8 mathematics instructional materials list includes 38 titles, without making meaningful distinction among them in quality or CMF alignment. Rigorous pilot-based evaluation is beyond most districts' capacity; without clearer state quality signals, decisions are made based on publisher pitches. State support for K–8 math more broadly reaches districts through what Gallagher et al. describe as fifty or more initiatives with limited cohesion.

Districts lack the capacity to support strong math instruction across staffing, professional learning, and system coordination

California's high-need schools face the steepest math staffing constraints. In schools serving the highest concentrations of low-income students, English learners, and foster youth, only about 70 percent of math teachers hold a full credential, compared with roughly 82 percent in lowest-need schools (Leung-Gagné). Over four in ten TK–8 district leaders report relying on underprepared teachers for one or more middle-school math positions, with rates far higher in central and northern regions (55 percent) than in southern regions (12 percent) (Gallagher et al.). Smith and Li show the broader pipeline has shifted: the share of new California teachers entering through student-teaching fell from 63.5 percent to 39.4 percent, while those entering on emergency permits rose from 10 percent to 30 percent. Recent state investments show early signs of working: new preliminary credentials issued to

California-prepared individuals grew 40 percent between 2022–23 and 2024–25, and California has invested more than $2 billion in workforce supports since 2016 — though many of these programs are scheduled to sunset (Leung-Gagné).

Once teachers are hired, ongoing development infrastructure is thin. One in five districts offered no consistent math professional development in 2024–25, and most existing opportunities are voluntary (Gallagher et al.). Voluntary PD compounds the challenges of math deprioritization: Teachers who lack interest in or comfort with math instruction are less likely to opt for development opportunities. District-level instructional support is also stretched: though more than three-quarters of districts have at least one TOSA, most cover multiple subjects, schools, and administrative duties. Even dedicated math TOSAs are overburdened — in Gallagher et al's site-visit districts, one covered 12+ elementary schools; another supported 50+ teachers.

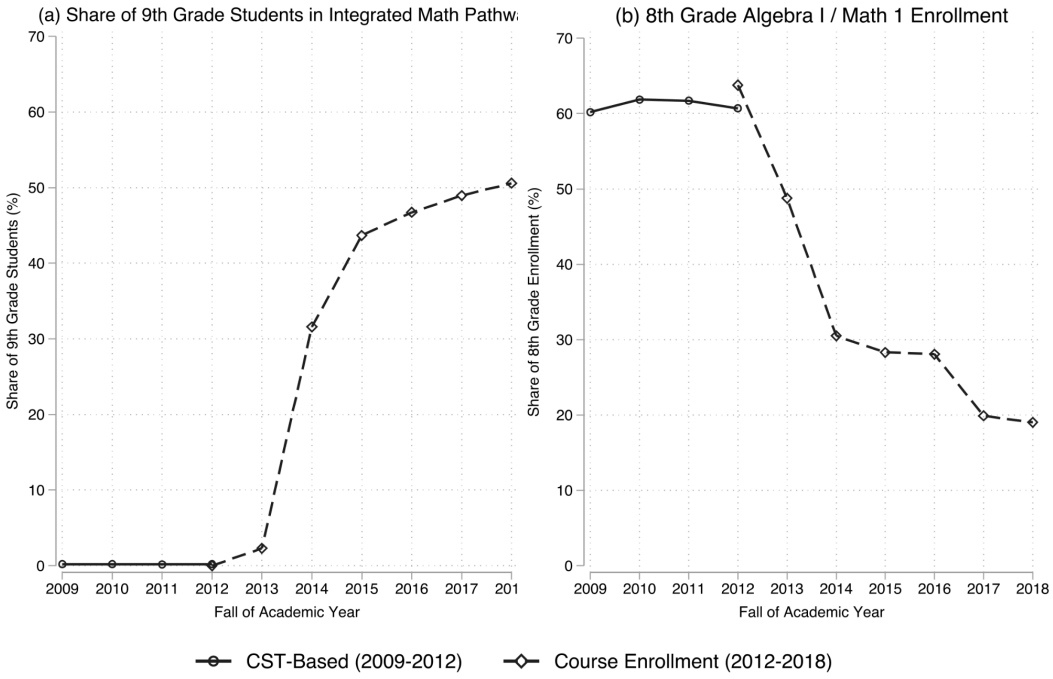
Beyond workforce gaps, districts navigate a fragmented state support system with limited help. About one-third moved ahead of the state's November 2025 list to adopt materials independently, and 12 percent report having no Transitional Kindergarten math materials, being uncertain about what materials are in use, or adapting kindergarten materials for TK (Gallagher et al.). As one superintendent put it, the system is "resource-rich, coordination-poor".

Advanced math course-taking has declined, even though it remains strongly associated with college enrollment

The Common Core era saw marked changes to secondary-math pathways. For instance, 56 percent of California's high-school-serving districts, encompassing half of all students, adopted a sequence of integrated mathematics courses in place of the traditional Algebra I, Geometry, Algebra II core. Relative to the conventional pathway, students in these districts saw equal or modestly higher 11th grade SBAC scores than their estimated achievement, although slightly lower rates of advanced course-taking.

However, the most consequential secondary-math reform of the past decade was the broad rollback of access to high-school math in middle school among most districts. Among eighth graders at districts where student trajectories can be tracked through high school (capturing three quarters of students) the share enrolled in Algebra I or Math 1 fell from 64 percent in 2012–13 to 19 percent by 2018, with virtual elimination in many districts (Huffaker).

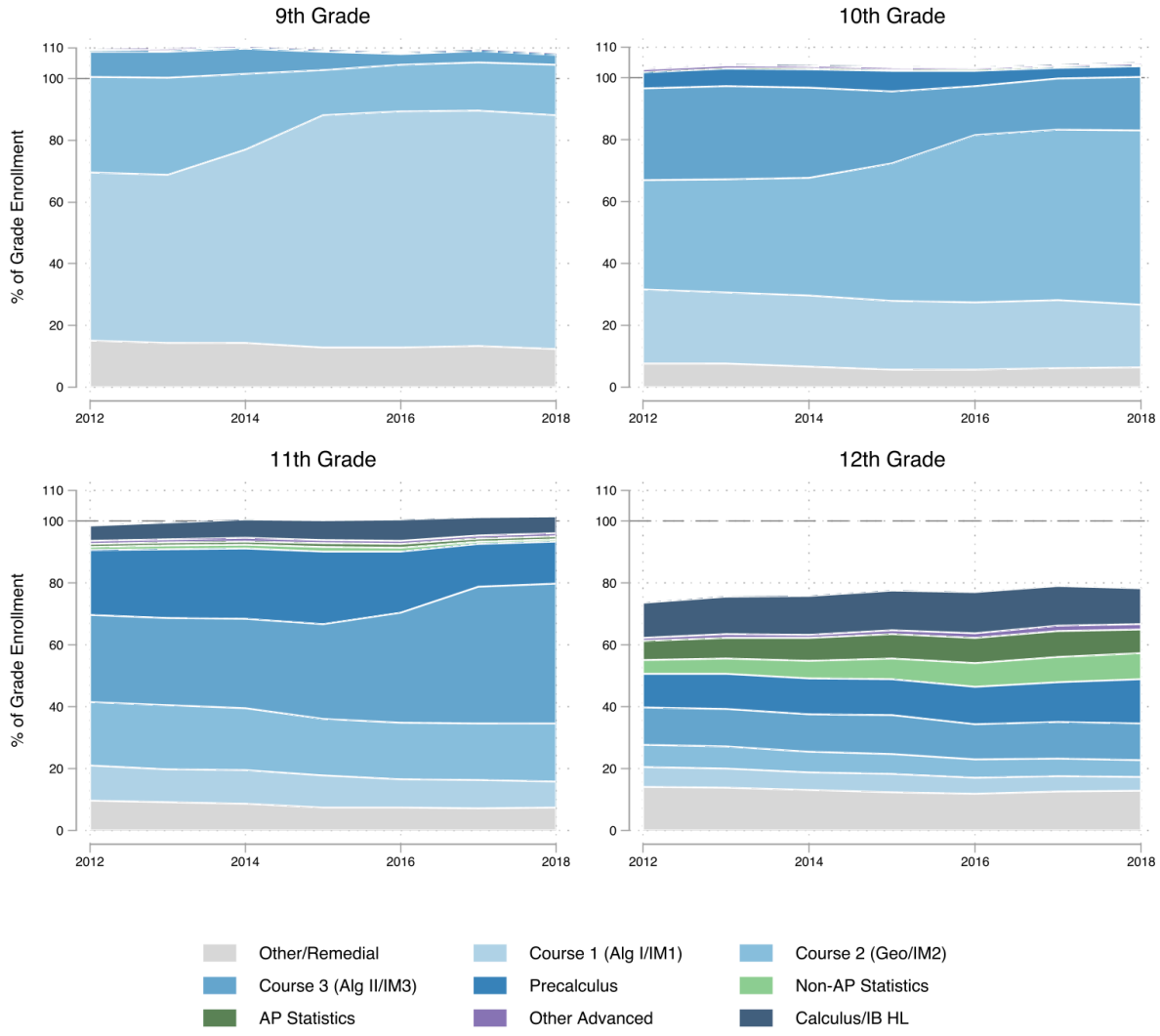
Figure 3: Enrollment-weighted district-level pathway reform



Notes: (a) 9th grade integrated math share (N = 395 districts) and (b) 8th-grade Algebra I / Math 1 enrollment shares (N = 330; unified and eighth-grade serving high school districts). 2009-2012 = CST testing rosters ; 2012-2018 CALPADS course enrollment. Source: CDE *(Huffaker).*

While some adjustment to the challenges of the "Algebra for All" era was warranted, this dramatic swing reduced cohort-tracked advanced math course-taking by roughly two to three percentage points at the end of high school – an approximate one percentage point drop for every ten percentage points of 8th-grade math access removed. The decline was concentrated in calculus (a 1.2 pp reduction, roughly 14 percent of the 8.7-percent baseline) and precalculus (Huffaker). To the extent these reforms narrowed racial gaps in advanced access, it was by reducing access among non-underrepresented minority (URM) groups rather than by expanding access for URM students (Huffaker). These course-taking patterns appear durable: A 2025 stratified random-sample of superintendents reported known 8th-grade algebra rates (mean 20 percent, median 15 percent) that track 2018 administrative data (Gallagher et al.). At the same time, enrollment in advanced secondary coursework remains strongly linked with postsecondary outcomes. Among California public high school students who reached Algebra 2 by 11th grade, those who went on to take Precalculus enrolled in four-year colleges at rates 19 percentage points higher than those who took no course beyond Algebra 2; AP Statistics enrollees attended four-year colleges at rates 31 percentage points higher; calculus enrollees at 38 percentage points higher (Dykeman).

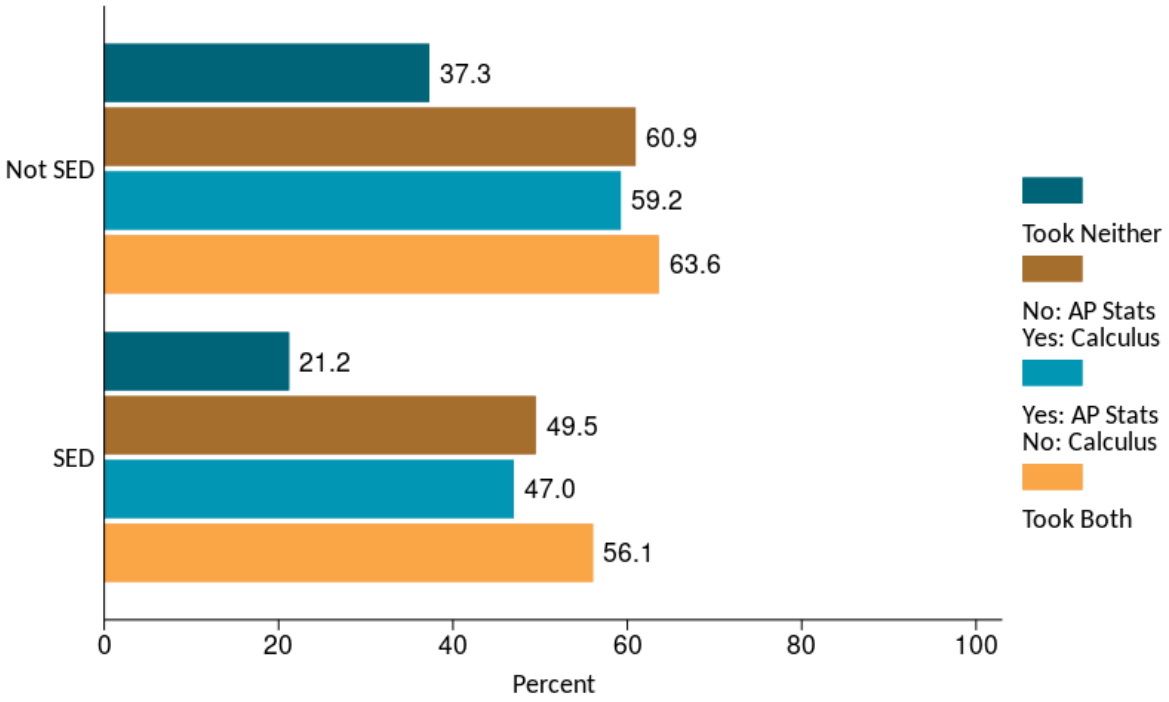
Figure 4: Course-composition shift in high school math, by grade and year



Notes: Shares may exceed 100% because of multiple student math enrollments within a year. 2012-2018 CALPADS course enrollment. Source: CDE (Huffaker).

Returns to advanced math course-taking are larger for students from socioeconomically disadvantaged backgrounds: students who take both AP Statistics and Calculus enroll in four-year colleges at rates 31 percentage points higher than peers who took neither, compared with a 26-point difference for non-SED students. Reed and colleagues find substantial school-level variation in advanced course access (school-level IQRs of 20–53 percent for precalculus participation and 38–72 percent for A–G completion). School size, student-body composition, and geographic locale do not fully explain these differences; within-school placement decisions are a major mechanism.

Figure 5: Four-year college enrollment rates by terminal high-school math course, with SED disaggregation (Kurlaender/Dykeman)



Implications for California

The research points to five areas where the evidence has direct bearing on decisions California is now facing.

A stronger Tier I and Tier II foundation for K–8 math, anchored in foundational numeracy

The first finding suggests that students who struggle in math in the early grades are often left behind and rarely catch up, which gives particular importance to a stronger foundation across both Tier I and Tier II supports. Among Tier II approaches, high-impact tutoring has the strongest evidence base: Loeb and Ziegler document average effects of 0.36 standard deviations when tutoring programs include frequent sessions, small group sizes, alignment with core instruction, and sustained tutor-student relationships. For Tier I instruction, the Institute for Education Science practice guide for supporting struggling math learners points to systematic instruction on foundational skills and vocabulary using strategic representations (e.g., number lines) as important components of effective support. Given how early math disparities emerge, attention to foundational skills in the early grades appears especially important. An early-grade math screening requirement analogous to California's literacy screening

infrastructure is now under legislative consideration through SB 1067. At the same time, the evidence base for early-math screeners remains thinner than for early literacy, making the quality and validation of any screening approach an important implementation issue.

California's recent experience also suggests that coherent, targeted investment can matter. Burns and Price document that the math gap between students ever classified as English learners and never-EL peers narrowed across kindergarten cohorts entering between 2011 and 2015, alongside state investments in Transitional Kindergarten and educator supports.

A policy architecture for math comparable to literacy's: legislative stack, funding, and accountability signals

The state's instructional vision for math has not been backed by the kinds of structures literacy has received. Literacy now operates with a legislative stack, dedicated coaching infrastructure, and an implementation chain that connects standards to classroom practice. The broader implication is that math improvement depends on a more stable policy architecture, with sustained funding, clearer implementation supports, and stronger accountability signals. SBAC already functions as one such signal: Gallagher et al. reports that districts consistently identify state test scores as drivers of instructional priorities, suggesting that California already has a lever it could build on more deliberately.

Other states illustrate what a stronger priority architecture can look like. Alabama's 2022 Numeracy Act established an Office of Mathematics Improvement, revised teacher preparation, and placed a full-time K–5 math coach in every school. In the two years following implementation, Alabama recorded the largest NAEP fourth-grade math score gain in the nation. The relevance of this example is not that California should replicate Alabama directly, but that sustained state prioritization in mathematics can be built through linked policy, funding, and support structures.

Clearer state signals on instructional materials, quality, and evidence

Districts are currently making consequential decisions about instructional materials, placement, and implementation without especially strong state signals about quality or alignment. California's current K–8 math materials adoption process does not differentiate among approved titles on quality or framework alignment, and districts often lack the capacity to conduct rigorous evaluations on their own. This suggests the importance of a state role that provides more structure around materials quality, evidence, and implementation support without necessarily prescribing a single instructional approach.

One concrete example comes from Massachusetts' CURATE process, which provides public educator-panel evaluations of instructional materials against common research-based criteria. More

transparent quality signals, independent review, and clearer public reporting could help California districts navigate adoption decisions with more confidence and consistency.

These clarity challenges are heightened by the absence of a widely shared consensus about K–12 math instruction. Unlike in reading, where the science-of-reading movement has created a recognizable common language around early instruction, math lacks an equivalent organizing framework. Some district leaders explicitly identify this gap. At the same time, authoritative sources diverge visibly, and the brief's purpose is not to resolve those debates. Rather, the implication is that California may need stronger mechanisms for transparency, independent evaluation, and learning-outcomes-based review if districts are expected to navigate a contested instructional landscape.

A more deliberate approach to instructional and workforce capacity, drawing on state and cross-sector models

The evidence suggests that instructional improvement in math depends not only on curriculum and policy, but also on whether California builds sufficient instructional and workforce capacity to support implementation. California already has internal foundations to build from. The Golden State Teacher Grant reaches 45 percent of new teacher candidates, preliminary credentials issued to California-prepared individuals rose 40 percent between 2022–23 and 2024–25, and LCFF priority-school funding has been associated with measurable gains. The AB 181 Literacy Coaches and Reading Specialists Grant offers a possible domain-parallel model for math coaching architecture, while the SB 153 Math Professional Learning Partnership provides an early statewide framework that may require greater scale and durability if it is to shift practice broadly.

Many of these investments, however, are scheduled to sunset. Cross-sector and cross-state examples suggest that workforce and instructional capacity often improve when supports are sustained, specialized, and embedded in day-to-day work. Louisiana's literacy coaching model and Alabama's revised math preparation requirements illustrate this point. The broader implication is that California's math improvement efforts may depend on whether promising initiatives become durable enough to shape staffing, preparation, and instructional support at scale.

A more systematic strategy to advanced-math placement, including automatic enrollment

The revised Mathematics Framework endorses middle school acceleration for some students, but it does not offer especially clear guidance for determining who should be accelerated. Drawing on surveys from Gallagher and colleagues, Huffaker reports that school and district leaders struggle to balance fairness and achievement when making placement decisions, especially under pressure from

families and local expectations. This points to the importance of a more systematic approach to advanced-math placement.

Automatic-enrollment or opt-out policies are one increasingly common mechanism for addressing these challenges. Several states, including Washington, Virginia, North Carolina, and Texas, now use versions of this approach to advance students who meet assessment-based thresholds into advanced coursework. These policies reduce reliance on traditional gatekeeping, avoid placing the burden on students and families to navigate opt-in systems, and still preserve a degree of choice. The significance of these models for California is that they offer a more structured way to manage acceleration decisions in a context where placement remains both consequential and uneven.

Conclusion

California's recent experience in mathematics shows that progress depends on improving classroom instruction while also aligning policy, capacity, and implementation. The state has made gains overall, but widening gaps by income, race, and gender, uneven district capacity, and declining access to advanced coursework make clear that improvement has not been broadly shared.

The evidence in this brief points to a central challenge for California's next phase of math improvement: whether the state can build the coherence and support structures needed to make math a sustained priority. That includes stronger foundations in early mathematics, clearer state signals on instructional materials and quality, more durable instructional and workforce capacity, and more systematic approaches to advanced-math placement. Without that kind of coherence, California risks allowing math opportunity to become even more unevenly distributed. With it, the state has a stronger chance of making high-quality math learning more broadly available across schools and student groups.

GDTFIII Technical Reports Referenced

Burns, D., & Price, H. (2026). *Multilingual learners of English: Progress of California's English learners and the resources that support their educational achievements*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Gallagher, H. A., Towne, L., Gomez, D. M., & Loeb, S. (2026). *The California state role in supporting district capacity for TK–8 math improvement*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Huffaker, E. (2026). *Adoption windows and reform: California's math pathways in the Common Core era*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Kurlaender, M., Reed, S., Hurtt, A., Jackson, J., Larson, B., & Dykeman, K. (2026). *High school coursetaking in California: A primer*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Leung-Gagné, M., Carver-Thomas, D., Sorensen, L., Kini, T., Patrick, S. K., Tan, T. S., & Darling-Hammond, L. (2026). *Trends in California's teacher workforce: Understanding supply, demand, and shortages*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Loeb, S., & Ziegler, L. (2026). *Beyond the whole class: Systematizing engaging, individualized support at scale*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Reardon, S. (2026). *Recent academic achievement trends in California*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Smith, T. M., & Li, Y. (2026). *Who stays, who leaves: Five-year retention patterns by teacher entry pathways*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Additional References

Alabama Legislature. (2022). *Alabama Numeracy Act, SB 171, Act No. 2022-249*.

California Legislature. (2024b). *Senate Bill 153: Math Professional Learning Partnership*.

California Legislature. (2025b). *Senate Bill 1067: Early-elementary math-difficulty screening*.

Dykeman, K., Jackson, J., Kurlaender, M., Larson, B., & Reed, S. (2026). *Does your math pathway make a difference? High school mathematics and college outcomes*. *Getting Down to Facts III*, SCALE Initiative, Stanford University.

Fuchs, L. S., Newman-Gonchar, R., Schumacher, R., Dougherty, B., Bucka, N., Karp, K. S., Woodward, J., Clarke, B., Jordan, N. C., Gersten, R., Jayanthi, M., Keating, B., & Morgan, S. (2021). *Assisting students struggling with mathematics: Intervention in the elementary grades* (NCEE 2021-006). National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.

Massachusetts Department of Elementary and Secondary Education, & Rennie Center for Education Research & Policy. (n.d.). *CURATE: Curriculum Ratings by Teachers*.