MATH in COMMON®

Spotlight on Student Achievement

Analyses of Statewide Assessment Data in Math in Common Districts

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Introduction

The Math in Common (MiC) initiative was launched in 2013, amid the introduction of many education policy changes in California. The California State Board of Education adopted the Common Core State Standards for Mathematics (CCSS-M) in 2010, although there was a delay in associated state policy supports for CCSS-M implementation. For instance, there was no state-approved list of CCSS-M–aligned instructional materials until 2014, and the first standards-aligned summative achievement test was not administered until spring 2015.

The MiC initiative aimed to support 10 California districts in implementing the CCSS-M and improving mathematics teaching and learning in grades K–8. Another goal of the initiative was for participating districts to identify and share best practices that could help the state's other 900-plus districts accelerate implementation of the CCSS-M and improve their math achievement (S.D. Bechtel, Jr. Foundation, 2012).

Five years into the initiative, and with several years of data available from the state's standards-aligned summative achievement test, the California Assessment of Student Performance and Progress (CAASPP), we are in a position to examine some trends in student achievement scores in the CCSS-M era. Analyzing these data can help us understand how MiC districts, with their infusion of both material and intellectual resources, are performing in relation to the state mathematics standards, and how this progress looks when compared to peer districts and to districts across the entire state.

This report documents the uneven math gains made by MiC districts, schools, and students, by analyzing the patterns of those gains, which range from outperforming statewide trends to more moderate growth. While progress in student achievement in the MiC districts has been slow, there are some promising signs to share with the field.

Slow improvement in California mathematics achievement

In California, student achievement outcomes in mathematics have been disappointing to educators, parents, and students (Cano, 2018; Reardon et al., 2018). CAASPP mathematics data reveal that the progress of student achievement in mathematics since 2015, the first year in which the CAASPP was administered, is slow and lags behind student achievement in English language arts (see Tables 1 and 2).[1] Educators and observers want to see higher percentages of California students meeting or exceeding the standard as set forth in the CAASPP,[2] but those percentages are mostly stagnant.

Tables 1 and 2 show statewide CAASPP performance and progress data for both mathematics and English language arts for two student cohorts across years of administration: an elementary school cohort

1 Mathematics scale scores (which are students' raw test scores converted into a common scale that is comparable across grades) increase as students progress across grade levels, as would be expected given the psychometric properties of the assessment (Warren, 2018).

2 Four achievement levels are specified for the CAASPP: *standard not met, standard nearly met, standard met,* and *standard exceeded.*

Table 1. California Student CAASPP Performance for Two Student Cross-Grade Cohorts, 2015–2018

	Average Scale Score, 2015	Average Scale Score, 2016	Average Scale Score, 2017	Average Scale Score, 2018*	Scale Score Increase, 2015–2016	Scale Score Increase, 2016–2017	Scale Score Increase, 2017–2018
Elementary school cohort Math	2415.1	2460.5	2485.8	2511.0	45.4	25.3	25.2
Elementary school cohort English language arts	2402.9	2454.4	2489.5	2518.9	51.1	35.1	29.4
Middle school cohort Math	2504.4	2525.0	2540.2	N/A*	20.6	15.2	N/A*
Middle school cohort English language arts	2511.8	2542.0	2559.0	N/A*	30.2	17.0	N/A*

* 2018 data for the grade 6 cohort are not available because the CAASPP is not administered to grade 9 students.

Source: California Department of Education, 2018a.

Table 2. California Student CAASPP Achievement Progress for Two Student Cross-Grade Cohorts, 2015–2018

	Percentage Meeting/ Exceeding Standard, 2015	Percentage Meeting/ Exceeding Standard, 2016	Percentage Meeting/ Exceeding Standard, 2017	Percentage Meeting/ Exceeding Standard, 2018
Elementary school cohort Math	40	38	34	37
Elementary school cohort English language arts	38	44	47	48
Middle school cohort Math	33	36	36	N/A*
Middle school cohort English language arts	42	48	49	N/A*

* 2018 data for the grade 6 cohort are not available because the CAASPP is not administered to grade 9 students.

Source: California Department of Education, 2018a.

(who were tested in grade 3 in 2015,[3] in grade 4 in 2016, and in grade 5 in 2017) and a middle school cohort (who were tested in grade 6[4] in 2015, in grade 7 in 2016, and in grade 8 in 2017). Table 1 shows that both cohorts' average math scale scores increased each year. However, Table 2 shows that the percentages of these same students meeting or exceeding the standard in math were stagnant.

3 CAASPP assessments are administered in the spring of each school year. For the purposes of this report, the assessment date (e.g., 2015) indicates the spring of the school year (e.g., 2014–15) in which the assessment was administered.

4 In some California school districts, grade 6 is included in the elementary level. For the purposes of this report, grade 6 is included as the baseline year for the middle school cohort of students.

While, as shown in Tables 1 and 2, mathematics achievement levels are disappointing across all California students, achievement data for three subpopulations of California students — English learners, students with disabilities, and low-income students — have been even more disappointing (Cano, 2018; Education Trust—West, 2018a; Reardon et al., 2018; Warren, 2018). For example, the Education Trust—West (2018a) summarized the particularly poor performance of English learners on the most recent (2018) CAASPP mathematics and English language arts tests, noting that English learners' 2018 scores increased by less than 1 percentage point over the 2017 results. In a related report, Education Trust—West (2018b) researchers lauded the efforts of California policymakers to support equity for English learners — including the state's adoption of the English Language Development Standards in 2012 and the English Learner Roadmap in 2017 — but noted that there is more work to do to "dismantle the inequities far too many of our students face" (Education Trust—West, 2018b).

Although state policymakers have assured Californians that student achievement is expected to improve over time (California Department of Education, 2018b), in the short term, the public is apt to wonder why mathematics achievement, as measured by statewide assessments, is not improving. Recent research from Policy Analysis for California Education and Stanford University (2018) has identified a host of issues (both inside and outside of California's education system) that may be contributing to both the overall disappointing mathematics results and disparities among different student subgroups, including financing that creates disparities between poorer and wealthier communities; early childhood education and poverty; and the capacities of teachers and principals.

Of course, CAASPP data and data from other high-stakes student assessments cannot, on their own, offer a complete picture of either student achievement in mathematics in California or the state's progress in implementing the CCSS-M. Based on years of work with the MiC initiative, we know how complicated it can be to accurately measure the deep changes that are occurring in mathematics classrooms across the initiative and across the state. While assessment data offer critical insights into how students are performing, it also generally makes sense to look beyond student test scores to gain a fuller understanding of how CCSS-M implementation is playing out in classrooms. For instance, conducting classroom observations and analyzing the resulting data can provide useful on-the-ground insights about math teaching and learning (Chu, Perry, Reade, & Marple, 2019).

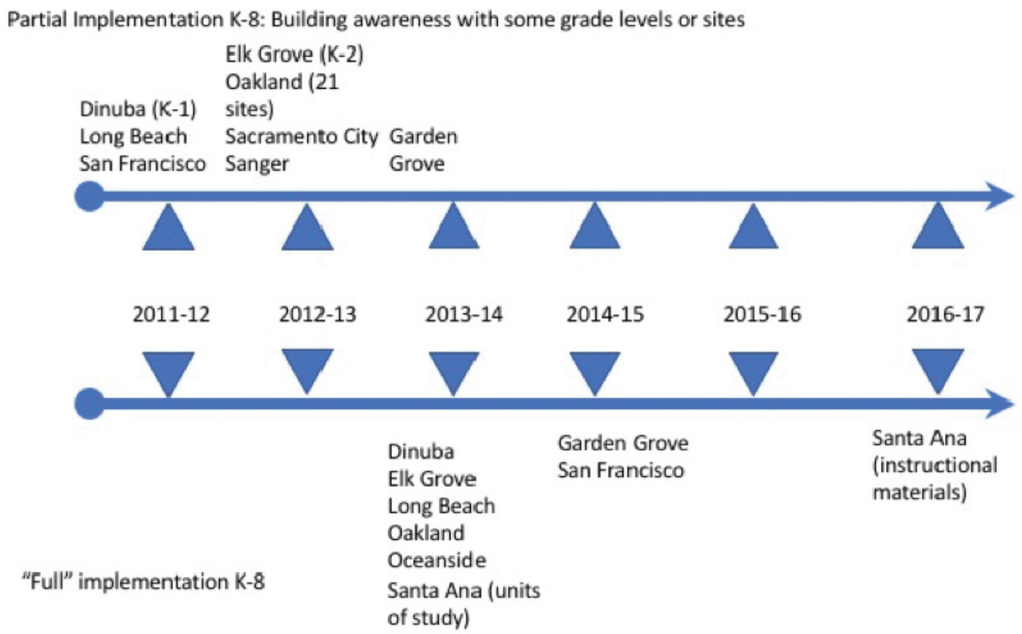
Math in Common districts: Priorities, demographics, and CCSS-M implementation timelines

Understanding the MiC districts' priorities, demographics, and implementation timelines is important in order to contextualize the tables, figures, and analyses offered in this report.

Focusing on equity. In 2012, the S.D. Bechtel, Jr. Foundation invited 27 California districts whose students were underperforming on state mathematics achievement measures to apply for MiC funding; 23 districts submitted proposals to participate, and 10 were accepted into the initiative. One criterion for districts to be invited to submit a proposal was the extent to which district leaders were already working to close achievement gaps between their student populations and the statewide student population. All 27 of the invited districts already had student equity as a focus of their work.

In order to understand how the eventual 10 MiC districts' work toward achieving equity among their students has played out in testing, this report analyzes achievement for all students in each district, as well as for one

Figure 1. CCSS-M Implementation Timelines for the Math in Common Districts



Source: Math in Common district leadership team members.

student subgroup — English learners — in each district.[5]

As a comparison group for the MiC districts, we analyzed student scores from the 13 districts[6] that applied for, but did not receive, MiC funding. We used these districts as a comparison group because, like the 10 MiC districts, they all had plans for creating equitable learning environments supportive of all students, so we have assumed that they continued to pursue student equity without the extra supports that MiC provided.

MiC district demographics. At the beginning of the initiative, the percentages of English learners in the 10 MiC districts ranged from 16 percent (Elk Grove) to 82 percent (Sacramento City), with an average English learner percentage of 43 percent across the 10 districts. Four of the districts (Sacramento City, San Francisco, Sanger, and Santa Ana) had English learner percentages higher than 50 percent. Although student socioeconomic status is not addressed in this report, it is also noteworthy that several MiC districts had high percentages of low-income students, which may have exacerbated challenges related to supporting students' mathematics achievement.[7] The percentages of low-income students (i.e., students eligible to receive free or reduced-price lunch) in MiC districts ranged from 51 percent (Elk Grove) to 93 percent (Santa Ana), with an average percentage of 72 percent across the 10 districts.

CCSS-M implementation timelines. Education reform is not immediate. Indeed, some researchers have argued that it may take several years for the impact of implementation of education innovations to be realized

5 Additional reporting on mathematics achievement for English learners (e.g., by language and by amount of time in the United States) and for other student subgroups, including low-income students and African American and Latino students, is forthcoming.

6 Twenty-seven districts were invited to apply to participate in the MiC initiative, and 23 submitted an application; 10 of the districts that submitted an application were accepted as MiC districts, and 13 were not.

7 Across the United States, districts with more affluent students consistently have higher math and reading achievement (Reardon, 2016).

(Fullan, 2001; Jellison, 2006; Solmon, 2003). Therefore, when looking at CAASPP data from 2015 through 2018, it is important to understand the different timelines for CCSS-M implementation that districts pursued throughout this period, with some reaching "full" implementation years before others. Some MiC districts began with partial implementation (i.e., only implementing the CCSS-M at selected grade levels) in the 2011–12 school year and moved to full implementation during the 2013–14 school year, while others rolled out the CCSS-M across all grades simultaneously (see Figure 1 on page 4 for a visual representation of CCSS-M implementation progress across all 10 MiC districts).

The different implementation timelines across MiC districts likely affected changes or improvements in student achievement in these districts; districts that did not achieve full implementation until later in the initiative might also show improvements in student achievement later than other districts that fully implemented the CCSS-M earlier.[8]

The MiC districts also took a variety of approaches to CCSS-M implementation, with different indicators to define "full" implementation and different paths to achieve it. For example, while adopting new instructional materials was a main implementation activity across the districts, individual districts made very different choices about their materials. Two districts organized groups of local educators to develop their own instructional materials and teaching toolkits; other participating districts quickly adopted commercially produced instructional materials; and still other districts decided to wait several years before making decisions about which math materials to adopt. Santa Ana MiC leadership team leaders reported that district staff felt that they had achieved full implementation only as recently as the 2016–17 school year, after it had adopted instructional materials for all K–8 grade levels.

Focus of this report

This report describes three analyses that we conducted in order to understand student achievement in MiC districts, relative to achievement in the rest of California, on the CAASPP in mathematics:

- First, it examines the percentages of students meeting or exceeding the standard over time, and compares MiC districts' progress to other California districts' progress on this measure.
- Second, it presents regression analyses predicting school-level achievement gains between 2016 and 2018 on the CAASPP, with schools in MiC districts compared to other California schools.
- Third, it provides analyses of student-cohort data showing how students in MiC districts progressed over three years, compared to their peers across the state.

Some analyses compare scores from MiC districts to scores from districts that were invited by the S. D. Bechtel, Jr. Foundation to apply, and that subsequently applied, to participate in MiC, but that were not selected for participation. We chose these districts as a comparison group because they were similar in many ways, such as their student demographics and implementation priorities, to the 10 selected MiC districts. Details on the methodology for these analyses are included in Appendix A.

We cannot draw causal links between specific districts' interventions to support students' mathematics achievement and those districts' student outcomes. However, positive achievement outcomes in districts pursuing strategic CCSS-M implementation activities can shine a light on those districts' practices that are worth learning more about.

8 Several MiC districts reported that they began "full" implementation in the 2013–14 school year. One researcher has asserted that this year was the year that CCSS-M implementation started more broadly across the state, "only after previous state tests were discontinued in 2013" (Warren, 2018, p. 17).

Student Achievement Results

This section presents three different analyses of student achievement. The first analysis presents average performance for MiC districts, drawing on both elementary and middle school data. Following that analysis, two sections describe student achievement results at the elementary school level and at the middle school level, respectively. Regression analyses in both the elementary and middle school sections describe school-level achievement on the CAASPP between 2016 and 2018; schools' progress on the CAASPP in relation to their initial achievement levels; and student-cohort data showing how student cohorts in MiC districts progressed over three years, compared to their peers across the state.

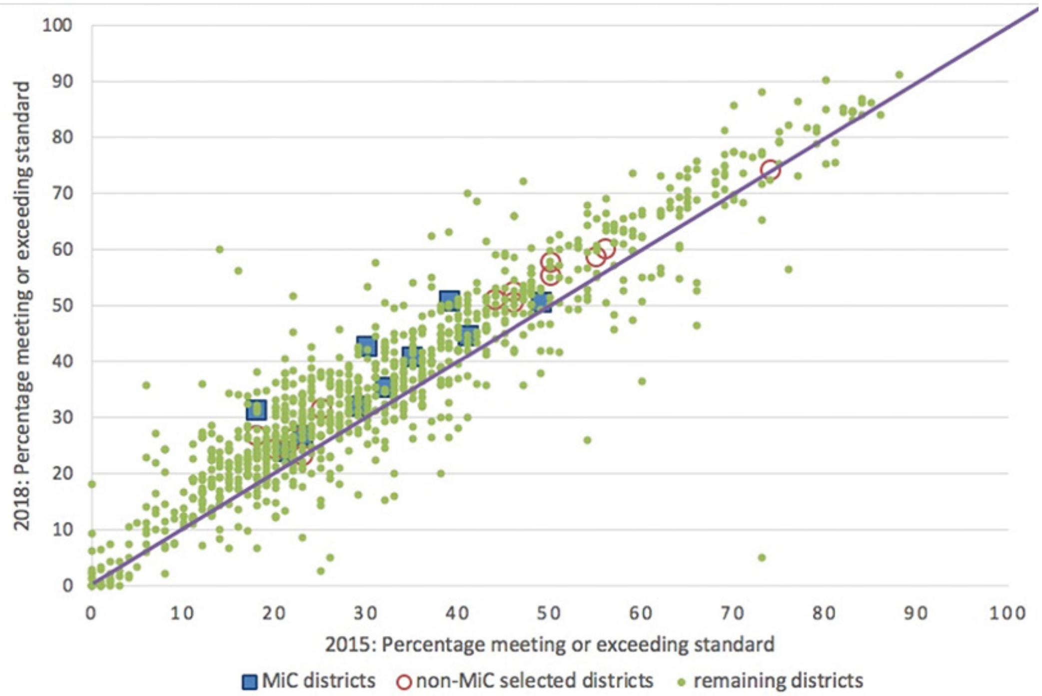
Average performance of MiC districts, compared to other California districts, 2015 vs. 2018

- **Summary:** The percentages of students who met or exceeded the standard on the CAASPP for mathematics achievement in 2015 and in 2018 were similar between MiC districts and other California districts.

As shown in Tables 1 and 2 (on page 2), average statewide mathematics achievement between 2015 and 2018 was mostly stagnant. However, looking only at statewide averages obscures information about how each of the more than 900 districts in the state performed over this same period. In order to show how individual MiC districts performed, relative to other individual California districts, we developed Figure 2. This graph shows the variation between districts' performance in 2015 and their performance in 2018, comparing, for each district, the percentage of students in grades 3–8 who met or exceeded the standard on the CAASPP in mathematics in 2015 (shown on the *x*-axis) and the percentage of students in those grades who met or exceeded the standard in 2018 (shown on the *y*-axis). In this graph, each district in the state is represented as a dot; MiC districts are represented as solid blue squares; and districts that applied for, but were not accepted into, the MiC initiative are represented as open red circles.

The diagonal ($y=x$) reference line represents no difference between 2015 and 2018 results; districts whose 2015 and 2018 achievement falls exactly on the ($y=x$) reference line had the same percentage of students meeting or exceeding the standard in both years. As shown in Figure 2, on average, achievement generally follows the same pattern of performance in MiC districts as in other districts across the state. However, MiC districts are slightly more homogeneous in the percentages of students who met or exceeded the standard than those of the non-MiC-selected districts. This is indicated by the tighter clustering of the blue squares slightly left of center, compared to the positions of the red circles.

Figure 2. Average Percentages of Students Who Met or Exceeded the Standard on the CAASPP in Mathematics in California Districts, 2015 vs. 2018



Source: Authors' analysis based on publicly available data from the California Department of Education.

Elementary school level

Student achievement results in elementary schools in MiC districts, compared to other districts, 2016–2018

- **Summary:** Relative to elementary schools in other California districts, increasing percentages of MiC elementary schools exceeded the predicted achievement on the CAASPP between 2016 and 2018. MiC district elementary schools' performance increased by 7 percentage points over the two-year period, a statistically significant increase.

The district-level achievement data shown in Figure 2 only tell part of the story. District-level achievement patterns alone cannot tell us about how schools within individual districts are performing in relation to one another. Because conditions can vary greatly across schools within a district — from differing student demographics, to levels of district investment, to patterns in staff experience levels — it is important to learn which schools are achieving under which conditions, in order to better understand which practices from those schools can be effectively spread to other sites.

Although MiC was a district-level initiative focused on improving achievement in all schools in a district, we believed that looking at individual sites would provide a fuller picture of progress. If the initiative was having an effect on individual schools, we would expect to see differences in average school performance between MiC district schools and non-MiC district schools with similar characteristics.

One way to analyze how schools are performing in relation to one another is by using a regression analysis, in which we employ a predictive model based on data from all schools in the state. This model is

Table 3. Predicted School-Level CAASPP Mathematics Outcomes of Elementary Schools in MiC Districts, Compared to Elementary Schools in Non-MiC Districts, 2016–2018

Year		Number of Elementary Schools	Number of Schools Performing Beyond Prediction	Percentage of Schools Performing Beyond Prediction
2016	**10 MiC districts**	**379**	**182**	**48**
2016	13 non-MiC-selected districts	658	325	49
2016	Remaining 575 districts in CA	3501	1624	46
2017	**10 MiC districts**	**378**	**199**	**53**
2017	13 non-MiC-selected districts	657	297	45
2017	Remaining 574 districts in CA	3495	1687	48
2018	**10 MiC districts**	**378**	**207**	**55**
2018	13 non-MiC-selected districts	657	312	47
2018	Remaining 574 districts in CA	3493	1691	48

Source: Authors' analysis based on publicly available data from the California Department of Education.

strengthened by the breadth of available data from across California, which gives us a more complete understanding of how mathematics achievement is changing under the new standards than we would have gained from examining the 10 MiC districts alone.

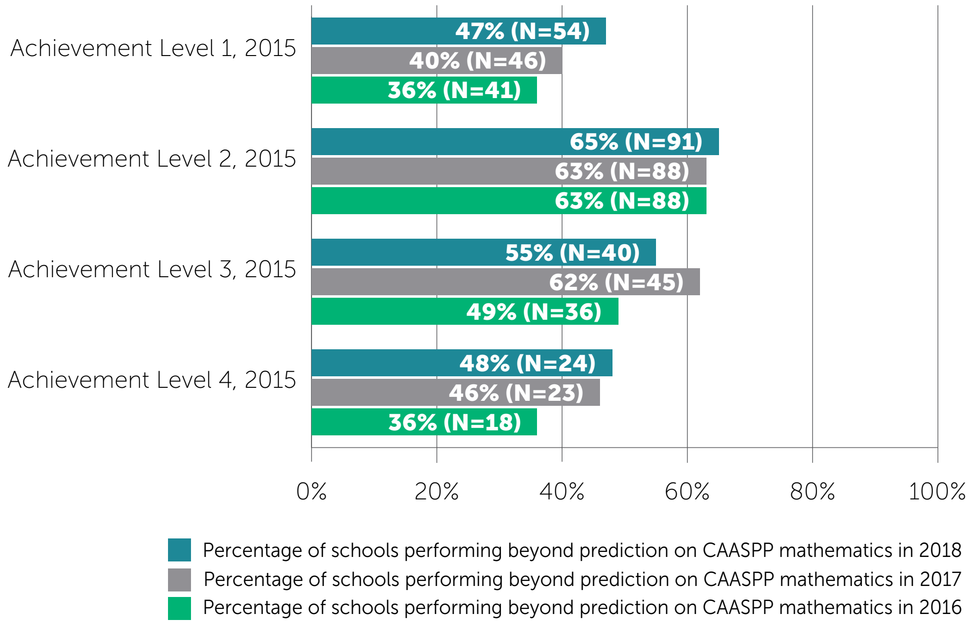
Using statewide data, we utilized a regression model to predict school achievement, based on prior performance and on school-level characteristics associated with math achievement as measured by the CAASPP. (See the *School-level profile regression analysis* section of Appendix A for more information on how this regression model was set up.)

Table 3 summarizes the results of this school-level profile analysis for elementary schools in the 10 MiC districts, compared to elementary schools in the 13 districts that applied for, but were not selected for, MiC participation and to elementary schools in all of the remaining California districts. The table shows that between 2016 and 2018,[9] schools in MiC districts made significantly more progress, compared to schools in the two other comparison groups, in exceeding their predicted performance; the percentage of schools exceeding the predicted achievement between 2016 and 2018 was significantly higher ($p < .05$) in the 10 MiC districts than in the other districts.

Table 3 shows that in 2016, across all three groups, about the same percentage of schools exceeded our performance prediction (48 percent of schools in MiC districts, compared to 49 percent of non-MiC-selected districts and 46 percent of schools in the remaining districts). In 2017, 53 percent of MiC district schools exceeded prediction, while about 45 percent of schools in non-MiC-selected districts and 48 percent of schools in the remaining districts did. In 2018, the difference was larger between MiC

9 Although the previous achievement analyses begin in 2015, the two cohort progress analyses in this report begin in 2016, because the 2015 achievement information is used in the regression models for subsequent years.

Figure 3. Achievement over Time for Elementary Schools in MiC Districts at Four Baseline (2015) CAASPP Mathematics Achievement Levels, 2016–2018



district schools and other schools across the state, with 55 percent of schools in MiC districts exceeding the performance prediction, compared to 47 percent of schools in non-MiC-selected districts and 48 percent of schools in the remaining districts.

School performance: Progress in MiC elementary schools across different achievement levels, 2016–2018

- **Summary:** Across four identified achievement levels, the greatest percentage of MiC district elementary schools that performed better than predicted on the CAASPP between 2016 and 2018 was in the middle of the achievement range, although MiC districts also succeeded in making progress with their lowest-performing elementary schools.

The evidence of stronger-than-predicted achievement in MiC elementary schools, compared to elementary schools in other districts, made us wonder about which group of schools in the MiC districts was most likely to perform better than predicted on the CAASPP in mathematics in each year of the CAASPP administration: higher-performing sites, lower-performing sites, or those in the middle.

To answer this question, we divided the MiC school sample into four achievement levels[10] based on the percentage of each school's students who met or exceeded the standard in the CAASPP baseline year (2015). We then examined whether these schools performed beyond prediction in each subsequent year of CAASPP administration from 2016 to 2018. As shown in Figure 3, across all three subsequent years, higher percentages of schools at the two middle achievement levels than at level 1 or level 4 performed beyond prediction; for both of the middle achievement levels, the percentage of schools performing

10 The levels were defined as follows: level 1: less than or equal to 20 percent of students meeting or exceeding the standard; level 2: between 20 and 40 percent of students meeting or exceeding the standard; level 3: between 40 and 60 percent of students meeting or exceeding the standard; level 4: greater than or equal to 60 percent of students meeting or exceeding the standard.

beyond the prediction was 49 percent or greater in each year.

Figure 3 also shows that a higher percentage of lower-performing schools (schools at level 1) in 2015 performed beyond prediction in 2018 than in the earlier years: 47 percent of lower-performing schools scored beyond prediction in 2018, while only 40 percent of these schools did so in 2017 and 36 percent did so in 2016.[11] This finding suggests that the lower-performing schools in MiC districts made increasingly greater progress as their implementation of the CCSS-M deepened between 2016 and 2018 (a change of 11 percentage points between 2016 and 2018, compared to, for instance, a change of 6 percentage points for level 3 schools during the same period).

Cohort analysis describing achievement for all elementary school students

- **Summary:** Patterns of math achievement from 2015 to 2017 for the MiC elementary school cohort generally followed the statewide pattern, although, across all three years, students in four MiC districts (Elk Grove, Garden Grove, Long Beach, and San Francisco) had higher annual gains in mathematics achievement than the statewide average.

Schools with large percentages of high-poverty students — like many schools in the MiC districts[12] — can also have higher student mobility rates, especially in urban areas (Sparks, 2016), with students moving frequently between schools in a district or out of the district altogether. Because the population of students within a school is not stable from year to year, using school-level data to examine achievement can mask details about individual students' achievement patterns.

In order to gain a clearer understanding of achievement in MiC districts, we felt that it was particularly important not only to look at school-level achievement, but to follow a cohort of students and understand those students' mathematics achievement across their years of schooling, using student-level data shared by our MiC district partners. Specifically, we gathered individual student math CAASPP data from 2015, 2016, and 2017 from nine[13] MiC districts. (Student-level data from the 2018 CAASPP were not available for analysis at the time this report was prepared.) The data were linked so that we could examine individual student achievement across years and then aggregate achievement patterns for individual students to the district level for a cohort analysis. The MiC student cohort scores were then compared to scores for similar statewide grade-level cohorts, using publicly available data.[14]

As shown in Table 4, the pattern of student achievement for the elementary school cohorts in nine MiC districts generally reflects the statewide growth pattern (as shown in the first table row), with scale-score gains for students as they move across grades. Student achievement for the elementary school cohort across 2015–2017 was consistently higher than the state average in four of nine districts (Garden Grove, Elk Grove, Long Beach, and San Francisco). That these districts had stronger-than-state-average achievement in 2015, the CAASPP baseline year, may indicate that efforts to support students' conceptual understanding of mathematics in these districts began before the baseline year. For example, as shown in Figure 1 (page 4), San Francisco began building awareness of

11 This trend also seems to be the case for schools at level 4 (48 percent of these higher-performing schools scored beyond prediction in 2018, while only 36 percent of these schools did so in 2016), although the number of schools at this level is small enough across each year to make such a summary statement less straightforward.

12 As stated earlier, across all 10 MiC districts, an average of 72 percent of students were eligible for free or reduced-price lunch.

13 One MiC district, Sacramento City, did not provide student-level data for the student cohort analyses.

14 We were unable to obtain comparable student-level data from non-MiC districts. As such, state data represent data on the grade-level cohort in a given school year (e.g., grade 3 in 2015, grade 4 in 2016, grade 5 in 2017).

Table 4. Average District CAASPP Mathematics Achievement and Annual Percentage Gains for the Elementary School Cohort, 2015–2017

Location	Estimated Average Scale Score (and Corresponding Achievement Level), 2015, Grade 3	Estimated Average Scale Score (and Corresponding Achievement Level), 2016, Grade 4	Estimated Average Scale Score (and Corresponding Achievement Level), 2017, Grade 5	Percentage Gain Toward Next CAASPP Achievement Level from 2015 to 2016	Percentage Gain Toward Next CAASPP Achievement Level from 2016 to 2017
Statewide*	**2415.1 (2)**	**2460.5 (2)**	**2485.8 (2)**	**65%**	**37%**
Dinuba	2385.1 (2)	2440.1 (2)	2475.0 (2)	55% (–)	40% (*)
Elk Grove	2432.8 (2)	2482.0 (2)	2504.6 (2)	94% (+)	49% (+)
Garden Grove	2423.0 (2)	2477.3 (2)	2500.9 (2)	88% (+)	47% (+)
Long Beach	2419.0 (2)	2464.2 (2)	2496.1 (2)	69% (*)	50% (+)
Oakland	2400.3 (2)	2440.2 (2)	2471.5 (2)	47% (–)	36% (*)
Oceanside	2384.8 (2)	2437.9 (2)	2476.3 (2)	53% (–)	43% (+)
San Francisco	2445.1 (3)	2483.1 (2)	2510.9 (2)	95% (+)	62% (+)
Sanger	2421.5 (2)	2462.6 (2)	2483.3 (2)	65% (*)	32% (*)
Santa Ana	2396.2 (2)	2443.5 (2)	2465.0 (2)	53% (–)	25% (–)

*Statewide values are actual, not estimated.
+ Percentage gain is higher than state for the period
* Percentage gain is same as state for the period (within a 5% difference)
– Percentage gain is lower than state for the period
Source: Authors' analysis of student-level data gathered from each MiC district.

the CCSS-M as early as the 2011–12 school year, and it fully implemented the districtwide Math Core Curriculum beginning in the 2014–15 school year, the same year as the baseline CAASPP test. These efforts may have contributed to San Francisco students having higher overall performance that year, relative to their peers across the state.

Student achievement was consistently lower than the state average in four districts (Dinuba, Oakland, Oceanside, and Santa Ana). In Sanger, achievement was higher than the state average in 2015, but was slightly lower than the state average in 2017.

In addition to estimated average scale score, Table 4 includes information about the nine districts' CAASPP achievement levels, shown in parentheses after the estimated average scale score each year. CAASPP scores are generally understood using these four achievement levels: 1 = *standard not met*; 2 = *standard nearly met*; 3 = *standard met*; 4 = *standard exceeded* (California Department of Education, 2018c).[15] Districts, schools, and students may make significant score gains from year to year while remaining at the same achievement level. We also wanted to understand progress *within* the four achievement levels, so we calculated the

15 We use different definitions of achievement levels for the school-profile analyses, as indicated in Appendix A.

percentage gains made, in each district and statewide, toward the next achievement level in each year. Percentage gains in CAASPP scores from 2015 to 2016 and from 2016 to 2017 are shown in the last two columns of Table 4. A percentage gain of 100 or above means that in the following year the average district performance moved up to the next achievement level. A percentage gain of less than 100 means that the district performance moved toward, but did not reach, the next achievement level (see the *Student cohort analyses* section of Appendix A for more information about the analysis of these percentage gains).

Table 4 includes symbols to visually highlight how the annual percentage gain for each district compares to the statewide percentage gain for the same year.[16] A green plus sign indicates that growth for the district was greater than the state average (i.e., a higher percentage gain from year to year), a red minus sign indicates that growth was lower than the state, and a yellow star indicates that the district's growth was about the same as statewide growth. This information illustrates which of the MiC districts' student cohorts started off with strong performance (as indicated by a green plus sign from 2015 to 2016) and remained strong (as indicated by a green plus sign from 2016 to 2017) relative to the state (i.e., Elk Grove, Garden Grove, and San Francisco), and which gained more in the second year than in the first year, as indicated by a sign change (i.e., Long Beach and Oceanside).

Elementary school student cohort analysis: Achievement for English learners

- **Summary:** Across the state, achievement gaps between English learners and English speakers[17] are increasing. Although achievement in elementary schools in MiC districts is lower for English learners than for English speakers, English learners in most of the MiC districts showed stronger score gains than their statewide peers from 2015 to 2017.

Table 5 shows achievement data for English learners in the elementary school cohort for the nine MiC districts and statewide from 2015 to 2017. Comparing the average scale scores and their corresponding achievement levels in Table 5 to the scores in Table 4 shows that achievement for English learners in elementary schools was lower than for students overall, both in the MiC districts and across the state.

Statewide, the majority of English learners (87 percent) were below or far below standard on the 2018 CAASPP (California Department of Education, 2018). The disappointing statewide achievement for English learners in the first few years of the CAASPP has prompted districts across the state to focus on supporting their English learners more strategically (Ruffalo, 2018).

Although English learners in California are performing more poorly than their English-speaking peers, there are some bright spots in the data from the MiC districts. Across the three years of the analysis, achievement for English learners in elementary schools in two

16 In this and subsequent similar tables, the percentage gain for each cohort for the 2015 to 2016 period was computed as follows: Percentage gain = scale score change / (the cutoff of the next achievement level – the estimated average scale score in 2015). The percentage gain equation is similar from 2016 to 2017, except for using the estimated average scale score in 2016.

17 In this section and in the comparable middle school section, *English learners* are defined as students who have been identified by their districts as "English learner" (EL) students or as students with "limited English proficiency" (LEP). The *English speaker* group may include students who are not EL/LEP students or who are "English only" students, depending on how they have been identified by their districts. Since we do not have the true student cohort data (i.e., individual student data across years) for the statewide comparison, for the statewide dataset we have used the "English only" group to represent English speakers. Therefore, the difference between English learners and English speakers at the state level may represent the upper bound of the true difference. More information about the English learner and English speaker categories is provided in Appendix A.

Table 5. Average District CAASPP Mathematics Achievement for English Learners in the Elementary School Cohort, 2015–2017

Location	Estimated Average Scale Score (and Corresponding Achievement Level), 2015, Grade 3	Estimated Average Scale Score (and Corresponding Achievement Level), 2016, Grade 4	Estimated Average Scale Score (and Corresponding Achievement Level), 2017, Grade 5	Percentage Gain Toward Next CAASPP Achievement Level from 2015 to 2016	Percentage Gain Toward Next CAASPP Achievement Level from 2016 to 2017
Statewide*	**2383.2 (2)**	**2412.9 (2)**	**2421.9 (1)**	**30%**	**10%**
Dinuba	2344.1 (1)	2396.7 (1)	2426.8 (1)	80% (+)	50% (+)
Elk Grove	2380.6 (1)	2422.1 (2)	2433.0 (1)	140% (+)	10% (*)
Garden Grove	2380.1 (1)	2429.4 (2)	2446.5 (1)	160% (+)	20% (+)
Long Beach	2388.6 (2)	2428.9 (2)	2458.4 (2)	40% (+)	30% (+)
Oakland	2353.0 (1)	2390.8 (1)	2415.6 (1)	70% (+)	40% (+)
Oceanside	2333.1 (1)	2379.3 (1)	2431.0 (1)	60% (+)	70% (+)
San Francisco	2400.8 (2)	2435.3 (2)	2455.5 (2)	40% (+)	20% (+)
Sanger	2365.3 (1)	2404.3 (1)	2426.6 (1)	90% (+)	40% (+)
Santa Ana	2352.1 (1)	2395.4 (1)	2413.4 (1)	70% (+)	30% (+)

*Statewide values are actual, not estimated.

+ Percentage gain is higher than state for the period

* Percentage gain is same as state for the period (within a 5% difference)

– Percentage gain is lower than state for the period

Source: Authors' analysis of student-level data gathered from each MiC district.

MiC districts, Long Beach and San Francisco, was at the same level as or higher than the statewide average for English learners. Overall, achievement for English learners in the MiC districts improved from 2015 to 2017, although achievement for this group of students was lower than the state average in Oakland and Santa Ana.

Achievement levels for many of the MiC districts remained at the lowest level (1) across multiple years. However, as indicated by the many green plus signs in Table 5, the annual percentage gains in average CAASPP scores for English learners in all MiC districts were greater than the statewide percentage gain (as shown in the first row of the table), with only one exception: from 2016 to 2017, Elk Grove's percentage gain was the same as the statewide gain. This tells us that English learners in the MiC districts were making progress even though their average scores were still in the lowest CAASPP achievement level score range.

Table 6 on page 14 shows the estimated average scale score differences between English learners and English speakers in each year from 2015 to 2017, for each district and (as shown in the first row of the table) for the state.

Table 6 also identifies, for each of the districts and for the state, the slope of the score gap between English learners and English speakers, as well as identifying whether the

Table 6. Achievement Gap on the CAASPP in Mathematics Between English Learners and English Speakers in the Elementary School Cohort, 2015–2017

Location	Estimated Average Scale Score Difference Between English Learners and English Speakers, 2015	Estimated Average Scale Score Difference Between English Learners and English Speakers, 2016	Estimated Average Scale Score Difference Between English Learners and English Speakers, 2017	Slope of Score Gap Between English Learners and English Speakers, 2015–2016	Slope of Score Gap Between English Learners and English Speakers, 2016–2017	Slope Trend in Gap Between English Learners and English Speakers, 2015–2017
Statewide	**41.5**	**57.8**	**74.7**	**0.39**	**0.29**	**Increasing**
Dinuba	65.4	69.4	76.8	0.06	0.11	Increasing
Elk Grove	59.0	67.6	80.8	0.15	0.19	Increasing
Garden Grove	59.8	66.7	75.7	0.11	0.14	Increasing
Long Beach	40.8	47.4	50.7	0.16	0.07	Increasing
Oakland	64.6	67.4	76.3	0.04	0.13	Increasing
Oceanside	61.2	69.3	53.6	0.13	*–0.23*	*Decreasing*
San Francisco	60.4	65.1	75.5	0.08	0.16	Increasing
Sanger	64.9	67.4	65.5	0.04	*–0.03*	Increasing
Santa Ana	65.8	71.7	77.1	0.09	0.08	Increasing

Source: Authors' analysis of student-level data gathered from each MiC district.

trend in slope of score gap between these groups was increasing or decreasing over time (see Appendix A for more information about these slope analyses). A slope with a positive number indicates that the score gap between English learners and English speakers increased from one year to the next, with a higher number indicating a relatively larger gap between these groups over the year. (For example, the statewide gap between these two student groups between 2015 and 2016 was 0.39, while in Dinuba, the gap between the two groups was much lower, at 0.06.) A slope with a negative number indicates that the gap between these groups decreased from one year to the next.

Across the state, the achievement gap between these groups increased during the three-year period, and this pattern of an increasing gap across all three years is evident in all but one MiC district as well. In Oceanside, the gap between English learners and their English-speaking peers closed over the three years.

Middle school level

The analyses for the middle school cohort include far fewer schools than the elementary school cohort. Therefore, the percentage values in this section may be more easily influenced by small numbers and should be interpreted with greater caution.

Student achievement results in middle schools in MiC districts, compared to other districts, 2016–2018

- **Summary:** In both 2016 and 2017, schools in MiC districts performed better than predicted, compared to

Table 7. Predicted School-Level CAASPP Mathematics Outcomes of Middle Schools in MiC Districts, Compared to Schools in Non-MiC Districts, 2016–2018

Year		Number of Middle Schools	Number of Schools Performing Beyond Prediction	Percentage of schools Performing Beyond Prediction
2016	**10 MiC districts**	**80**	**45**	**56**
2016	12 non-MiC-selected districts	136	55	40
2016	Remaining 411 districts in CA	902	422	47
2017	**10 MiC districts**	**82**	**48**	**59**
2017	12 non-MiC-selected districts	136	54	40
2017	Remaining 410 districts in CA	899	415	46
2018	**10 MiC districts**	**82**	**41**	**50**
2018	12 non-MiC-selected districts	134	66	49
2018	Remaining 409 districts in CA	897	439	49

Notes: This table summarizes findings from school-level profile analyses using a regression model that the authors developed (see the *School-level profile regression analysis* section of Appendix A for more information). The analyses summarized in this table include only 12 non-MiC-selected districts, rather than 13 as shown in Table 3, because one district does not have middle schools.

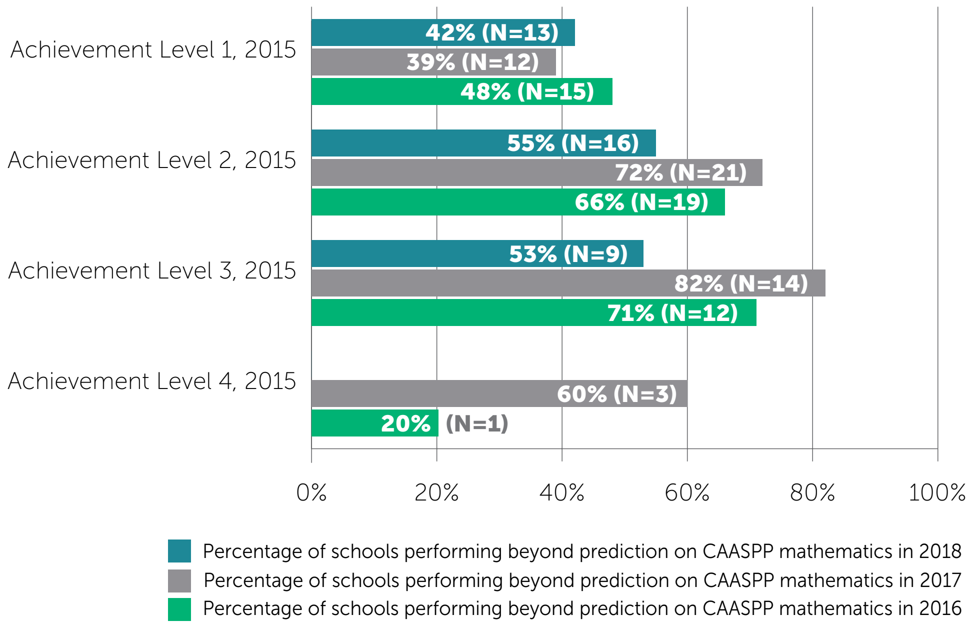
Source: Authors' analysis based on publicly available data from the California Department of Education.

a group of similar districts that were not selected for MiC funding. In 2018, schools in MiC districts performed about the same, relative to the prediction, as schools in the comparison group and as schools in all California districts.

Table 7 summarizes the data from our regression analysis for middle schools, comparing schools in MiC districts to schools in a comparison group of schools in similar districts that were not selected for MiC funding, as well as to schools in other districts across the state, based on how each group of schools performed relative to predictions. (For this middle school analysis, we used only 12 non-MiC-selected districts, rather than 13 as shown in Table 3, because one district does not have middle schools.)

In both 2016 and 2017, a higher percentage of middle schools in MiC districts performed better than predicted, compared to middle schools in the group of similar districts that were not selected for MiC funding; the differences are statistically significant at the $p < .05$ level. In 2018, however, middle schools in MiC districts performed about the same, relative to the prediction, as middle schools in other districts did. Between 2016 and 2018, the percentage of middle schools in MiC districts that were performing beyond prediction decreased (56 percent in 2016 versus 50 percent in 2018); this difference is not statistically significant. On the other hand, middle schools in the non-MiC-selected districts showed an opposite trend of improvement, with 40 percent of middle schools performing beyond prediction in 2016 and 49 percent of middle schools performing beyond prediction in 2018. This increase of 9 percentage points is significant at the $p < .05$ level. In the remaining districts across the state, the percentage of middle schools performing beyond prediction over the three years of the analysis remained about

Figure 4. Achievement over Time for Middle Schools in MiC Districts at Four Baseline (2015) CAASPP Mathematics Achievement Levels, 2016–2018



the same: 47 percent in 2016, 46 percent in 2017, and 49 percent in 2018. Overall, the regression analysis shows that in MiC middle schools, improvement has been uneven.

School performance: Progress in MiC middle schools across different achievement levels, 2016–2018

- **Summary:** Across four identified achievement levels, the greatest percentage of MiC district middle schools that performed better than predicted on the CAASPP between 2016 and 2018 was in the middle of the achievement range. Overall, MiC districts made less progress in improving their CAASPP scores than predicted for middle schools as implementation continued from 2016 to 2018.

As shown in Figure 4, the greatest percentage of MiC district middle schools that performed better than predicted on the CAASPP between 2016 and 2018 was in the middle of the achievement range.[18] Across all three years, 53 percent or more of the schools at the two middle achievement levels (levels 2 and 3) performed beyond prediction, but fewer than half of the lowest-performing middle schools (level 1) performed beyond the prediction. A larger percentage of these schools in level 1 did so in 2016 (48 percent) than in the subsequent years (39 percent in 2017 and 42 percent in 2018). In fact, across achievement levels 1–3, middle schools were more likely to perform better than predicted in 2017 than in 2018. This information is consistent with the data in Table 7 showing the declining percentage of schools performing beyond prediction over the period from 2016 to 2018.

Cohort analysis describing achievement for all middle school students

- **Summary:** Patterns of math achievement from 2015 to 2017 for the MiC middle school cohort generally

18 The levels were defined as follows: level 1: less than or equal to 20 percent of students meeting or exceeding the standard; level 2: between 20 and 40 percent of students meeting or exceeding the standard; level 3: between 40 and 60 percent of students meeting or exceeding the standard; level 4: greater than or equal to 60 percent of students meeting or exceeding the standard. Since only 5 schools fall in level 4, we did not interpret any findings at that level.

Table 8. Average District CAASPP Mathematics Achievement and Annual Percentage Gains for the Middle School Cohort, 2015–2017

Location	Estimated Average Scale Score (and Corresponding Achievement Level), 2015, Grade 6	Estimated Average Scale Score (and Corresponding Achievement Level), 2016, Grade 7	Estimated Average Scale Score (and Corresponding Achievement Level), 2017, Grade 8	Percentage Gain Toward Next CAASPP Achievement Level from 2015 to 2016	Percentage Gain Toward Next CAASPP Achievement Level from 2016 to 2017
Statewide*	**2504.4 (2)**	**2525.0 (2)**	**2540.2 (2)**	**33%**	**25%**
Dinuba	2472.7 (2)	2480.5 (1)	2480.2 (1)	8% (−)	−1% (−)
Elk Grove	2532.7 (2)	2547.7 (2)	2560.9 (2)	44% (+)	35% (+)
Garden Grove	2527.7 (2)	2549.9 (2)	2582.8 (2)	57% (+)	91% (+)
Long Beach	2499.8 (2)	2523.7 (2)	2546.2 (2)	36% (*)	36% (+)
Oakland	2462.5 (1)	2484.8 (2)	2496.3 (1)	104% (+)	11% (−)
Oceanside	2504.4 (2)	2550.6 (2)	2556.4 (2)	74% (+)	16% (−)
San Francisco	2531.6 (2)	2565.8 (2)	2588.0 (3)	96% (+)	110% (+)
Sanger	2504.3 (2)	2531.5 (2)	2564.7 (2)	43% (+)	61% (+)
Santa Ana	2459.4 (1)	2486.2 (2)	2501.4 (1)	109% (+)	15% (−)

*Statewide values are actual, not estimated.

+ Percentage gain is higher than state for the period

* Percentage gain is same as state for the period (within a 5% difference)

− Percentage gain is lower than state for the period

Source: Authors' analysis of student-level data gathered from each MiC district.

followed the statewide pattern, with variability across nine MiC districts. Students in most MiC districts had higher annual gains in math achievement than the statewide average in at least one year-over-year period.

As shown in Table 8, across years, the average scale scores for the middle school cohort (following individual students as they moved from grade 6 to grade 7 to grade 8 between 2015 and 2017) were consistently at or higher than the state average in four of nine districts (Elk Grove, Garden Grove, Oceanside, and San Francisco). In Long Beach and Sanger, average scores for the middle school cohort started at or lower than state average, but were above state average by 2017. Average scores for the middle school cohort were consistently lower than the state average in the three other MiC districts (Dinuba, Oakland, and Santa Ana). Of these nine MiC districts, Dinuba's student achievement over these years was flattest; overall, the district's student scale scores never rose more than 10 points across the three years.[19]

19 For many students, the transition from elementary to middle school can be a difficult transition that negatively influences student achievement (West & Schwerdt, 2012; Rockoff & Lockwood, 2010). In Dinuba, Elk Grove, Garden Grove, and Sacramento City, grade 6 is included at the elementary level, and students' transitions from elementary to middle school may be a factor in achievement patterns for this cohort.

Table 9. Average District CAASPP Mathematics Achievement for English Learners in the Middle School Cohort, 2015–2017

Location	Estimated Average Scale Score (and Corresponding Achievement Level), 2015, Grade 6	Estimated Average Scale Score (and Corresponding Achievement Level), 2016, Grade 7	Estimated Average Scale Score (and Corresponding Achievement Level), 2017, Grade 8	Percentage Gain Toward Next CAASPP Achievement Level from 2015 to 2016	Percentage Gain Toward Next CAASPP Achievement Level from 2016 to 2017
Statewide*	**2420.6 (1)**	**2423.3 (1)**	**2427.6 (1)**	**0%**	**10%**
Dinuba	2402.0 (1)	2388.8 (1)	2405.4 (1)	−20% (−)	10% (✱)
Elk Grove	2443.4 (1)	2447.3 (1)	2458.2 (1)	10% (+)	20% (+)
Garden Grove	2469.5 (1)	2477.0 (1)	2496.6 (1)	50% (+)	70% (+)
Long Beach	2447.1 (1)	2460.6 (1)	2479.3 (1)	40% (+)	40% (+)
Oakland	2381.4 (1)	2397.4 (1)	2418.0 (1)	20% (+)	20% (+)
Oceanside	2442.6 (1)	2481.5 (1)	2495.7 (1)	90% (+)	60% (+)
San Francisco	2441.4 (1)	2470.8 (1)	2492.3 (1)	70% (+)	60% (+)
Sanger	2410.2 (1)	2433.2 (1)	2449.9 (1)	30% (+)	20% (+)
Santa Ana	2370.3 (1)	2391.5 (1)	2409.5 (1)	20% (+)	20% (+)

*Statewide values are actual, not estimated.

\+ Percentage gain is higher than state for the period

✱ Percentage gain is same as state for the period (within a 5% difference)

− Percentage gain is lower than state for the period

Source: Authors' analysis of student-level data gathered from each MiC district.

Based on the annual achievement levels (shown in Table 8, following the estimated average scale score), and as indicated by the green plus signs in Table 8, most of the districts also showed a larger percentage gain than the state (shown in the first row of the table), in at least one year. In particular, although they began at CAASPP level 1 in 2015, Oakland and Santa Ana both progressed to CAASPP level 2 in 2016 (as indicated in Table 8 by the percentage gain from 2015 to 2016 being greater than 100), and San Francisco continued to make strong progress each year toward reaching the next performance level in 2017.

Middle school student cohort analysis: Achievement for English learners

- **Summary:** Statewide, middle school English learners performed more poorly than their English-speaking peers. In some MiC districts, English learners consistently performed better than the state average for English learners, but in all MiC districts, English learners will need to improve much more to close the achievement gap between them and English speakers.

As was true for the elementary school cohort, the scale scores for middle school English learners (as shown in Table 9) are lower than the comparable scores for all middle school

Table 10. Achievement Gap on the CAASPP in Mathematics Between English Learners and English Speakers in the Middle School Cohort, 2015–2017

Location	Estimated Average Scale Score Difference Between English Learners and English Speakers, 2015	Estimated Average Scale Score Difference Between English Learners and English Speakers, 2016	Estimated Average Scale Score Difference Between English Learners and English Speakers, 2017	Slope of Score Gap Between English Learners and English Speakers, 2015–2016	Slope of Score Gap Between English Learners and English Speakers, 2016–2017	Slope Trend in Gap Between English Learners and English Speakers, 2015–2017
Statewide	**96.3**	**115.9**	**126.8**	**0.20**	**0.09**	**Increasing**
Dinuba	91.4	118.7	96.9	0.30	*−0.18*	Increasing
Elk Grove	95.3	107.1	109.5	0.12	0.02	Increasing
Garden Grove	74.8	93.8	111.0	0.25	0.18	Increasing
Long Beach	65.5	78.3	83.0	0.20	0.06	Increasing
Oakland	97.9	105.6	94.6	0.08	*−0.10*	*Decreasing*
Oceanside	70.6	79.0	69.4	0.12	*−0.12*	*Decreasing*
San Francisco	102.8	108.3	109.0	0.05	0.01	Increasing
Sanger	101.9	106.5	124.3	0.05	0.17	Increasing
Santa Ana	109.0	115.9	112.5	0.06	*−0.03*	Increasing

Source: Authors' analysis of student-level data gathered from each MiC district.

students combined (see Table 8). Table 9 shows that middle school English learners in five districts (Elk Grove, Garden Grove, Long Beach, Oceanside, and San Francisco) scored above the state average (shown in the first row of the table) for these students across all three years, while English learners in three districts (Dinuba, Oakland, and Santa Ana) scored below the state average across all three years. In Sanger, English learners in middle school scored below the state average in 2015, but scored above the state average in the following two years.

While English learners in middle school consistently scored at the lowest CAASPP performance level (level 1) across districts and across years, some districts made more noticeable progress in achievement for this group than the state average. As shown in Table 9, the percentage gain in three districts progressed at least halfway toward the next level (level 2) between 2015 and 2016: Oceanside (90 percent), San Francisco (70 percent), and Garden Grove (50 percent). Between 2016 and 2017, the same three districts continued to progress by 60 or 70 percent toward the next CAASPP level (level 2).

Table 10 shows data on the achievement gap between English learners and English speakers in the nine districts. As we did for the elementary school cohort (see Table 6 on page 14), we computed the difference in scale scores for English learners, compared to their English-speaking peers, in each year, for each district and for the state (as shown in the first row of the table), and examined the extent to which the score gap was closing over time. A slope with a positive number indicates that the gap between English learners and English speakers increased from one year to the next, with a higher number indicating a relatively larger gap between these groups over the year. A slope with a negative number indicates that the gap between these groups decreased from one year to the next.

Across the state, the achievement gap between these groups increased during the three-year period, and the pattern was similar for students in most MiC districts. The pattern in Oakland and Oceanside was different, with the gap between English learners and English speakers decreasing minimally over the three years. This information suggests that most districts will need to improve their supports for English learners in order to narrow the gap between these students and English speakers.

Summary of Results

CAASPP achievement at the district level (Figure 2):

- The average achievement of the MiC districts between 2015 and 2018 was comparable to that of other California districts, though the MiC districts were more homogeneous.

CAASPP achievement at the school level (Table 3, Figure 3, Table 7, Figure 4):

- Relative to schools in other districts in the state, an increasing percentage of MiC elementary schools performed better than predicted on the CAASPP in mathematics between 2015 and 2018.
- At the middle school level, the percentage of schools performing better than predicted remained mostly the same for MiC district schools across years.
- Elementary and middle schools at the middle two achievement levels in 2015 were more likely to perform better than predicted on the CAASPP in subsequent years; the percentage of the lowest-performing elementary schools that performed better than predicted increased as districts' implementation continued from 2016 to 2018.

CAASPP achievement at the student level (Tables 4–6 and Tables 8–10):

- Analyses showed substantial variation in achievement across the MiC districts for both the elementary school and middle school student cohorts.
- However, every MiC district showed growth that was more positive than the state average for at least one annual growth period or student group (as indicated by the green plus signs in Tables 4, 5, 8, and 9).
- Achievement for English learners in MiC districts was lower than for all students in these districts, but in most MiC districts, this group showed stronger percentage gains from 2015 to 2017 than the statewide average for English learners.
- For both the elementary and middle school cohorts in most MiC districts, the achievement gap between English learners and English speakers was not closing; indeed, in most of these districts, it was increasing.

Limitations

Several factors in these analyses limit the conclusions that can be drawn from them. The primary limitation is the extent to which causal connections can be drawn between the MiC initiative and the student achievement outcomes described in this report. As our other reports in this series demonstrate, although deep learning and change was happening in the initiative (for example, in relation to the MiC districts supporting student mathematical discourse and using data for improvement), any impact of the initiative on student achievement is indirect at best. Additionally, many other improvement activities and factors were occurring in each of the MiC districts at the same time as the initiative, which may have directly influenced the results summarized in this report.

This report does not include all analyses of interest. For example, results for analyses of low-income students and students of color in the MiC districts are forthcoming and will be made available on the MiC website (https://www.wested.org/project/math-in-common-evaluation/). Additionally, this report includes only three years of individual student-level CAASPP data. California policymakers hope and expect that CAASPP student achievement will improve over time (California Department of Education, 2018b), so more substantial improvement may be expected once data from subsequent years of CAASPP testing are included in analyses. Similarly, as districts continue to deepen their CCSS-M implementation efforts, data from future testing periods may reveal achievement patterns that look different from those described in this report.

Although the gathering of CAASPP data across all districts in the state provides an invaluable source of information on student achievement and progress, CAASPP data are only one indicator of achievement and progress. Another report in this series discusses the value of using classroom observation data to understand CCSS-M implementation (Chu, Perry, Reade, & Marple, 2019). Additionally, the evaluation team is analyzing student mathematics course-taking patterns in the MiC districts, to see what patterns and findings arise from these data. In at least one district, San Francisco, indications are that changes that the district made in response to the CCSS-M are paying dividends in terms of providing access for all middle school students to rigorous mathematics instruction in grades 6–8 (Schoenfeld & Boaler, 2018).

Conclusion

At the conclusion of the five-year MiC initiative, although we might have expected implementation lag (Fullan, 2001; Jellison, 2006; Solmon, 2003) following the adoption of the CCSS-M to have caused delays in improvements to student achievement, student achievement results in MiC districts reveal both substantial variation across the districts and several positive findings.

There are signs that some MiC districts have accelerated student achievement on the CAASPP in mathematics somewhat more rapidly than the average statewide improvement pace. But even with hints of positive impacts on student achievement from the MiC initiative in some of the MiC districts, scores are still not at the level at which educators, parents, and the state would like them to be.

The MiC initiative offered districts significant funding and support, allowing them to increase mathematics staffing, gain ideas about specific instructional shifts, and learn in collaboration with other districts. It is not yet clear whether the initiative's work has built the kind of capacity and innovation, in the participating districts, that will ultimately result in more promising CAASPP results down the line. Our evaluation of Math in Common has suggested that district educators are only beginning to clearly specify the kinds of mathematics instruction that they want to see in mathematics classrooms, so it may still be too early for districts and educators to have designed and implemented effective delivery systems to achieve the desired outcomes from such instruction.

Standards implementation is in the details of how districts, schools, and teachers interpret and pursue the goals of the CCSS-M, and correlating impacts on student achievement may take a long time. Future positive achievement results for students in the MiC districts and in other California districts will depend on the accumulation of important learning and on capacity built for continuous improvement. Although we see signs of good news, we must remain patient about the disappointing early CAASPP results, and continue to support educators in persevering to make steady, positive changes. The words of one of our district colleagues echo this call for patience.

> *"A more abstract threat to our CCSS-M implementation is the fact that there is a sizable group of people across the state getting impatient with the slow progress of the work. Instead of understanding that the way we are asking teachers to teach CCSS-M mathematics is more challenging and takes more time to become proficient, I fear critics' voices will become louder. I recently participated in an . . . event and visited a classroom in another district. . . . The lesson was grounded in best practices, and the teacher was skilled at connecting the students' methods at the conclusion of the lesson. It wasn't perfect, but the teacher and students were well on their way. . . . Yet, the discussion*

among the administrators across districts was that this approach wouldn't work when the students got to algebra, and there was concern about why the standard algorithm wasn't introduced yet. Unless we in the field can convincingly persuade and answer these concerns, the CCSS-M and their associated instructional shifts will suffer a backlash, and the pendulum will swing away from research-based instructional practices to a 'back to basics' movement."
— 2017–18 Dinuba grant report

Along with the positive achievement outcomes discussed in this report, we learned much from our use of the CAASPP achievement data within the MiC initiative. The CAASPP data for the 10 MiC districts could be analyzed and presented in ways that sparked conversations within each district system about how to improve mathematics achievement. We believe that this helped stakeholders within district systems gain clarity on the mathematics instruction that they were aiming for in classrooms, and strengthened conversations about whether and how the districts' investments and choices were or weren't paying off for teachers and students.

The MiC initiative also illustrated how using CAASPP results as common achievement measures could facilitate learning across districts. After careful work to build a sense of trust and community, MiC district teams dug into their student achievement data in collaborative settings. This provided them with opportunities to understand and describe their own progress and to hear about others' progress, while thinking together about the different policies, practices, and programs in place for students across the districts, and about the effects of these investments.

We believe that, if implementation happens in details of interpretation and action at multiple levels of complex district systems, impact on student achievement can be catalyzed when district leaders get better at understanding, describing, and sharing complex and context-specific initiatives within their own district systems. Once district leaders understand and can describe what is happening within their districts, they can enable others outside of their districts to more easily learn from the ideas they are testing. Using both summative student achievement data and classroom observation data to support deeper analysis of and sharing about the possible impacts of district improvement systems on student achievement and teacher practice could go a long way toward helping all California districts implement the CCSS-M as well as other standards, such as the Next Generation Science Standards.

We wonder whether the state could increase the reporting options offered through the California Department of Education's CAASPP reporting portal to enable districts to track the progress of individual students over time, as we have done in our student cohort analysis. While districts receive their own student data, many do not have analytic support to conduct cohort analyses. Being able to analyze student cohort performance across an extended period of standards implementation and testing would enable districts to more closely understand their own achievement gaps, compare their achievement with their interventions, and learn from one another about what works to improve student achievement.

Appendix A. Methodology

Three levels of analyses were conducted to examine math achievement on the California Assessment of Student Performance and Progress (CAASPP) over time among the MiC districts: analyses at the district level, the school level, and the student level. Each is discussed in the following sections.

District-level analysis

We examined how MiC districts differed from other districts in terms of average district performance on the CAASPP in mathematics, by plotting the relationship between results from the baseline year and from the most recent year. The percentage of students meeting or exceeding the standard in 2015 (the baseline year) was plotted against the percentage of students meeting or exceeding the standard in 2018 (the most recent year) among 10 MiC districts; 12 (middle school) and 13 (elementary school) non-MiC-selected districts (districts that applied for MiC funding, but were not selected to receive it); and the rest of the districts in the state.

School-level profile regression analysis

Since 2016, we have conducted a school-level profile regression analysis, using all schools of the same grade range (i.e., elementary or middle school[20]) in California to examine whether a school meets the expected performance based on its performance from the prior year(s) and based on some school-level characteristics that are associated with math achievement as measured by the CAASPP.

This analysis involves two steps. As the first step, a regression model is set up with the following elements:

- Dependent variable: percentage of students meeting or exceeding the standard on the CAASPP in mathematics in the current year
- Independent variable(s): percentage of students meeting or exceeding the standard in prior year(s) (for 2018, this element includes data from 2015, 2016, and 2017)
- Covariates: (1) percentage of students who are eligible for the free or reduced-price lunch program; (2) percentage of English learners; (3) percentages of students from each of four ethnic groups (Asian, Hispanic, African American, and White); and (4) percentage of students with disabilities

As the second step, the difference between the actual percentage of students meeting or exceeding the standard and the expected percentage is computed for each school in the MiC districts. This information is used to produce the school-level profile plot that shows how each school within a district

20 In some districts, grade 6 students attend elementary schools, while in other districts, sixth graders are in middle school. Mathematics achievement can often drop as students move from one level of schooling to another (West & Schwerdt, 2012; Rockoff & Lockwood, 2010). For the purposes of comparison across districts, grade 6 is included in the middle school level within this report.

progresses over time and whether that change meets the expectation.

The inclusion of all California schools in the analysis allowed us to compare the findings among the MiC districts, the non-MiC-selected districts, and the rest of the school districts in the state. For the purpose of comparison across years, we examined the percentage of schools that exceeded the prediction over time. In addition, in order to see whether certain schools tended to more often exceed the prediction than other schools, we divided the schools to four groups based on their achievement in 2015:

- Level 1 schools: percentage of students meeting or exceeding the standard is less than or equal to 20
- Level 2 schools: percentage of students meeting or exceeding the standard is between 21 and 40
- Level 3 schools: percentage of students meeting or exceeding the standard is between 41 and 60
- Level 4 schools: percentage of students meeting or exceeding the standard is greater than or equal to 60

Student cohort analyses

While the school-level profile analysis is helpful in using performance levels to examine whether a school meets expectations, it does not yield information about the amount of improvement that students make in relation to prior years. Such information is helpful in understanding average district growth over time, even though the overall performance may remain at the same level from year to year. For this reason, we also conducted cohort analyses for the elementary and middle school cohorts.

Our student cohort analyses included data from nine MiC districts that provided student-level CAASPP and demographic data from 2015 to 2017 (student-level 2018 data were not available at the time of this report's preparation). Using a growth model, we estimated the average growth on the CAASPP scale score over three years for all students in a cohort. Two cohorts of students were studied:

- Cohort 1 (elementary): grade 3 in 2015, grade 4 in 2016, grade 5 in 2017
- Cohort 2 (middle): grade 6 in 2015, grade 7 in 2016, grade 8 in 2017

The growth model used to estimate the average growth from year to year for all students was set up as follows:

- Dependent variable: student scale score on the CAASPP in mathematics
- Independent variable: the "year" indicator (e.g., year 1: 2015)
- Covariates: gender, ethnicity (each of four groups: African American, Asian, Hispanic, and White), English learner status, special education status, and poverty status (represented by students who are eligible for free or reduced-price lunch)

An additional term is added to the model when estimating growth for a specific subgroup (annual achievement growth by gender, for example). This report focuses on the English learner subgroup,[21] which has been shown to be underperforming at the state level. We also examined the achievement gap between English speakers and English learners over time.

In this report, students' English learner status is based on information from their final enrollment years for their respective cohorts. For

21 We also conducted subgroup analyses for low-income students (those eligible for free or reduced-price lunch) and African American students, but did not present those data in this report because income data were not available from two districts (San Francisco and Oakland) and because the percentage of African American students was less than 5 percent of all students in five districts (Dinuba, Garden Grove, Oceanside, Sanger, and Santa Ana). We hope to soon make these analyses available elsewhere.

example, for the elementary school cohort, students' English learner status in grade 5 was used in the analysis. This means that the students classified as English learners in our analysis would have been classified as an English learner since grade 3 (or earlier). Similarly, for the middle school cohort, students classified as English learners in our analysis would have been classified as an English learner since grade 6 (or earlier). CAASPP achievement gaps between English learners and English speakers in our analysis would be primarily for existing or long-term English learners.

The state classifications for English-language fluency include the following categories: fluent English proficient and English only; initial fluent English proficient (IFEP); reclassified fluent English proficient (RFEP); English only; English learner; English learners enrolled in school in the United States fewer than 12 months; English learners enrolled in school in the United States 12 months or more; ever-English learners; and to be determined (TBD). For the analysis that used state-level data, student groups were identified based on the "English learner" and "English only" categories; the "English only" group is referred to in this report as "English speakers." In the data provided by the districts, the "English speaker" category used in this report may include IFEP, RFEP, and "English only," in comparison to the "English learner" group. That is, "English speakers" may include both native English speakers and non-native speakers who have become fluent English proficient.

Since MiC districts tend to be heterogeneous in terms of student composition and achievement, and since the districts carried out their work uniquely, the student-cohort growth analysis was conducted separately by district. This enabled us to understand how achievement in each district progressed over time.

For this cohort analysis, we were not able to use any comparison samples (as we did for the other two levels of analyses), because individual student-level data were not available statewide. In order to help readers make sense of the values presented for each of the MiC districts, we used publicly available statewide data (such as the average scale score for students in grade 3 in 2015) to estimate growth over time for each cohort. Since we expect that most students in each grade remained in California when moving up to the next grade level, the resulting values shared for the state in this report were expected to be close to those that would be based on the true student cohorts if those data were available to us.

Furthermore, we computed the percentage gain for each growth estimate, to yield information about the amount of improvement being made and the distance to the next-highest CAASPP achievement level (1 = *standard not met*; 2 = *standard nearly met*; 3 = *standard met*; 4 = *standard exceeded*; see California Department of Education, 2018a). The percentage gain for each cohort was computed as follows:

> Percentage gain = scale score change / (the cutoff of the next achievement level − the estimated average scale score in 2015 or 2016).

A percentage gain of 100 or above means that in the following year the average district performance moved up to the next achievement level. A percentage gain of less than 100 means that the district performance moved toward, but did not reach, the next achievement level.

Similarly, to help interpret the achievement gap over time between a particular subgroup (such as English learners in this report) and its counterpart (such as English speakers in this report), we computed a slope of score gap (difference) between subgroups from year to year, as follows:

> Slope = (gap or achievement difference between CAASPP subgroups in Year Y − gap in Year (Y–1))[22] / gap in year (Y–1)

22 For example, if Year Y is 2016, Year Y–1 is 2015.

A slope with a positive value indicates an increasing gap (with higher values indicating larger gaps), while a negative slope indicates a decreasing gap. With three years of data, the slope information allowed us to determine whether the subgroup gap kept increasing, remained the same, or decreased over time. Again, we referenced the statewide data to determine whether such a pattern is similar to or different from the state trend during the same period.

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