California is on the cusp of implementing a new statewide math framework that will drive curriculum decisions and pedagogical approaches for years to come. Although the state’s content standards for mathematics are not changing, a statewide framework could nevertheless shift instruction by providing educators guidance on how to implement content standards; for example, by describing the kinds of instruction, instructional materials, and profes-

### KEY FINDINGS

- Ninety-one percent of California math teachers reported that they spent the majority of their five most-recent lessons on grade-level, standards-aligned topics.
- One-third of California math teachers reported skipping standards-aligned math content occasionally or frequently. These teachers were most likely to replace skipped content with content from prior grade levels.
- Half of California math teachers reported regularly using at least one standards-aligned curriculum material, but this rate was lower among teachers serving high-poverty schools and secondary teachers.
- Although culturally relevant math instruction was not a top priority for California math teachers when selecting instructional tasks or activities, roughly four in ten teachers said that they had a major or moderate need for more or better culturally relevant curriculum materials.
- Few California middle school teachers advised students on the high school math courses available to them.
- About half of California math teachers expressed concerns with continuity of programming in their schools, suggesting a need to sustain efforts to improve math instruction in the state.
sional development that would support successful implementation of standards-based instruction (California Department of Education, 2022e).

The updated framework has a strong focus on supporting “equity in mathematics,” guided by the notion that “all students, regardless of background, language of origin, differences, or foundational knowledge are capable and deserving of depth of understanding and engagement in rich mathematics tasks” (California Department of Education, 2022a, pp. 10–11). The framework also emphasizes engaging students in inquiry-based, open-ended, multidimensional problem-solving revolving around “big ideas” in math, which are focal points that anchor and coherently connect mathematical skills and knowledge (California Department of Education, 2022a, p. 11; Wurman and Evers, 2022).

However, the framework also has been the subject of discussion and critique. Critics of the framework have voiced concerns that it privileges “social justice over rigor” (Fensterwald, 2022b) by more heavily emphasizing “students’ cultural backgrounds” and “incorporating into mathematics instruction students’ authentic questions about social issues” (California Department of Education, 2022b, p. 55). Critics also have raised concerns about the framework’s caution against placing students on advanced tracks during middle school and prematurely accelerating students to algebra in 8th grade (Hong, 2022; California Department of Education, 2022e). Critics worry that this approach could limit students’ access to advanced courses, forcing them to fit more math courses into their high school years to take calculus (Barak et al., undated; Fensterwald, 2022a; Fensterwald, 2022b).

The framework also has drawn criticism for its emphasis on data science rather than “essential mathematical tools such as calculus and algebra” (Barak et al., undated), which critics fear could further disadvantage the students the state seeks to support by guiding them away from courses that would better prepare them for science, technology, engineering, and mathematics (STEM) fields in the future (Chayes and Liu, 2022; Ford, 2022; McDonald, 2022).

Meanwhile, advocates of the framework assert that, “if effectively implemented, [the framework] has the potential to transform mathematics instruction to ensure that all students have equitable access

### Learn Together Survey and American Instructional Resources Survey Data

To examine the state of math instruction in California, we leveraged data from two surveys: the Learn Together Survey (LTS) and the American Instructional Resources Survey (AIRS). The 2022 LTS was administered in March 2022 to 3,606 teachers, 216 of whom were California math teachers. The 2022 AIRS was administered in April and May 2022 to 8,063 teachers, 128 of whom were California math teachers. We use data from both surveys because they cover complementary content regarding math instruction. The AIRS focuses on teachers’ perceptions about and use of math instructional materials, whereas the LTS has a broader focus on math materials, instruction, teaching practices, and supports. Both surveys have state-representative samples of California teachers. The samples do not include the same teachers, so we are unable to draw connections between the responses of teachers across both surveys. Within these state-representative samples, we focused on math teachers.

One main limitation of our data is that our sample sizes of California math teachers are relatively small, which restricted our ability to detect statistical significance for all subgroup differences. In analyzing our data, we explored whether teachers’ responses differed according to their demographic characteristics, school context, or the characteristics of the students in their schools. However, in our reporting, we focus on differences between teachers serving high-poverty and low-poverty schools and differences between elementary and secondary teachers. We focus on these teacher groups in part because these sample sizes were reasonably large enough to conduct subgroup analyses. Unless otherwise noted, we describe differences among teacher subgroups that are statistically significant ($p < 0.05$). However, in a few instances, we present subgroup differences that are not statistically significant. In these instances, subgroup differences are large in magnitude and reflective of other research, including findings from the 2022 LTS or AIRS at the national level.
to rigorous and relevant coursework” (Fensterwald, 2022b). The framework’s focus on ensuring that math is culturally relevant and connected to students’ backgrounds and lived experiences is especially salient, given the unique demographic composition of California’s students. About 80 percent of public school students in California are students of color, compared with about half of public school students nationally (National Center for Education Statistics, 2022; California Department of Education, 2022f).

Although the framework provides recommendations rather than mandates, many districts and schools need updated state-level guidance to address the state’s current challenges. California last updated its math framework a decade ago, and the primary purpose of the 2013 framework was to support the implementation of the California Common Core State Standards for Mathematics, which had recently been adopted by the state board of education (California Department of Education, 2013; Yakes and Sprague, 2015). This new framework, therefore, presents an opportunity to provide updated guidance that considers the accumulation of experiences and lessons about the implementation of standards-aligned instruction over the past decade. Moreover, recent assessment results both nationally and in California have sounded alarms about pandemic-era math achievement (Schwartz, 2022; Wakelyn, 2022). In 2022, only 33 percent of California students met the state’s math standards, compared with 40 percent of students in 2019 (Hong and Yee, 2022).

On the eve of the framework’s adoption, which is anticipated in 2023, we leveraged data collected from math teachers in California to paint a picture of math instruction throughout the state. We use this data to illuminate ways in which state and local education leaders can foster equitable instruction in the context of the state’s new framework. Districts, schools, and teachers may require numerous coordinated supports to implement the framework’s relatively novel priorities, including guidance on curriculum material selection and adoption, professional learning, and teacher preparation. Thus, we focus on four areas that may have implications for the development of such guidance and support: (1) students’ varied access to standards-aligned, grade-level instruction; (2) the state of culturally relevant math instruction; (3) students’ access to guidance about the math opportunities available to them in high school and

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**Definitions of Key Terms**

When we refer to teachers throughout this report, we are referring to the samples of California math teachers for each survey, unless otherwise noted.

**Standards-aligned math content** comprises the concepts, knowledge, and skills students are expected to master at grade or course level in math as outlined by California’s content standards in mathematics for grades K–12.

We define **standards-aligned math instruction** as any instructional methods or practices teachers use to promote student mastery of standards-aligned math content.

**Standards-aligned math curriculum materials** are materials that have been rated by EdReports, a nonprofit organization that reviews curriculum materials, as fully meeting the expectations of college- and career-ready standards.

**Curriculum materials** are instructional materials that are intended to constitute a full, comprehensive course of study for a particular subject and grade level. Curriculum materials can be provided through textbooks, online platforms, or both. Although standards may inform the development and selection of curriculum materials, in our reporting, standards do not in and of themselves make up the curriculum.

**Instructional materials** are any materials that are intended to provide learning opportunities to students, including curriculum materials and other supplemental instructional materials that do not constitute a full course of study.
beyond; and (4) teachers’ perceptions about the continuity of new programs or initiatives at their schools.

**Students in California Have Varied Access to Standards-Aligned Math Instruction**

Nearly All California Math Teachers Spent the Majority of Their Five Most-Recent Lessons on Grade-Level, Standards-Aligned Topics

To examine how California math teachers spend their instructional time, we analyzed teachers’ reports of how often their students engaged in various tasks in their last five lessons. Although math teachers may often think of tasks as math problems (Smith and Stein, 1998), in the 2022 AIRS, we asked math teachers about the tasks in which their students engaged by describing various instructional activities, such as explaining their mathematical thinking, choosing which methods to use to solve a problem, or making sense of a problem that did not include clear solution procedures (see Figure 1). These tasks are based in the Common Core State Standards for mathematical practice and are aligned with many of the principles outlined in the proposed framework, including a focus on multidimensional, open-ended problem-solving; tasks rooted in real-world contexts; and opportunities for mathematical reasoning.

Teachers most commonly reported engaging students in grade-level mathematics topics addressed by their state standards in their daily instruction. More than 90 percent of teachers reported that their students engaged in this task for at least three to five of their last five lessons, and nearly three-quarters of teachers reported that their students engaged in this task for each of their last five lessons (see Figure 1).

Teachers’ second- and third-most-common response was that their students focused on building their conceptual understanding and procedural fluency. Teachers were least likely to report that their students reviewed content from previous grade levels without connecting it to new mathematics content; still, 23 percent of teachers reported that their students engaged in such review for at least three of their last five lessons. Notably, tasks that might be considered more application-oriented, collaborative, or complex were relatively less common.

These results may have implications for the implementation of the California framework, which emphasizes both opportunities for students to “conjecture, reason, and justify” and for them to work on “open, engaging tasks” (California Department of Education, 2022b, pp. 69, 27), which allow students to take part in cognitively demanding expressions of mathematical understanding rather than the rote reproduction of facts and procedures. Although it is difficult to precisely know the correct number of high-complexity tasks to which students should be exposed, examinations of instruction in other countries known for high math achievement may shed some light on the appropriate balance between high-complexity tasks and more-simple, procedural tasks, along with the balance between reviewing content and introducing new content.

According to an international examination of 8th-grade math lessons in high-achieving countries, such as Japan, teachers spent only about one-quarter of their instructional time on reviewing content and the remainder of their time on introducing or practicing new content. In comparison, in the United States, teachers spent about half of their instructional time reviewing content. Additionally, 84 percent of the math problems per lesson that Japanese students encountered were deemed of moderate or high procedural complexity, and 54 percent of their math problems per lesson revolved around making mathematical connections. In the United States, these numbers were 33 percent and 17 percent, respectively (National Center for Education Statistics, 2003). Altogether, our results point to a potential need to shift teachers’ instruction so that they engage students in the appropriate balance of active-learning experiences promoted within the framework.

Finally, when examining the data by grade band and student demographics, we observed evidence suggesting that teachers serving high-poverty schools and secondary teachers might be less likely than their counterparts to spend a majority of their lessons addressing grade-level, standards-aligned content. Although these differences were not statistically significant, potentially because of small sample sizes,
this observation sets the stage for our other findings, which highlight disparities in the instructional content to which students in different types of schools are exposed.

### FIGURE 1
California Teachers’ Reports of Tasks in Which Students Engaged During Their Five Most Recent Lessons

<table>
<thead>
<tr>
<th>Task</th>
<th>Percentage of Teachers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spent most instructional time on grade-level math topics addressed by state math standards</td>
<td>43% (Every lesson) 74% (3-4 lessons) 17% (1-2 lessons) 5% (Never)</td>
</tr>
<tr>
<td>Focused on building conceptual understanding</td>
<td>38% (Every lesson) 31% (3-4 lessons) 28% (1-2 lessons) 2% (Never)</td>
</tr>
<tr>
<td>Focused on building fluency with using math procedures to solve problems</td>
<td>33% (Every lesson) 37% (3-4 lessons) 25% (1-2 lessons) 1% (Never)</td>
</tr>
<tr>
<td>Explained mathematical thinking</td>
<td>32% (Every lesson) 42% (3-4 lessons) 22% (1-2 lessons) 3% (Never)</td>
</tr>
<tr>
<td>Chose which methods to use to solve a problem</td>
<td>29% (Every lesson) 36% (3-4 lessons) 28% (1-2 lessons) 7% (Never)</td>
</tr>
<tr>
<td>Chose which tools to use to solve a problem</td>
<td>28% (Every lesson) 36% (3-4 lessons) 32% (1-2 lessons) 2% (Never)</td>
</tr>
<tr>
<td>Related new math content to other math content within grade level</td>
<td>23% (Every lesson) 41% (3-4 lessons) 34% (1-2 lessons) 2% (Never)</td>
</tr>
<tr>
<td>Focused on applying math learning to real-world contexts</td>
<td>23% (Every lesson) 29% (3-4 lessons) 36% (1-2 lessons) 12% (Never)</td>
</tr>
<tr>
<td>Built on the thinking of other students</td>
<td>22% (Every lesson) 29% (3-4 lessons) 37% (1-2 lessons) 7% (Never)</td>
</tr>
<tr>
<td>Related new math content to other math content at prior grade levels</td>
<td>14% (Every lesson) 27% (3-4 lessons) 42% (1-2 lessons) 12% (Never)</td>
</tr>
<tr>
<td>Made sense of problems that did not include clear solution procedures</td>
<td>11% (Every lesson) 12% (3-4 lessons) 27% (1-2 lessons) 46% (Never)</td>
</tr>
<tr>
<td>Reviewed math content at prior grade levels without connecting it to new math content</td>
<td>11% (Every lesson) 12% (3-4 lessons) 27% (1-2 lessons) 46% (Never)</td>
</tr>
</tbody>
</table>

**NOTE:** This figure displays California math teachers’ responses to the following 2022 AIRS question: “Think of the mathematics class you teach this school year (2021–2022). . . . In the last five lessons you taught this class (i.e., the past week, if you teach every day), how often did students engage in each of the following tasks, with or without your prompting?” Teachers were able to respond, “never,” “1–2 lessons,” “3–4 lessons” or “every lesson.” Some bars do not sum to 100 percent because teachers were also able to respond, “Not relevant or not appropriate for the grade/class I teach,” which we do not display in this figure. California math teachers N = 126.

One-Third of California Math Teachers Reported Skipping Standards-Aligned Math Content Occasionally or Frequently; These Teachers Were Most Likely to Replace Skipped Content with Content from Prior Grade Levels

Thirty-four percent of California math teachers reported skipping standards-aligned content in their math instruction occasionally or frequently (see
Figure 2); this result is not significantly different from the national rate of 30 percent. An additional 40 percent of California math teachers reported skipping standards-aligned content, but only rarely (not shown in the figure). As noted earlier, we define standards-aligned math content as the grade- or course-level concepts, knowledge, or skills that students are expected to master at grade or course level, as outlined by state content standards.

Among those teachers who reported skipping standards-aligned content in their math instruction, 45 percent reported that they replaced the grade-level standards-aligned math content that they skipped with content from prior grade levels. Twenty-nine percent of teachers reported that they replaced skipped content with content from the next grade level or content that is not included in the standards. Also potentially concerning is the finding that 26 percent of California math teachers reported that they did not replace skipped content with any other content (possibly because they lacked sufficient time to cover all the standards). Together, these results suggest that some California students may have reduced or incomplete access to standards-aligned content.

We further examined why teachers skipped standards-aligned content. Seventy-nine percent of teachers somewhat or strongly agreed that they skipped standards-aligned content because they needed to review or re-teach content from prior grade levels. Other top reasons included that they believed that their students needed something different from what is outlined in the math standards (67 percent),

![Figure 2](image)

**Figure 2**
Percentage of California Math Teachers Reporting That They Skip Standards-Aligned Math Content Occasionally or Frequently

<table>
<thead>
<tr>
<th></th>
<th>Occasionally</th>
<th>Frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>California math teachers</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>Elementary teachers</td>
<td>30%</td>
<td>25%</td>
</tr>
<tr>
<td>Secondary teachers*</td>
<td>39%</td>
<td>24%</td>
</tr>
<tr>
<td>Teachers serving low-poverty schools</td>
<td>33%</td>
<td>23%</td>
</tr>
<tr>
<td>Teachers serving high-poverty schools</td>
<td>31%</td>
<td>23%</td>
</tr>
</tbody>
</table>

**NOTE:** This figure displays California math teachers’ responses to the following 2022 LTS question: “Do you ever skip standards-aligned content in your math instruction?” Teachers were able to respond, “never,” “rarely,” “occasionally,” or “frequently.” When comparing responses of elementary and secondary teachers, we compared the responses of teachers who teach grades K–5 with the responses of teachers who teach grades 6–12 and excluded teachers who teach across both grade bands. The asterisk denotes statistically significant differences at p < 0.05 before and after controlling for school- and teacher-level characteristics, where the reference groups are elementary teachers and teachers serving low-poverty schools. Black bars represent 95-percent confidence intervals. California math teachers N = 214; elementary teachers n = 136, secondary teachers n = 67, teachers serving low-poverty schools n = 91, teachers serving high-poverty schools n = 115.
standards-aligned math content does not adequately address basic skills in math (48 percent), some standards are not important for their students’ future learning in math (44 percent), and standards-aligned math content is not engaging enough to keep their students’ attention and focus (41 percent).

The skipping patterns of secondary teachers and teachers serving high-poverty schools suggest that these teachers experience challenges with covering standards-aligned content. First, mirroring national results on this same LTS survey item (Wolfe, Steiner, and Schweig, 2023), California secondary teachers were significantly more likely than elementary teachers to skip standards-aligned content (Figure 2). Moreover, secondary teachers were more likely than elementary teachers to skip standards-aligned math content without replacing it with any additional content, while elementary teachers were more likely than secondary teachers to replace skipped content with content from the next grade level (Figure 3).

Responses from teachers serving high-poverty schools also suggest that lower-income students may experience reduced access to standards-aligned, grade-level content. Thirty-eight percent of teachers serving high-poverty schools reported skipping standards-aligned content often or always, compared with 27 percent of teachers serving low-poverty schools (Figure 2). Although this difference was not statistically significant in our state-level sample, potentially because of our small sample size, a similar pattern is mirrored and statistically significant in the national-level analysis of this same LTS survey item (Wolfe, Steiner, and Schweig, 2023).

Teachers serving high-poverty schools were more likely than teachers serving low-poverty schools to report that they replaced the standards-aligned content that they skipped with content from prior grade levels (56 percent and 31 percent, respectively). In comparison, even when teachers from low-poverty schools reported skipping standards-aligned content, they were significantly more likely to report that they replaced skipped content with content from the next grade level. It is unsurprising that, when asked why they skipped standards-aligned content, teachers serving high-poverty schools were statistically significantly more likely than teachers in low-poverty schools to report that standards-aligned math content does not adequately address basic skills in math (56 percent versus 36 percent) and that they needed to review or re-teach content from prior grade levels (86 percent versus 68 percent).

Altogether, these findings suggest that, even though teachers mostly prioritized grade-level, standards-aligned content in their daily instruction (Figure 1), students in California may have inequitable access to such content. Teachers serving students who may have had fewer opportunities to access grade-level, standards-aligned content in the past (and who may, consequently, have gaps in their mathematical knowledge and skills) may experience more difficulty in completely covering all grade-level, standards-aligned content. This could be especially true for secondary teachers who reach students later in their mathematical careers. It is also possible, as we describe in the next section, that teachers’ use of different types of curriculum materials plays a role in their instructional decisions and the content to which students are exposed.

Half of California Math Teachers Reported Regularly Using at Least One Standards-Aligned Curriculum Material, but This Rate Was Lower Among Teachers Serving High-Poverty Schools and Secondary Teachers

In previous sections, we asked teachers about their perceptions of and instructional decisions regarding standards-aligned content. However, because teachers’ perceptions about what might be considered standards-aligned content could vary, we also lean on an external determination of standards alignment to examine whether the same trends we observed earlier still hold. Specifically, we leverage EdReports’ definition of standards-aligned materials to assess whether California math teachers serving different populations of students may be systematically using different types of curriculum materials. Use of standards-aligned curriculum materials also could be considered a signal of rigor because materials deemed standards-aligned according to EdReports are vetted
Uneven use of standards-aligned materials raises concerns about potential disparities in access to high-quality instructional content.

According to the 2022 AIRS, 50 percent of California math teachers reported using at least one standards-aligned material once per week or more for their math instruction, which we define as regular use. This was on par with the national average of 49 percent. However, reported regular use of standards-aligned materials was statistically significantly lower among teachers serving high-poverty schools. Forty-two percent of teachers serving high-poverty schools reported regularly using at least one standards-aligned material, compared with 61 percent of teachers serving low-poverty schools.
However, this difference is no longer statistically significant after controlling for an array of school- and teacher-level characteristics.

Notably, this pattern suggesting that California math teachers in high-poverty schools are less likely to regularly use standards-aligned curriculum materials runs counter to the pattern in several other states, where use of standards-aligned materials is more prevalent among teachers serving historically underserved populations (Doan et al., 2022). In those states, state leaders have enacted policies to promote the use of standards-aligned materials, driven by the notion that use of such materials can provide more-rigorous instruction, particularly for historically underserved student populations.

Additionally, regular use of at least one standards-aligned material was statistically significantly lower at the secondary level than at the elementary level. Fifty-eight percent of elementary teachers reported regularly using at least one standards-aligned material, compared with 39 percent of secondary teachers. This result aligns with prior research at the national level, which found that use of standards-aligned math curriculum materials was especially low among high school teachers (Kaufman, Doan, and Fernandez, 2021). We hypothesize that these differences could stem from a variety of factors, including the availability of more standards-aligned materials at the elementary level; secondary teachers’ exercising greater autonomy over their choice of instructional materials; and secondary teachers’ need to tailor their instruction to the needs of their students, who may have lacked prior opportunities to access and master grade-level content.

Overall, in combination with the findings described earlier, the uneven use of standards-aligned materials among teachers serving different populations of students raises concerns about the potential for disparities in access to high-quality, rigorous instructional content. This finding might be especially instructive as California considers which math curriculum materials to promote in its next curriculum adoption cycle and as the state considers potential barriers to that adoption in different types of schools.

Although Culturally Relevant Math Instruction Was Not a Top Priority for California Math Teachers When Selecting Instructional Tasks or Activities, Roughly Four in Ten Teachers Said That They Had a Major or Moderate Need for More or Better Culturally Relevant Curriculum Materials

“Teaching toward social justice” is a core equity-oriented principle in the new framework and involves leveraging students’ existing “funds of knowledge” so that they can see math as relevant to their own lives (California Department of Education, 2022b, p. 55). This emphasis within the updated framework could be a salient driver for equitable math instruction in California; research suggests that math instruction that connects to students’ cultural experiences and to social justice issues affecting students’ own communities can support their engagement in and retention of mathematical learning, thereby also potentially supporting students’ math proficiency (Aronson and Laughter, 2016). Notably, these aspects of math instruction—connecting learning to students’ lived experiences and providing students with the opportunity to understand and analyze social issues through a mathematical lens—are encapsulated in culturally relevant math instruction (Aronson and Laughter, 2016).

According to the 2022 LTS, 99 percent of California math teachers agreed that students of all backgrounds and identities should feel that math is relevant to their lives, and 90 percent agreed that math instruction should be culturally relevant for students of all racial, ethnic, and cultural backgrounds and identities. However, only 59 percent of teachers agreed that their students see math as relevant to their futures, suggesting that more can be done to ensure that students see the connection between math and their own lived experiences.

Despite teachers’ beliefs that math instruction should be culturally relevant, when we asked teachers in the 2022 AIRS what their top priorities were for determining which tasks or activities to use for their
mathematics instruction, selecting tasks or activities related to culturally relevant instruction was among the lowest priorities. Indeed, only 8 percent of teachers chose “activating the diverse cultural background knowledge of students” as one of their top five priorities, and 22 percent chose “providing authentic opportunities for students to understand and reflect upon their own identities and the identities of others” as one of their top five priorities (Figure 4). This is in comparison to roughly 70 percent of teachers who reported that providing scaffolds or supports to help students master grade-level content, alignment with their state’s math standards, and student engagement were among their top five priorities when choosing tasks and activities for students.

Although teachers indicated that culturally relevant math instruction was not a top priority, they also indicated a need for math curriculum materials that better addressed culturally relevant approaches. Roughly four in ten teachers reported that they had a moderate or major need for more or better mathematics curriculum materials to address culturally relevant approaches, such as activating students’ cultural knowledge or helping them reflect on their own identities and the identities of others (Figure 4).

Notably, student engagement was both a top priority for teachers and a top need for more or better curriculum materials. Sixty-eight percent of teachers indicated it was one of their top five instructional priorities when selecting tasks or activities, and 60 percent of teachers reported that they had a moderate or major need for more or better math curriculum materials to engage students. By making explicit the connection between student engagement and culturally relevant practices (Hubert, 2014; Wang et al., 2021), state and district leaders could help teachers accomplish both goals simultaneously. In other words, by providing teachers with culturally relevant materials, state and district leaders also could provide teachers with materials that students might find more engaging.

Our data suggest that state, district, and school leaders might consider the materials they require or recommend to be a natural starting place. Roughly 40 percent of teachers reported that the math curricu-
lum materials provided by their districts or schools as a recommendation or requirement were inadequate for the purposes of reflecting the diversity of identities within their classrooms, helping them provide culturally relevant instruction, or reflecting students’ interests or experiences. Only about one-quarter of teachers felt that their curriculum materials were adequate for these purposes. The remainder either felt that their materials were inadequate in some ways and adequate in others or were unsure (Figure 5).

Our findings from the 2022 LTS also suggest that many teachers need more professional learning to enact culturally relevant math instruction. Only a little more than one-third of teachers reported that, during the 2021–2022 school year, their math professional learning opportunities placed a moderate amount or a lot of emphasis on implementing culturally relevant pedagogy (37 percent), reflecting on their own cultural lenses and personal biases (39 percent), selecting and using culturally responsive instructional materials (35 percent), and understanding systemic bias and injustice and their impacts on students’ education (37 percent). Additionally, about 40 percent of teachers reported that they did not receive professional learning on these topics at all.

 Few California Middle School Math Teachers Advised Students on the High School Math Courses Available to Them

The proposed California math framework affords students the opportunity to choose among multiple pathways to select the courses that will best align with their future endeavors. Although it is not mandated, the framework cautions against “early tracking” and prematurely accelerating students to algebra in 8th grade (California Department of Education, 2022e). However, by delaying algebra until 9th grade, students may have to take multiple math courses simultaneously or

FIGURE 5
California Math Teachers’ Perceptions About the Math Curriculum Materials Provided by Their Districts or Schools as a Recommendation or Requirement

[Graph showing percentage of teachers' perceptions of curriculum materials adequacy]

NOTE: In the 2022 AIRS, California math teachers were asked to “[i]ndicate the extent to which the mathematics curriculum materials provided by your school or district as a recommendation or requirement are adequate for each purpose listed . . . as they were designed (regardless of whether you use them in practice, and prior to any modifications you may make to them).” Teachers were able to respond on a scale of 1 to 7, where 1 meant “completely inadequate,” 4 meant “inadequate in some ways and adequate in others,” and 7 meant “completely adequate.” We defined inadequate as a rating of 1, 2, or 3 and adequate as a rating of 5, 6, or 7. Bars do not sum to 100 percent because teachers were also able to respond “not sure or N/A,” which is not displayed. In the survey, we defined culturally relevant as “addressing students’ cultural backgrounds, interests, and lived experiences.” California math teachers N = 118.
during the summer to reach calculus by their senior year. Alternatively, schools may need to consider how they can create three-year pathways to advanced math courses by reducing redundancies in course content (California Department of Education, 2022c). In high school, students are given the opportunity to opt out of such courses as advanced algebra and pre-calculus in favor of other courses, such as data science, which critics worry would underprepare them for future math-focused majors and careers. Although these suggestions are intended to modernize math pathways, ensure that students have strong foundational knowledge before progressing to more-advanced math courses, and address inequities introduced through tracking (California Department of Education, 2022c; Gamoran, 2009), they could introduce unintended negative consequences if students are left to make these choices on their own, without the benefit of guidance or advice.

Teachers play a significant role in advising students about postsecondary pathways (Mulhern and Steiner, 2022) and are critical for helping students get on and persist in accelerated math tracks in high school, especially for Black students (Irizarry, 2021). With this new framework, teachers could play an even greater role in advising students on which courses or pathways they might pursue.

As the framework authors point out, students’ choices for their third-year courses during high school could cause them to leave the traditional pathway to calculus in high school or at the beginning of their postsecondary careers. Students also might choose to take advantage of supplemental courses offered by their schools or districts to help prepare them for upcoming courses, catch up, or further accelerate or deepen their learning (California Department of Education, 2022c; California Department of Education, 2022d). These options for student choice underscore the heightened importance of receiving guidance on course-taking. Because we focus on just the responses of middle school or high school math teachers, the sample sizes for the following results are very small (i.e., 38 to 43 California math teachers). We present these results to shed light on how math teachers are advising students in California but urge caution in interpreting the findings.

According to the 2022 LTS, California math teachers rarely advised students on the kinds of high school math courses available to them according to their current math achievement. Only 22 percent of California math teachers reported that they spoke to all or most of their students about this topic, which is statistically significantly less than teachers nationally (39 percent). Similarly, when we asked middle school teachers and 9th- and 10th-grade teachers whether they spoke to their students about the courses they should take to prepare for advanced placement (AP) math courses in high school, only 11 percent of teachers reported that they did so with all or most of their students, compared with 21 percent of math teachers nationally, although this difference was not statistically significant (Figure 6).

Advising students on their postsecondary math opportunities was much more common than advising students on their high school math opportunities. When we asked high school teachers about the conversations they had with their students about their future math opportunities, 43 percent reported that they engaged in conversations with most or all of their students about the college-level math courses available to them, given their current achievement level in math; 61 percent reported that they spoke with most or all of their students about the different postsecondary education and career options that use math; and 76 percent reported that they talked to most or all of their students about the math courses they should take in high school to prepare for college-level math. However, it is possible that delaying these conversations until high school may restrict the high school math courses available to students. Guidance from middle school teachers about the various pathways available could be critical for informing students’ high school math choices, which could then either expand or constrict their postsecondary opportunities.

Moreover, about 20 to 40 percent of teachers reported having these conversations with some of their students. That teachers may be relying on their own discretion to choose which students receive or do not receive guidance also might have consequences for students’ equitable access to future math opportunities.

It is important not only for students to receive guidance on the math opportunities available to them but also for teachers to acquire more informa-
tion about students’ future endeavors and goals to better inform instruction. In the absence of such information, teachers might unintentionally create barriers to students’ future math advancement. Teachers were least likely to draw on their knowledge of students’ future career and education plans when deciding whether to skip standards-aligned content: Only 33 percent of teachers reported that they rely on such knowledge to a great or moderate extent. This finding is especially concerning in light of our earlier findings that some groups of teachers were more likely to skip standards-aligned content and more likely to have negative perceptions about that content. If teachers who are struggling to provide standards-aligned instruction opt to skip such content without taking students’ future aspirations into account, they may be inadvertently influencing or creating barriers to students’ future math pathways.

About Half of California Math Teachers Expressed Concerns with Continuity of Programming in Their Schools

Because the framework’s implementation might lead to a wave of instructional directives, we also considered the extent to which California math teachers feel that there is continuity in their schools’ programs or initiatives. This analysis could shed light on the sup-
ports that teachers need to sustainably implement instructional changes. We asked about school programs broadly rather than math programs specifically and defined programs in the survey as any that might “support student outcomes, instructional systems, data and continuous improvement, and/or school culture and community engagement.” Thus, although math teachers may be considering their math programs in responding to this item, they also might be thinking of other types of programs in their schools.

Only 51 percent of teachers felt that there is continuity from one initiative to another at their schools (Figure 7). Roughly half of all teachers expressed the idea that many special programs or initiatives “come and go” at their schools and that there are so many different programs at their schools that they cannot keep track of them. Additionally, roughly 40 percent of teachers disagreed that, when their school begins a new initiative, school staff follow up to make sure that it is working. This finding underscores the importance of ensuring that any new reforms, initiatives, or programmatic changes within the school to support the framework’s implementation are coherently embedded in, connected to, and sustained within the school’s practices and structures. If school and district leaders neglect to communicate a coherent and consistent message about how teachers should engage in math instruction, teachers might view the changes stemming from the framework as simply another transient reform effort without lasting power.

**Summary and Implications**

In this report, we paint a picture of the state of math instruction in California on the eve of the implementation of its new math framework. Our results highlight several challenges to supporting equitable math instruction in California.
instruction in the state. One recurring theme throughout our data is that teachers serving high-poverty schools and secondary teachers may need more support to implement standards-aligned instruction. One-third of California math teachers skip standards-aligned content occasionally or frequently, and teachers serving high-poverty schools are more likely than their counterparts in low-poverty schools to replace that skipped content with content from prior grade levels, although secondary teachers are especially likely to not replace skipped content.

We also found that both secondary teachers and teachers serving high-poverty schools were less likely than their counterparts to use a standards-aligned math curriculum material, suggesting that students may have disparate access to standards-aligned instructional content. These results suggest that a core piece of the state’s challenge in equitably providing students with high-quality math instruction is that all students in California currently do not have the same access to grade-level, standards-aligned instructional content.

To support the implementation of the framework’s priorities, teachers will need to shift their mindsets, priorities, and practices. For example, advising students on their future math opportunities, especially at the middle school level in preparation for high school, is reportedly rare. Additionally, culturally relevant math instruction and tasks rooted in real-world contexts are not high priorities for teachers, and many teachers indicated that they need more or better curriculum materials to help them enact culturally relevant approaches. State leaders and other education leaders might consider how they can generate more buy-in for their new priorities, potentially through providing teachers with supports connected to these priorities.

Our findings make it clear that teachers prioritize providing students with access to grade-level, standards-aligned instruction—or, where they may struggle to do so, they prioritize providing students with a review of content from prior grades to engage in such learning. Accordingly, state and district leaders will need to consider how they can message their new vision for math instruction in a clear and coherent manner that makes connections between (1) teachers’ priorities and concerns and (2) state leaders’ priorities.

Therefore, we suggest that California policymakers and education leaders consider the recommendations discussed in the following sections.

**Provide Teachers with the Curriculum Materials and Professional Learning to Successfully Enact Culturally Relevant Math Instruction**

Because culturally relevant instruction may be considered the domain of other subjects, such as English language arts or social studies, it is likely that integrating a more culturally relevant vision for math instruction could be novel for many math teachers throughout the state.

State leaders have several opportunities to support culturally relevant math instruction through instructional materials and professional learning. For instance, state leaders might consider how they can create greater transparency around the quality of curriculum materials by engaging in curriculum review processes and embedding notions of cultural relevance into their review criteria. A review rubric that clearly outlines criteria aligned to state priorities could help districts and school leaders select high-quality materials and might spur curriculum developers to mold their materials to better meet the state’s criteria.

State leaders also might consider how they can bolster teachers’ access to professional learning opportunities that touch on culturally relevant math instruction. For instance, they might provide guidance around professional learning opportunities by identifying high-quality vendors or directly providing professional learning to district leaders, school leaders, or teacher leaders.

**Integrate Statewide Goals into the Next Curriculum Adoption Cycle and Support the Equitable Adoption of Standards-Aligned Curriculum Materials**

According to the California Department of Education, curriculum materials adoption occurs every eight years for math and the last adoption of math curriculum materials occurred in 2014 (California...
Department of Education, 2021). Thus, curriculum materials adoption and implementation are topics ripe for updated state-level guidance.

State leaders might consider how they can adopt curriculum materials that help them reach their statewide goals. Before adoption occurs and as the framework enters its final set of revisions, state leaders might begin to collaborate with curriculum developers, provide curriculum developers with input on existing curriculum materials, and ensure that available curricula meet teachers’ areas of need for more or better curriculum materials. For instance, teachers differ in their patterns and reasons for skipping standards-aligned instructional content; state leaders might help districts and schools select materials that support teachers in covering standards-aligned content with the appropriate scaffolds to mitigate the need for skipping.

Because we found that teachers serving high-poverty schools were less likely than teachers serving low-poverty schools to use at least one standards-aligned curriculum material, state leaders also might consider how to support the equitable adoption of curriculum materials. State leaders in California might draw on strategies used in other states to help schools—particularly those with larger vulnerable student populations, such as students experiencing poverty—select high-quality, standards-aligned curriculum materials. These strategies include providing guidance to districts on curriculum adoption to help them select high-quality materials that best fit their local needs and offering districts financial incentives to make the adoption of state-approved materials more attractive (Doan et al., 2022). By supporting the equitable adoption of standards-aligned curricula, state leaders also might be able to support students’ equitable access to standards-aligned, rigorous, grade-level content.

However, we acknowledge that, in an era in which schools and teachers are working hard to mitigate the impacts of the coronavirus disease 2019 (COVID-19) pandemic, simply providing teachers with more or better instructional materials may not be sufficient. In addition to materials that better scaffold content for struggling learners, schools and districts might consider how they can provide teachers with additional resources to address unfinished learning, such as additional staff or opportunities for high-dosage tutoring or expanded learning time (The Education Trust, 2022; Kraft and Novicoff, 2022).

Provide Teachers with Support on How to Advise Students on Their Future Math Pathways and Create Structured Opportunities to Provide Students with Equitable Access to Guidance

If students are to have greater autonomy over their math pathways, teachers will need more support on how to advise students on their future math opportunities so that students and their families are able to make informed choices.

First, our data make clear that teachers need more information about students’ long-term goals to inform their instruction. State or district leaders might consider how they can facilitate teachers’ collection of such student data—perhaps by developing and disseminating student surveys—and support teachers’ use of those data through, for example, protocols for peer collaborative learning.

Second, as guidance around future math pathways becomes increasingly important, it is even more critical that students have equitable access to such guidance by ensuring that all students have opportunities to obtain advice. School or district leaders might build structures to systematically create those opportunities so that teachers have more time to provide guidance to students and are not relying solely on their own discretion to determine which students will receive their guidance. School or district leaders might provide more opportunities for math instructors to collaborate or share information with the academic counselors in their schools to enhance the guidance that students receive from their counselors. School or district leaders also might set aside dedicated time for students to share their future career and education plans so that math teachers can advise them on the pathways that are best aligned with their endeavors.
Sustain Efforts to Improve Math Instruction by Messaging a Shared Vision, Coherently Embedding Supports into Multiple Aspects of the Instructional System, and Periodically Gathering Feedback from Teachers

Intense debate about the content and delivery of math instruction could further confuse math educators about how and what to teach (Noguera and Polikoff, 2022). Advocates for a more inquiry-based, social justice–oriented form of math instruction are on one side of this debate, while advocates for more-traditional math instruction that privileges explicit, direct instruction are on the other (Noguera and Polikoff, 2022; Wurman and Evers, 2022). State and local policymakers should (1) strive to craft a shared vision for math instruction that recognizes and balances the concerns of both sides and (2) demonstrate how both approaches can support and reinforce each other. By consistently messaging a clear vision for math instruction that can be shared across different stakeholders, education leaders can further support the sustainable implementation of the framework’s priorities by clarifying expectations for math instruction and demonstrating to schools and districts that this shared vision will not be another fleeting initiative, even in the midst of controversy and debate.

Sustained implementation of the state’s vision for math instruction—embodied by the updated framework—is especially important because majorities of California math teachers have expressed skepticism about the continuity of new programs at their schools. Over the long term, state leaders might

How This Analysis Was Conducted

In this report, we used responses from 128 California math teachers from the 2022 AIRS and 216 California math teachers from the 2022 LTS to examine the state of math instruction in California. Additional information about each of these surveys is included in American Instructional Resources Surveys: 2022 Technical Documentation and Survey Results (RR-A134-14, www.rand.org/t/RRA134-14) and Learn Together Surveys: 2022 Technical Documentation and Survey Results (RR-A827-9, www.rand.org/t/RRA827-9). We report sample-wide and subgroup-specific means and proportions of variables of interest, weighted to ensure national and state representation.

To compare responses for teachers in schools with different demographic profiles, we matched AIRS and LTS responses to school-level data from the 2020–2021 Common Core of Data. On select survey items, we explored whether math teachers’ responses differed according to their school context (i.e., school locale), the characteristics of the students at their schools (i.e., student poverty levels), or the grade that they taught. We used the percentage of students enrolled in FRPL programs as a proxy for student poverty levels and characterized schools with 50 percent or more of student enrollment in FRPL as “high poverty” and schools with less than 50-percent student enrollment in FRPL as “low poverty.” We grouped teachers into two grade bands according to the grades they reported teaching (i.e., elementary [K–5] and secondary [6–12]). To support the interpretability of our findings, when conducting subgroup analyses by grade level, we omitted reports regarding the small number of teachers who taught across both grade bands (11 teachers in the 2022 LTS and four teachers in the 2022 AIRS), allowing us to compare the responses of elementary teachers with those of secondary teachers.

Unless otherwise noted, we discuss differences among educator subgroups that are statistically significant ($p < 0.05$) on pairwise comparisons. We tested the robustness of significant differences across teacher subgroups to adjust for observable school-level characteristics (e.g., poverty level, student racial and ethnic composition, locale) and educator-level characteristics (e.g., race, gender, grade level). We note where teacher subgroup differences are no longer significant after controlling for school-level and teacher-level characteristics. These regression analyses are useful for understanding the drivers of differences, but we do not present regression-adjusted statistics because we believe that these teacher subgroup differences remain notable even if they could be driven by multiple underlying factors. Moreover, we did not make statistical adjustments for multiple comparisons because the intent of this report is to provide exploratory, descriptive information rather than to test specific hypotheses or causal relationships.
consider how they can coherently embed their vision into multiple aspects of the instructional system (e.g., educator preparation and professional learning; development and selection of curriculum materials, teacher evaluation, and student assessment) to support sustainability.

However, to determine whether instructional practices are shifting meaningfully to align with the state’s priorities and vision, state and local leaders must understand and consider the perspectives of teachers on the ground who are tasked with implementing that vision. To further support the sustained implementation of the framework, state and local leaders might consider how they can gather feedback from teachers on the challenges they are facing and the successes they have experienced in the implementation process, possibly through ongoing surveys of teachers. Such data collection could be tied to aspects of the state’s vision and the instructional system components noted earlier, such as teachers’ perceptions of their curriculum materials and their preparation, professional learning, or evaluation processes. This could allow leaders at all levels to obtain feedback from teachers and tailor supports to teachers’ needs.

Limitations

This report provides an in-depth look at California teachers’ math instruction. However, there are several caveats that readers should consider when interpreting the results we present in this report. First, our samples of California math teachers are small ($N = 216$ for the 2022 LTS and $N = 128$ for the 2022 AIRS). Our samples of math teachers are subgroups of larger, state-representative samples of California teachers, so our results may not generalize to all math teachers in the state, and any differences across teacher subgroups should be interpreted cautiously. Second, our analysis of teachers’ responses to survey items relies on teachers’ self-reports and perceptions. These self-reports should be interpreted with caution; they rely on teachers’ knowledge, estimations, and recollection, which may be incomplete, and are subject to reporting bias—which are limitations that are present in all survey research. Finally, our analysis is driven primarily by interpretations of sample means, without controlling for potential confounders. The findings therefore represent purely descriptive characterizations of teacher responses and should not be interpreted as causal relationships.

Notes

1 We define students of color as students who do not identify exclusively as White.

2 In this report, we define high-poverty schools as schools in which a majority of the student population was eligible for free-or reduced-price lunch (FRPL). We define low-poverty schools as schools in which less than half of the student population was eligible for FRPL. We define elementary teachers as teachers serving grades K–5 and secondary teachers as teachers serving grades 6–12.

3 Although the California Department of Education website refers to its “instructional materials evaluation and adoption process,” it also notes that the State Board of Education “traditionally adopts only basic instructional materials programs (i.e., programs that are designed for use by pupils and their teachers as a principal learning resource and meet the basic organization and content requirements of a full course of study, which is generally one school year in length),” which aligns with our definition of curriculum materials (California Department of Education, 2021).

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About This Report

In 2023, California will implement a new statewide math framework that will drive curriculum decisions for years to come. We leveraged data collected from California math teachers to paint a picture of math instruction throughout the state. In this report, we draw on surveys of teachers from the American Teacher Panel (ATP), which is a nationally representative sample of more than 22,000 teachers across the United States. The ATP is one of three survey panels that comprise the American Educator Panels (AEP), which are nationally representative samples of teachers, school leaders, and district leaders across the country. The panels are a proud member of the American Association for Public Opinion Research’s Transparency Initiative. For more information about any one of the survey panels, visit www.rand.org/aep.

For technical information about the surveys and analysis in this report, please see Learn Together Surveys: 2022 Technical Documentation and Survey Results (RR-A827-9, available at www.rand.org/t/RRA827-9) and American Instructional Resources Surveys: 2022 Technical Documentation and Survey Results (RRA134-14, available at www.rand.org/t/RRA134-14). If you are interested in using AEP data for your own surveys or analysis in other publications related to the AEP, visit www.rand.org/aep or contact aep@rand.org.

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