

Testimony on K12 Math Education in California

Assembly Committee on Education

October 13, 2026

Linda Darling-Hammond

Good morning, Chair Patel and members of the committee. Thank you for this opportunity to offer testimony on the legislature's consideration of how to improve mathematics teaching and learning in California. I am Linda Darling-Hammond, Founding President and Chief Knowledge Officer at the Learning Policy Institute (LPI). I will discuss California's current status and overall progress in relation to recent challenges and investments in 3 areas: staffing, curriculum and materials, and state and local capacity, with attention to how we can build an increasingly coherent approach to tackling this critical area.

California's progress in math

The need for a comprehensive, coherent approach to mathematics improvement in CA is apparent. For many years, the US has scored well below the international average in mathematics on the Programme for International Student Assessment, or PISA, and California has scored well below the US average on the National Assessment of Educational Progress (NAEP). While the state made stronger progress than most between 2013 and 2019, we fell back during the pandemic, along with nearly all other states. Over the last 3 years, since the adoption of our mathematics framework, we have begun to turn around the negative trends on the NAEP, where CA gains in proficiency rates in 4th and 8th grade were stronger than the national average gains between 2022 and 2024. And we have seen 3 years of small but steady gains in math on our state test (CAASPP).

However, there is still a long way to go. In 2024-25, about 38% of our students scored at proficient or advanced level in math – which signals being on track for college – and about 38% scored at the minimal level, which is considered below grade level, with others (about 24%) performing at a more basic level. And because math is cumulative, when students fall behind year after year, it is harder and harder for them to catch up without extraordinary measures.

Especially in a state that relies on a high tech economy that demands strong proficiency in STEM fields, we can no longer ignore the challenges we've long experienced in math.

There are at least 3 major aspects of the problem that need to be addressed:

I. Solving Teacher Shortages and Ensuring Strong Preparation

The foundation for student learning is to ensure that teachers are sufficiently knowledgeable and are supported in teaching math effectively. California has two major problems here: Staffing classrooms and preparing teachers well for math teaching.

Staffing: We have long had shortages of math teachers in the US and in our state. California has had severe shortages since at least the 1990s, when the *Williams* lawsuit raised up both the inequities across districts in access to qualified teachers – with schools serving high proportions of black, Latino, and low-income students having 4 to 5 times as many uncertified teachers as those with few such students – and the extensive body of research showing that this matters greatly for achievement, especially in mathematics.¹ When there are shortages of qualified teachers, math classes are often staffed by teachers who are out of field or underprepared in math, in pedagogy, or in both. A recent study of districts in California found that one of the largest negative impacts on student achievement is the share of such underprepared teachers in a district.²

Based on data from CTC’s [Credentials](#) and [Interns, Permits, Waivers](#) Dashboards, nearly 40% of new math authorizations issued in 2024-25 were associated with substandard credentials, undermining students’ ability to make progress in math (see Table 1.)

Table 1. Preliminary Credentials, Intern Credentials, Permits, and Waivers with Math Authorizations in 2024-25

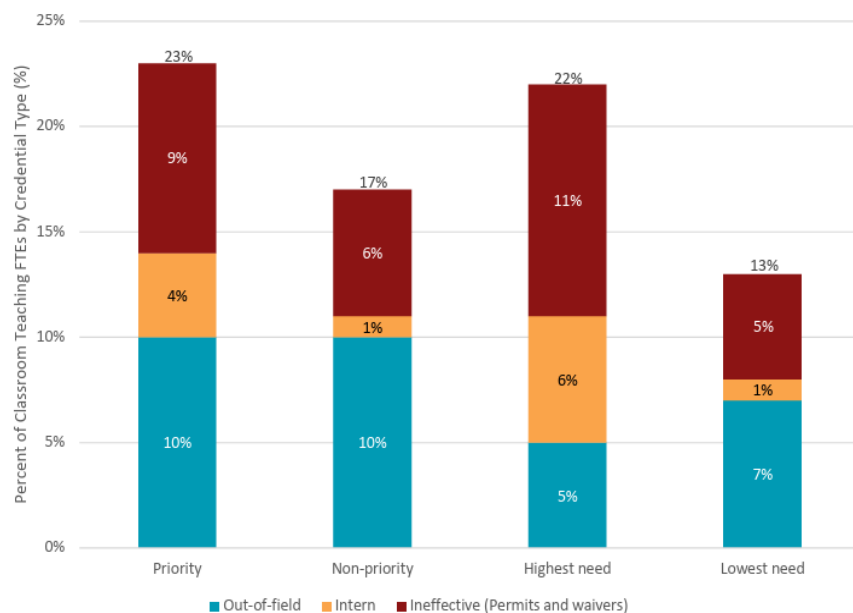
Authorization	Number of Mathematics Authorizations Issued	% of New Mathematics Authorizations Issued
Preliminary Credential	1214	61%
Intern Credential	288	25%
Permit or Waiver	492	14%
Total	1994	100%

Source: CTC Teacher Supply Dashboards.

In the field, this translates into many students, especially in priority schools with large shares of low-income students and English learners, receiving instruction from teachers who have not met the standards for a credential. The [Getting Down to Facts report on the CA teacher workforce](#) found that, in 2023-24, only 71% of math teacher FTEs held clear or preliminary credentials.³ This varies across schools, with higher shares of math teachers on substandard credentials in priority schools and schools with the highest shares of Unduplicated Pupil Count students (Figure 1.)⁴ Nearly 1 in 4 math teachers are underprepared in the highest-need schools. These disparities in teachers’ preparation between more and less advantaged schools are also found for multiple subject teachers –

which means that many students encounter teachers in the elementary grades who are also untrained to teach mathematics.

Figure 1. Distribution of Mathematics Teacher Substandard Credential and Permit Types by School Proportion of Unduplicated Pupil Count, 2023-24

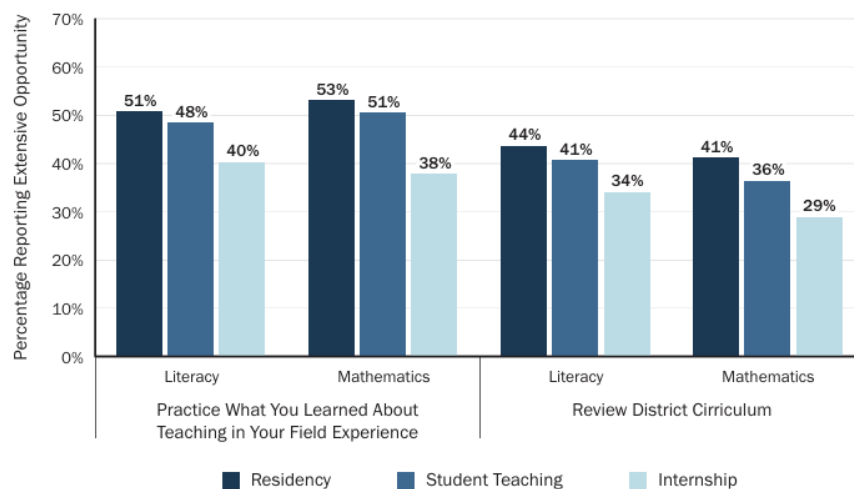


Notes: Data shows the average school-level proportions of mathematics teacher FTEs by substandard credential and permit type. Priority schools are schools serving 55% Unduplicated Student Count or above; highest and lowest need schools are the top and bottom decile of schools by percent UPC respectively.
Sources: Learning Policy Institute analysis of California Department of Education 2023–24 Teaching Assignment Monitoring Outcomes data and California Longitudinal Pupil Achievement Data System data.

In addition to these disparities in knowledge and skill for math teachers at the secondary level, many elementary teachers do not feel strong in math and do not feel comfortable teaching it. Studies of candidates completing teacher education find very different levels of preparation across programs. As figure 2 shows, multiple subject teachers completing intern programs report much less extensive opportunities to learn about curriculum and practice what they learned about teaching math in their field experiences or to adapt math lessons for students with diverse needs and learning styles, while residency graduates had the most extensive such opportunities.⁵

We need to learn more about how programs that produce effective math teachers organize their teacher education curriculum and clinical experiences, so that we can guide others to take up these practices. LPI is currently doing a study of 4 excellent mathematics teacher education programs in CA (2 elementary and 2 secondary programs) which produce graduates who feel well prepared for math teaching. The study will describe what these programs do so that their practices can be taken up by other programs and inform the accreditation and licensing assessments orchestrated by the CTC.

Figure 2. Learning Opportunities in Teacher Education, by Pathway



Notes: This analysis combined data across 4 years (2020–21 to 2023–24) and included responses from 2,835 residents, 14,880 student teachers, and 7,528 interns. Only Multiple Subject and Education Specialist credential completers answered these questions. These differences were statistically significant based on chi-square tests ($\chi^2 = 200.6, p < .001$; $\chi^2 = 159.7, p < .001$; $\chi^2 = 511.0, p < .001$; $\chi^2 = 409.1, p < .001$).

Source: Learning Policy Institute analysis of the California Commission on Teacher Credentialing's program completer survey data. (2026).

LPI has also completed a review of research⁶ and a field-based study⁷ of what California teachers do in effective math classrooms, which includes both the use of effective instructional strategies and creation of a positive environment in which students can develop a growth mindset and an identity as a math person. This kind of research needs to inform both pre- and in-service learning for teachers.

Fortunately, the state's investments in teacher residencies and in Golden State Teacher Grants have helped to boost the production of fully prepared teachers by about 30% over the last three years, including a preponderance of fully-prepared math teachers. Unfortunately, both are funded with one-time money, and this year the Golden State Teacher Grant lost most of its funding, now available only to special education teachers.

II. Ensuring Quality Curriculum and Materials

Teachers' knowledge and skill is augmented by thoughtful curriculum and high-quality instructional materials. When the mathematics framework was revised, it included a look at what high performing nations with equitable outcomes do in math (Japan, Korea, Estonia, Finland) and found major differences between the approach to mathematics in these countries and traditional practice in the US and California.⁸ These more productive strategies are incorporated into our new framework, adopted in 2023.

- ▷ Fewer concepts each year, taught more deeply
- ▷ Students collaboratively produce and discuss multiple strategies

- ▷ All students receive the same rich curriculum
- ▷ Data use and data science are infused across the grades
- ▷ Mathematics is taught in an integrated fashion showing connections between concepts and methods like algebra and geometry rather than treating topics and discrete and disconnected.

The framework attempts to move curriculum and instruction:

- ▷ From rote calculations to deeper understanding of math concepts
- ▷ From coverage of disconnected standards to big ideas that integrate and draw connections between math concepts
- ▷ From plug and play practice items toward Open ended, multidimensional tasks that develop problem-solving skills
- ▷ From abstract problems solved by algorithms to more meaningful instruction teaching quantitative reasoning using data and real-world examples
- ▷ From a focus to marching through grade level standards to a focus on learning progressions that lead to the grade-level standards and attention to students' process of mastering foundational concepts as they move along the progressions.

Curriculum materials for K-8 classrooms

High-quality instructional materials that reflect these ideas, along with professional development, should help support this next stage of work. However, the Department of Education, with the Instructional Quality Commission, required two years to complete its extensive process of vetting and adopting instructional materials, releasing an approved list in fall of 2025, which has then left local districts to sort through more than 50 programs – with little information about each of them other than that they made the list -- to figure out which one to adopt.⁹ Districts have spent another year on their process of local adoption and most will finally have an adoption this year. This very long process, which produces little useful guidance for curriculum adoption, is one of the challenges California needs to correct. We are grateful to the legislature for funding a study the State Board is now overseeing of how other states develop curriculum and materials guidance with more agility and greater information for the field and hope to return with insights shortly that can help us streamline and improve our curriculum adoption processes.

High School Curriculum

While we now have statewide guidance for K-8 curriculum, there are a set of knotty problems with the high school curriculum that are not part of the curriculum adoption process and also require attention if we are going to get a growing number of students to be ready to succeed in advanced mathematics and be enthusiastic and ready for STEM careers.

The problem begins with the fact that the traditional high school curriculum in much of California and the US is a 5-course sequence of Algebra I, Geometry, Algebra II, Pre-Calculus, and Calculus. This set of courses includes redundancies and disconnects of various kinds (for example, Algebra II repeats parts of Algebra I; pre-calculus was invented because the foundational elements for calculus were not well-enough taught in the previous courses; disconnecting algebra from geometry undermines conceptual learning that connects the two). It does not allow an integrated approach to mathematics, like the one used in the high-achieving countries I noted earlier, none of whom teach mathematics with this course sequence. All of these countries have constructed a more tightly integrated and strongly conceptualized set of Math 1, 2, and 3 courses that can lead directly and more successfully to calculus, statistics, and other advanced math courses.

In addition, the US sequence requires students to begin high school math in 8th grade if they want to reach Calculus by senior year. Mostly this is done by having students skip over a course, missing a body of content they have to infer on their own. When California earlier sought to incentivize 8th grade algebra for all students, some succeeded, while others struggled and failed, ultimately doing less well in high school mathematics than would otherwise have been the case.¹⁰

A more deliberative approach to curriculum can produce greater success. For example, a study of a large high school where all 8th graders succeeded in an early start to high school mathematics, passing the 9th grade New York Regents exam in 8th grade, found that teachers had revised the 6th and 7th grade curricula to ensure an adequate foundation and added a lab period to the 8th grade Mathematics I course for extra help for any students who needed it, planning together on a regular basis how to meet their needs.¹¹

Many of the problems with the secondary school curriculum are discussed in a new report from the California Mathematics Alignment Project¹² -- an intersegmental group of mathematics experts from K-12 and higher education -- which has proposed a roadmap for transforming mathematics education in California. They propose to synthesize and organize the high school Common Core standards in ways that better allow the pursuit of strong quantitative reasoning that produces greater depth and sophistication of learning.

They also propose a State Intersegmental Advisory Board of mathematics experts from all education segments plus industry stakeholders to oversee and guide this work.

III. Building System Capacity to Support Math Teaching and Learning

Finally, the state and its districts have to become well-organized to support and ensure good math teaching and stronger opportunities for math learning – including when additional time and assistance are needed. This means adopting a strong curriculum, managing ongoing high-quality professional development, finding time and opportunity for teacher collaboration, building additional opportunities for student learning – through small group and one-on-one tutoring, additional lab courses, summer learning that supports advancement and acceleration – a full approach to MTSS in math. There is growing evidence that being able to meet students where they are in math and teach to their specific needs can dramatically accelerate progress, which has been seen in many high-impact tutoring programs,¹³ as well as other successful student-focused interventions.

State Policy

To support this work at the local level, CA has adopted a new curriculum framework, adopted a list of recommended programs for districts, created a math network of operating out of CCEE,¹⁴ and invested about \$100 million over the last 6 years to launch free training for math coaches as well as administrators and teachers, through a consortium of county offices and the [California Mathematics Project](#) called the Mathematics Professional Learning Partnership (MPLP). (See Appendix A for a full listing of state investments that districts could apply to math professional learning.) This commitment to training mathematics coaches is intended to build local capacity, as these coaches can help organize the math program and curriculum, as well as supporting teacher learning and planning at the local level. This approach can be high-leverage: A review of more than 60 studies has found that direct coaching of teachers can accelerate student learning by the equivalent of four to six months on average.¹⁵

While these efforts are individually useful, and the math community is working to make them cohere with one another, we do not yet have a comprehensive approach that can ensure the rapid gains we need. We have not yet solved the teacher shortage, addressed teacher preparation for teaching math, ensured sufficient professional development and coaching to reach all teachers, or developed supports for high-dosage tutoring or other interventions. These should all be part of the agenda for the future.

There are a few states that have been making noteworthy progress in math who offer lessons about a comprehensive approach. Alabama had the largest gains of any state in 4th

grade math between 2022 and 2024 on NAEP (6 points) and made substantial progress at the elementary level on state tests. [Note: California also saw gains of 3 points in 4th grade math on NAEP and an improvement from 30% to 35% proficiency.] It overhauled its curriculum in 2019 (abandoning the Common Core standards for an approach built from recommendations of the National Council of Teachers of Mathematics) and enacted the Alabama Numeracy Act in 2022.¹⁶ The Act required:

- **New standards and high-quality instructional materials**
- An overhaul of **teacher preparation coursework** to include four specialized courses that combine math content and pedagogy, as well as a new assessment in math for licensure. A postsecondary task force was established to guide this work.
- An increase in **instructional time** for tier 1 instruction to 60 minutes a day in K-5, plus a requirement for small group intervention or tutoring for those in need on a daily basis, before, during, or after school, and in summer.
- Math **diagnostic screening** in grades 1-5 to determine progress and need for interventions.
- **Math coaches** for every elementary school (2 for schools above 900) and training of math coaches statewide, with expertise-based standards for selection and deployment.
- **School support tiers** that categorize the lowest-performing schools (the bottom 5% to increase over time to 10%) into full-support and limited-support (up to 25%) categories for targeted state assistance, including training of all staff in full support schools and assistance to establish curriculum, effective assessment and intervention, and multi-tiered systems of support.
- State-funded **summer school math programs** for students in low-performing schools.
- **Hiring of mathematics experts** in the state department of education (in a new Office of Mathematics Improvement) and regional offices to coordinate and support all of this activity in the schools.

The approach taken recently in Tennessee, which also had relatively large gains in 4th grade math (4 points) and the largest gains in 8th grade math (also 4 points) on NAEP between 2022 and 2024, reinforces many of these elements. The Mathematics Supports Act¹⁷ followed the adoption of Tennessee's math standards in 2021 and reinforces teacher training and aligned curriculum. Even before this act, the state launched extensive tutoring

and summer camps, particularly focusing on grades 3-8, and encouraged math coaching, which is now in place in nearly every district.¹⁸

Building a Coherent Approach in California

As we seek to build a coherent approach to mathematics improvement, we should consider the following elements that are needed to achieve that goal. In addition to the existing investments in math coach training and professional development, the state will benefit from:

- Continued attention to solving the **teacher shortage** through continuation and expansion of subsidies for preparation in high-retention pathways, including residencies and student teaching in undergraduate as well as graduate programs;
- Improvement in **teacher education** for the teaching of math based on evidence of what high-quality programs do;
- Infusion of math expertise and focus within the **Department of Education** to support ongoing coordination and guidance to the field;
- Research on current efforts to evaluate the outcomes of the **instructional materials and professional learning** now being used in the field;
- Review and revision of **secondary school curriculum** to create more integrated, effective middle and high school curriculum as proposed by the intersegmental California Mathematics Alignment Project, building on recent ICAS recommendations;
- Investment in math **coaches** as well as high-impact **interventions, including tutoring**, in the highest-need schools.
- Expansion of **time** for mathematics learning before, during, and after school hours, including purposeful programs that offer engaging, applied math learning in the summer and allow for continued acceleration of students.

California is launched on a course of improvement in mathematics that is beginning to bear fruit. It can be much accelerated with attention to a coherent vision that ensures well-qualified teachers who are well-supported with the curriculum, materials, learning opportunities, and time needed to ensure that every California student becomes a confident math learner.

Appendix: Recent Resources for Mathematics Improvement in CA

Dedicated math coaching: the Mathematics Professional Learning Partnership (MPLP)

\$100M to date beginning in **2024–25: \$20M**. The 2024–25 education trailer bill provided \$20 million for a county office of education to partner with the California Mathematics Project on educator training and resources aligned to the 2023 Mathematics Framework. The training is aimed mainly at math coaches and teacher leaders. Kern county Office of Education organized the consortium that received this funding, which grew to **2025–26: \$30M and 2026–27: \$50M**. Current end date is June 30, 2029.

Earlier grants that included math coaching include:

- **2021–22: Learning Acceleration System Grant, about \$45–50M, for math, literacy and language development** operated through the California Collaborative for Educational Excellence (<https://lasgrant.ccee-ca.org/>) ccee-ca (<https://ccee-ca.org/wp-content/uploads/2023/03/LASG-Fact-Sheet-Draft.pdf>)
- **2022–23: \$85M for math, science and computer science**. \$50 million went to San Joaquin County office of education to run a consortium for grades 4–12. One of its goals is to expand statewide capacity for professional learning and coaching in these subjects. The remaining \$35M supported early math, including the California Early Math Initiative. Mathematics, Science, and Computer Science Professional Learning Grant +2 (<https://www.grants.ca.gov/?p=16820>)

Smaller and indirect supports (2025–26 onward)

- \$15M for Literacy and Mathematics Networks, which bring together lead agencies to support practices aligned with each subject’s curriculum framework. (<https://ebudget.ca.gov/2025-26/pdf/Enacted/BudgetSummary/TK-12Education.pdf>)
- Commission on Teacher Credentialing grants of up to \$6,000 per teacher to earn a math instructional authorization or Mathematics Instructional Leadership Specialist credential. These were added to an existing reading grant program in 2025. (<https://www.ctc.ca.gov/?p=4732>)ca (<https://docs.ctc.ca.gov/Document/Download/31257>)
- Discretionary block grants: \$1.7B in 2025–26 and \$5B in 2026–27. Professional development on the Mathematics Framework is one of several suggested uses, but districts decide how to spend the money, so the amount going to math is unknown. (<https://ebudget.ca.gov/2025-26/pdf/Enacted/BudgetSummary/TK-12Education.pdf>)ca (<https://ebudget.ca.gov/2026-27/pdf/Enacted/BudgetSummary/TK-12Education.pdf>)

Endnotes

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- ¹⁴ The legislature appropriated \$7.5 million for a [Statewide Mathematics Network](#) to support evidence-based mathematics instruction across the state. Administered by the California Collaborative for Educational Excellence (CCEE) in consultation with the California Department of Education (CDE), the network convenes regional and local mathematics leads to implement practices aligned with the state mathematics framework, and to develop an online resource clearinghouse while highlighting the practices of high-performing local educational agencies (LEAs).
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