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Summer Math Program's Impact Evaluation

Middle Years Math Grantee Report

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Contents

LIST OF FIGURES

LIST OF TABLES

Math Program

Elevate [Math] is a 19-day (76-hour) in-person summer math program created by the Silicon Valley Education Foundation to help middle school students who are struggling in math to achieve math proficiency, increase their interest in math, and develop a growth mindset. Due to the COVID-19 pandemic, the in-person summer program was adapted to a 19-day (67-hour) online synchronous summer program for summer 2020. This report follows students who attended the in-person summer program in 2019 and the online summer program in 2020. See Appendix A for additional details.

Context of Implementation

The 19-day Elevate [Math] summer program was implemented in 10 school districts near Silicon Valley in the summers of 2019 and 2020. An evaluation was intended to include an impact analysis for students attending two summers, but a challenge associated with implementation during the pandemic was that only a small share of students returned for a second year of the summer program, limiting the sample size for estimating the effect of 2 years of summer program participation to approximately 170 students. See Appendix B for additional details.

Evaluation Study

WestEd conducted an evaluation of the Elevate [Math] program impact. The study included a 1-year component that analyzed results for incoming grades 6 and 7 students in summer 2019 and incoming grades 7 and 8 students in summer 2020 and a 2-year component that analyzed results for the returning incoming grades 7 and 8 students in summer 2020.

Methods

For the analyses presented in this report, the study team collected student math assessment scores and grades from before and after summer program attendance. By comparing grades and assessment scores of program participants to those of similar students who did not attend the program, the study's matched comparison method estimated the program's effect on these outcomes. See Appendix C for additional details.

Summary of Findings

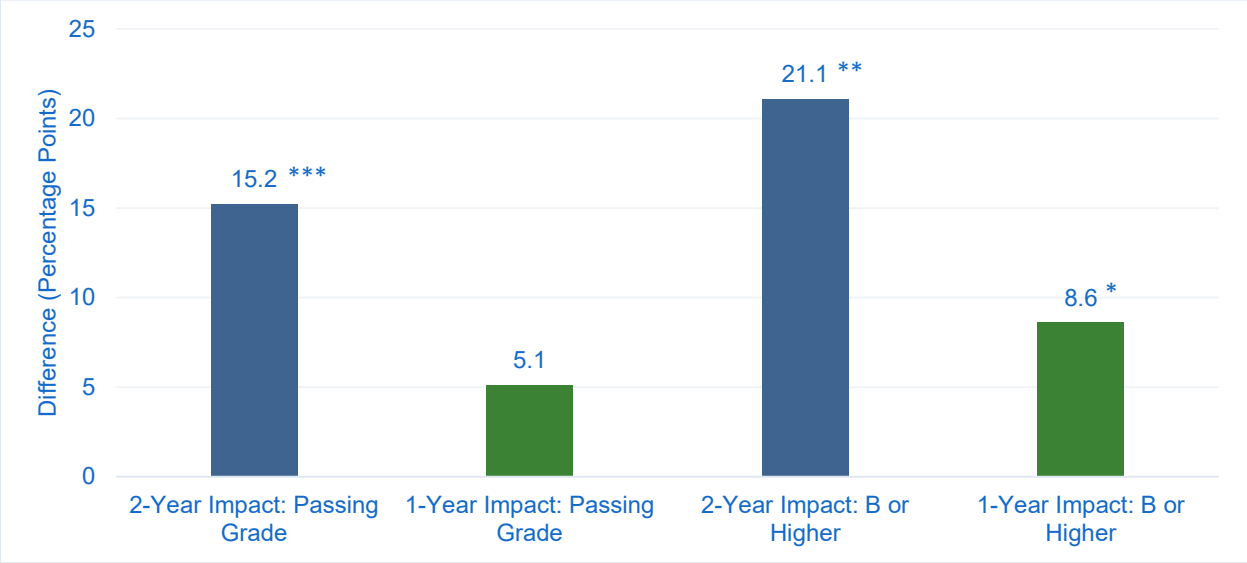
The Elevate [Math] program improved math course grades for the combined group of grades 7 and 8 students who attended two consecutive Elevate [Math] summer programs and may have also improved math standardized assessment scores, though evidence on assessment scores is not as strong. Among grade 8 students who attended one Elevate [Math] summer program for two consecutive summers, the Elevate [Math] program did not have improved math course grades or assessment scores relative to the comparison group. Grade 7 students who attended either 1 or 2 years of the program appeared to benefit, exhibiting higher course grades and assessment scores than comparison students did, but patterns of findings were less consistent for other student subgroups, such as Latino/a/x and Black students and those eligible for free or reduced-price lunches (FRPL).

Key Findings

Two years of participation in Elevate [Math] raised students' probability of earning a passing grade and earning a B or higher in their math courses.

A higher proportion of students who attended two Elevate [Math] summer programs during 2019 and 2020 earned a passing math grade in the semester after the second summer program than did similar students who did not attend two programs (Figure 1). Ninety-two percent of 2-year program attendees earned a passing grade, compared to 77 percent of comparison students, and the 15-percentage-point difference was statistically significant (at the 1% level). This improvement in grades represents an approximately two-thirds reduction—from 23 to 8 percent—of students earning a failing grade. Similarly, 2-year participants were 21 percentage points more likely to receive a B or higher in math, compared to similar nonparticipants, and this difference was statistically significant at the 5-percent level. Among students who attended only the second year of the summer program, in 2020, impacts on both measures of math grades were smaller and were not statistically significant at the 5-percent level.

Figure 1. Students Received Higher Grades After 2 Years' Participation in Elevate [Math]



Source: Author's analysis of data from Elevate [Math]

***Note*. The analytic sample size for the 2-year impact is 172 students. The analytic sample size for the 1-year impact is 488 students. For all analyses in this report, the analysis sample had an equal number of program participants and nonparticipants.**

*****Statistically significant, 0.01 level, two-tailed test; **Significant, 0.05 level; *Significant, 0.10 level**

The 2020 program participants experienced a slightly larger 1-year impact on course grades than did 2019 program participants.

Many factors differed between the summer 2019 and summer 2020 Elevate [Math] program. The summer 2019 program was conducted before the pandemic, in person, and covered three overarching topics. In contrast, the summer 2020 program occurred amid the pandemic, was implemented remotely, and covered two overarching topics over a slightly smaller number of hours. (Implementation details are presented in Appendix B.) Comparing each summer program's impact on grade 7 participants' math grades the following semester provides the most direct indication available about how the context and content of each year's program may have affected student learning in the program.

The program had a similar impact on the likelihood of students earning a passing grade in each of the 2 years; in contrast, the 2020 program's impact on the probability of students earning a B or better was higher than the 2019 program's impact, and it was statistically significant at the 10-percent level, unlike the 2019 impact (Table 1). Notably, in 2020, the share of students who earned a passing grade and who received at least a B dropped relative to 2019—for both program participants and comparison students. However, the drop in grades was smaller for

Elevate [Math] participants, suggesting that the program may have lessened the academic losses that the comparison students experienced.

Table 1. Percentage of Grade 7 Program Participants and Nonparticipants Earning a Passing Grade or Earning a B or Higher, by Year

	Percentage in 2019 (treatment)	Percentage in 2019 (comparison)	One-year impact in 2019	Percentage in 2020 (treatment)	Percentage in 2020 (comparison)	One-Year impact in 2020
Passing with a D or higher	88.0	82.3	5.7*	80.0	73.3	6.7
Receiving a B or higher	67.4	64.6	2.8	56.9	46.7	10.2*

Source: Author's analysis of data from Elevate [Math]

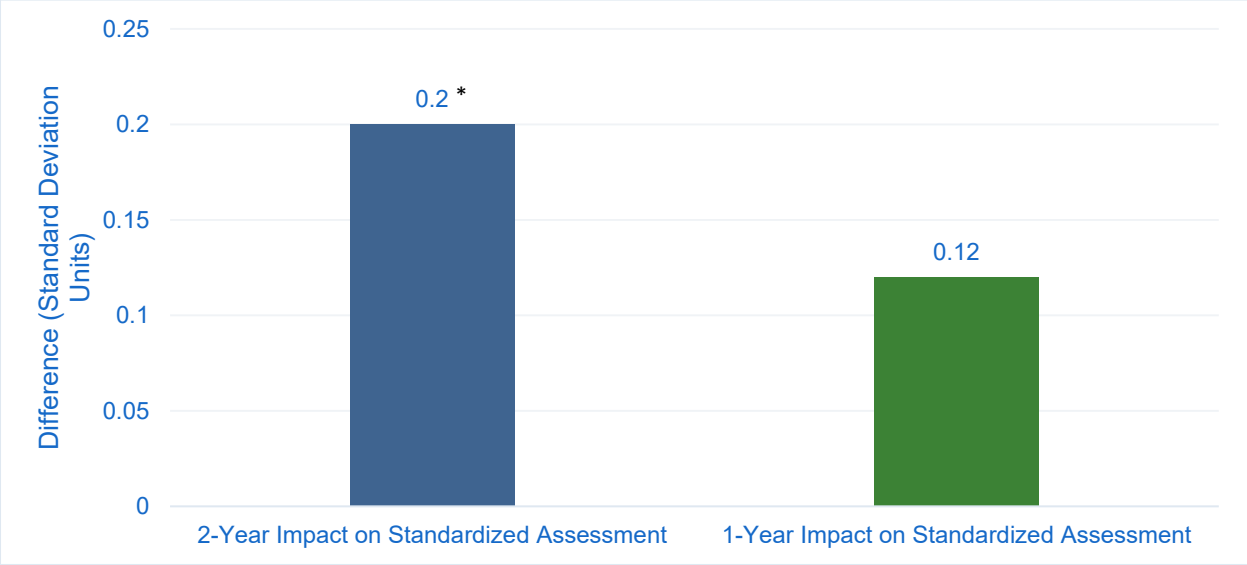
***Note*. The analytic sample size for the 2019 1-year impact is 350 students. The analytic sample size for the 2020 1-year impact is 260 students.**

***Statistically significant at the 0.10 level, two-tailed test**

In comparison to nonparticipants, students who participated in Elevate [Math] for 2 years scored higher on the standardized math assessment after the second year, though the sample size is small, and the difference is statistically significant only at the 10-percent level.

Among students who attended Elevate [Math] for 2 years, the average score on the district standardized math assessment following the second summer was 0.20 standard deviation higher than the average score of similar students who did not attend either year. This difference is only marginally statistically significant at the 10-percent level (Figure 2). Students who attended Elevate [Math] only in summer 2020 scored 0.12 standard deviation higher than similar nonparticipants, a difference that is not statistically significant.

Figure 2. Two-Year Elevate [Math] Participants Scored Higher on the District Standardized Math Assessment Than Did Nonparticipants



Source: Author's analysis of data from Elevate [Math]

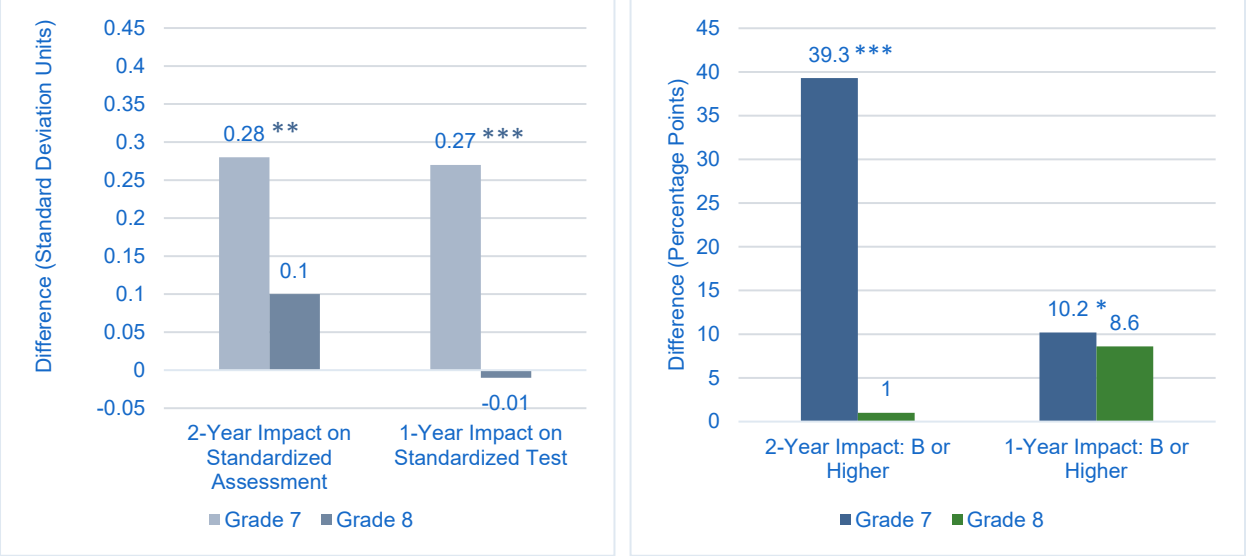
***Note*. The analytic sample size for the 2-year impact is 188 students. The analytic sample size for the 1-year impact is 406 students. The 2-year impact includes the cohort of incoming grades 6 and 7 students who returned for a second year in summer 2020. The 1-year impact includes incoming grades 7 and 8 students who attended the summer 2020 Elevate [Math] program.**

****Statistically significant, 0.01 level, two-tailed test **Significant, 0.05 level *Significant, 0.10 level**

Compared to nonparticipants, grade 7 students who attended the Elevate [Math] program for two summers earned higher assessment scores and were more likely to earn a math grade of B or higher.

Grade 7 students who attended two summer programs (summer before grade 6 and summer before grade 7) scored 0.28 standard deviation higher on their grade 7 district math assessment than did similar students who did not attend (Figure 3). These students were also 39 percentage points more likely to earn a grade of B or higher, compared to similar nonparticipants, and both of these impacts were statistically significant. Grade 7 students who attended only 1 year of Elevate [Math] also scored a statistically significant 0.27 standard deviation higher on the standardized math assessment than did nonparticipants, but the impact on the likelihood of earning a B or higher (10 percentage points) was statistically significant only at the 10-percent level.

Figure 3. Students Entering Grade 7 After the 2020 Summer Program Experienced Statistically Significant Impacts on Math Assessment Scores and, for 2-Year Participants, Grades



Source: Author's analysis of data from Elevate [Math]

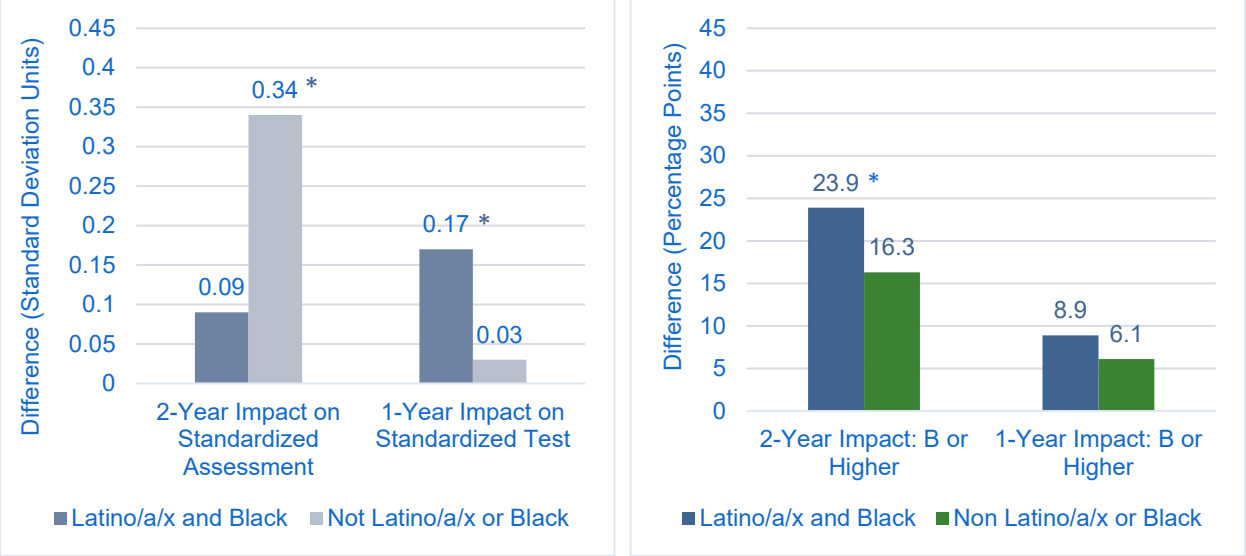
***Note*. The analytic sample size for the 2-year impact analysis for grade 7 is 86 students and for grade 8 is 102 students. The analytic sample for the 1-year analysis for grade 7 is 194 students and for grade 8 is 212 students. The analytic sample size for the 2-year impact analysis for grade 7 is 86 students and for grade 8 is 102 students. One or more student characteristic imbalances were larger than 0.25 for the 2-year impact on standardized assessment and the 2-year grades analysis.**

*****Statistically significant, 0.01 level, two-tailed test; **Significant, 0.05 level; *Significant, 0.10 level**

Patterns of impacts on standardized math assessment scores and course grades were not consistent for other subgroups of students, including groups defined by student race/ethnicity and FRPL participation.

Exploratory analyses focused on an additional subgroup of students—students who are Black, Latino/a/x, and/or experiencing poverty (as indicated by being eligible for the FRPL program)—found that impacts among priority community students were sometimes larger and sometimes smaller than those of other students. None of the impacts were statistically significant at the 5-percent level (Figure 4). (Note that there were no Black students in the 2-year sample.)

Figure 4. Impacts on Assessment Scores and Course Grades Among Latino/a/x and Black Students Were Larger Than Those Among White Students in Some Cases and Smaller in Others



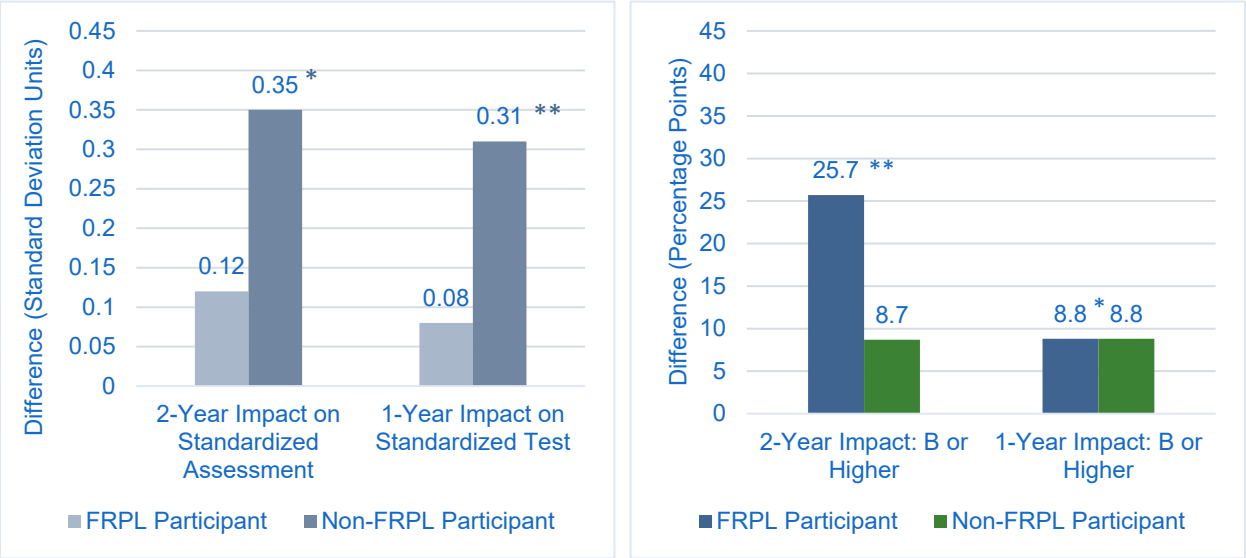
Source: Author's analysis of data from Elevate [Math]

***Note*. There were no Black students in the 2-year participant sample. The analytic sample size for the 2-year standardized math assessment impact analysis for the Latino/a/x subgroup is 128 students and for the non-Latino/a/x subgroup is 54 students. The analytic sample size for the 1-year standardized math assessment impact analysis for the Latino/a/x subgroup is 270 students and for the non-Latino/a/x subgroup is 136 students. The analytic sample size for the 2-year grades impact analysis for the Latino/a/x subgroup is 106 students and for the non-Latino/a/x subgroup is 60 students. The analytic sample size for the 1-year grades impact analysis for the Latino/a/x subgroup is 330 students and for the non-Latino/a/x and non-Black subgroup is 156. One or more student characteristic imbalances were larger than 0.25 for the 2-year standardized math assessment and grades impact analyses for the Latino/a/x subgroup.**

*****Statistically significant, 0.01 level, two-tailed test; **Significant, 0.05 level; *Significant, 0.10 level**

The Elevate [Math] program had larger effects on the math assessment scores of students who were in the FRPL program than on the scores of those who were not. This finding held for both those who attended 2 years of the program and those who attended only the 2020 program. Impacts on course grades among FRPL participants were equal to or larger than impacts among non-FRPL participants (Figure 5). Given the small sample sizes for these exploratory analyses, the inconsistent differences in impacts may be driven by a lack of statistical precision, so it is not possible to draw strong conclusions based on these subgroup differences.

Figure 5. Impacts on Assessment Scores and Course Grades Among FRPL Participants Were Larger Than Those Among Nonparticipants in Some Cases and Smaller in Others



Source: Author's analysis of data from Elevate [Math]

***Note*. The analytic sample size for the 2-year standardized math assessment impact analysis for the FRPL subgroup is 98 students and for the non-FRPL subgroup is 74 students. The analytic sample size for the 1-year standardized math assessment impact analysis for the FRPL subgroup is 306 students and for the non-FRPL subgroup is 98 students. The analytic sample size for the 2-year grades impact analysis for the FRPL subgroup is 98 students and for the non-FRPL subgroup is 74 students. The analytic sample size for the 1-year grades impact analysis for the FRPL subgroup is 324 students and for the non-FRPL subgroup is 158 students. One or more student characteristic imbalances were larger than 0.25 for the 1- and 2-year standardized math assessment and grades impact analyses for the non-FRPL subgroup as well as for the 2-year grades impact analysis for the FRPL subgroup.**

****Statistically significant, 0.01 level, two-tailed test; **Significant, 0.05 level; *Significant, 0.10 level**

Conclusion and Next Steps

The results presented in this report suggest the following key takeaways and next steps:

- The large, positive impact on course grades after 2 years of attendance and the suggestive evidence of positive impacts on achievement assessment scores after 2 years indicate that the Elevate [Math] program's benefits increase as students attend multiple years.
- Comparing the 1-year impacts on grade 7 students' math course grades after each summer suggests that Elevate [Math] in 2020 may have protected participants from the academic losses that their comparison group counterparts experienced to a higher degree.
- Students who attended the program in the summer before grade 7 appear to have benefited more than those who attended only in the summer before grade 8.
- Given these findings, Silicon Valley Education Foundation (SVEF), the program's creator, conducted focus groups with staff members who participated in the grade 8 program. The feedback led to specific changes to the grade 8 curriculum. SVEF uses an ongoing cycle of inquiry every summer to continue to improve the summer program.
- Given these findings, SVEF will continue to refine efforts to support and study the effects of multiple years of enrollment, including by extending the program to lower grades.
- This study did not provide clear evidence on whether the Elevate [Math] program provides equal or greater benefits to students in particular subgroups (Black students, Latino/a/x students, and FRPL participants), compared to other students. Future research on this program should include larger samples that allow precise estimation of impacts among priority community students.

Appendix A. Detailed Description of Elevate [Math]

Elevate [Math] is a 19-day (76-hour) summer math program designed to help middle school students who are struggling in math achieve math proficiency, increase their interest in math, and develop a growth mindset. Due to the COVID-19 pandemic, the in-person summer program was adapted to a 19-day (67-hour) online synchronous summer program for summer 2020. The key components of the Elevate [Math] program include

- **teacher professional learning**. Teachers receive 24 hours of professional development prior to teaching in the Elevate [Math] summer program. The professional development covers developing mathematical thinking; fostering creativity in teaching math; modeling and practicing project-based lessons; using formative assessments to inform instruction; understanding and applying culturally responsive pedagogy; fostering and integrating growth mindset practices; and using education technology such as Google Classroom, Nearpod, and Zoom. In addition, teachers participate in 6 hours of Professional Learning Community sessions and have personalized coaching throughout the summer.
- **curriculum**. Teachers implement a Common Core State Standards–aligned curriculum that focuses on solving real-world mathematical problems through project-based learning.[1] This curriculum aims to help students learn to use precise math language, make sense of problems and persevere in solving them, construct mathematical arguments, and critique the reasoning of others. The curriculum also includes explicit instruction of growth mindset strategies that push students to change their beliefs about their math and learning abilities, persevere through difficult concepts, and embrace their "struggle" as an important part of the learning process.
- **college-student mentors and STEM/career workshops**. College-student mentors with racial/ethnic backgrounds similar to those of program participants develop relationships with students during the Elevate [Math] summer program. The college-student mentors receive 2 days of training before the start of the summer program. Each mentor supports three teachers and their students with math instruction and activities. The mentors also deliver four lessons throughout the summer program: three college-readiness lessons that draw on the University of California, Berkeley, College Readiness Curriculum and one STEM hands-on activity per class. The mentors, with the

[1] The curriculum was developed by a design team convened by SVEF and composed of experts in the field of education. These experts included Phil Daro, an author of the Common Core State Standards; David Foster of the Silicon Valley Math Initiative; and Dr. Rebecca Wong, Head of the Math Department at West Valley College.

help of local technology professionals, provide STEM/career workshops during the summer program.

- **educational technology tools**. In summer 2020, SVEF delivered Elevate [Math] online only by using three technology products: Google Classroom, Nearpod, and Zoom. In summer 2019, SVEF delivered Elevate [Math] in person.

Appendix B. Detailed Description of Implementation Context

The 19-day Elevate [Math] summer program was implemented in 10 school districts near Silicon Valley (California) in the summers of 2019 and 2020. Specifically, 8 of the districts are in San Jose, 1 in the Central Valley, and 1 in the farming coast near Monterey. Target grades for this project included two cohorts, incoming grade 6 and grade 7 students. Tables B1–B3 present information on the districts as a group, and Table B4 provides details for each of the 10 districts.

During summer 2019, the program was delivered in person and comprised 72 hours of instruction focused on three overarching topics, or "big ideas," delivered with an emphasis on real-world problem-solving. Each class was composed of one teacher with an average of 17 students. There was one college mentor for every three classes, and mentors rotated between classes throughout each day.

During summer 2020, the program was delivered online and comprised 57 hours of instruction focused on two overarching topics: ratios and proportional reasoning, and the number system. Each class was composed of one teacher with an average of 17 students. There was one college mentor for every three classes, and mentors rotated between classes throughout each day.

Nine of the school districts implemented Elevate [Math] in both grades 6 and 7 classes in summer 2019 and grades 7 and 8 classes in summer 2020. One school district implemented Elevate [Math] in grade 6 classes only in summer 2019 and grade 7 classes only in summer 2020. Six of the school districts are situated in large cities, one is in a large suburb, and one is in a town. (Two of the districts are charter districts without locale information.) One of the large-city districts encompasses rural communities surrounding California's Central Valley.

The district size ranged from 481 students in one of the charter school districts to 31,654 students in the Central Valley, with an average of 8,598 students per district. About 51 percent of students in the 10 school districts were Latino/a/x, 4 percent were Black, and 61 percent qualified for free or reduced-price lunches. On average, about 39 percent of the students met standards in the math state assessment, Smarter Balanced Assessment.

Table B1. School/District Context for Implementation

Characteristic	Contextual detail
Grades served	In summer 2019, the Elevate [Math] program served grades 6 and 7 students. In summer 2020, the program served grades 7 and 8 students.
School type(s)	Eight traditional school districts and two charter school districts
District size	Range: 481 students to 31,654 students Mean: 8,374 students
School or program size	In summer 2019, the Elevate [Math] program sites included a total of 642 students. In summer 2020, the program sites included a total of 354 students. Site enrollment ranged from 17 to 80 students.
Setting	Six large urban districts, one large suburban district, one district in a town, and two charter districts
Location	All 10 school districts are located in California in or near Silicon Valley. Specifically, 8 school districts are located in San Jose, and the other 2 are located in the Central Valley and the coast of Monterey.

Sources: Common Core of Data public school district data for the 2018/19 school year

Table B2. Student Population Context for Implementation

Characteristic	Contextual detail
Percentage Black	4
Percentage Latino/a/x	51
Percentage students experiencing poverty	61
Percentage male/female	51
Percentage English learners	28
Prior achievement	39 percent met standards on the California state math assessment (Smarter Balanced)

Sources: The California Department of Education for the 2018/19 and 2019/20 school years

***Note*. The percentage of students experiencing poverty is measured as the share of students eligible for free or reduced-price meals. The latest available data are from the 2018/19 school year.**

Table B3. Policy Context for Implementation

Characteristic	Contextual detail
School Year District Curriculum	Five of the 10 school districts used College Preparatory Mathematics (CPM), 1 district used Houghton Mifflin Harcourt California Math for grades K–6 and MathLinks for grades 7 and 8, 1 district used Houghton Mifflin Harcourt California GO Math, 1 district used CPM 3, 1 district used Achieve3000, and 1 district used Illustrative Math.
Other	Elevate [Math] professional development was integrated with district teacher professional development and aligned with district objectives.

Sources: Information provided by the school district for the 2018/19 and 2019/20 school year

Table B4. District Information for Context

District	Type	Number of students enrolled	Setting	Percent Black	Percent Latino/a/x	Percent FRPL	Percent English learners	English language arts achievement	Math achievement
1	Public	10,264	City-Large	1	78	81	37	38	29
2	Public	6,842	City-Large	1	24	30	30	65	58
3	Public	6,974	Suburb-Large	3	47	41	26	58	52
4	Charter	594	Not available	2	93	85	38	30	16
5	Public	10,426	City-Large	1	25	29	24	66	61
6	Public	9,775	City-Large	2	59	72	43	45	36
7	Public	31,400	City-Large	7	46	66	19	44	33
8	Public	2,110	City-Large	2	75	70	46	38	26
9	Public	4,871	Town	1	95	91	32	33	21
10	Charter	481	Not available	1	93	54	46	51	43

Sources: The California Department of Education for the 2017/18 and 2018/19 school years; Common Core of Data public school district data for the 2016/17 and 2018/19 school years

***Note*. The number of students enrolled was rounded to the nearest whole number. English language arts achievement is listed in percent proficient. The percentage of students is based on the number of students enrolled as reported in the table. The percentages are slightly different from the actual school and district percentages because they were calculated using the actual numbers of students who fit the characteristic of interest divided by the number of students enrolled. Math achievement is listed in percent proficient. Students' English language arts and math achievements are based on state assessment score data from 2017/18 and indicate the percentage of students who met or exceeded standards on the California Standardized Testing and Reporting Program. FRPL = students eligible for free or reduced-price lunches.**

Appendix C. Methods

Research question: What is the impact of the Elevate [Math] summer program on math achievement for students attending for one and two summers, compared to students who do not attend the summer program?

To answer this research question, WestEd used a quasi-experimental design with a matching analysis. The matching was based on the Mahalanobis distance metric, which is defined as the distance between two values of the covariate vector x and x'

$$\| x, x' \| = (x - x')\Omega_x^{-1}(x - x')$$

where Ω_x^{-1} is the sample covariance matrix of the covariates. A treated student is matched to the closest comparison student ("nearest neighbor") based on the matching variables listed below. All study students, treated and comparison students, were from school districts participating in the study. Treated and comparison students were matched within the district based on the following student-level characteristics: grade level, gender, race/ethnicity, language status, prior year math course grade, and 2 prior years of Smarter Balanced math summative assessment scores. The grades 5 and 6 Smarter Balanced math summative assessments were used for the grade 7 cohort, and the grades 6 and 7 Smarter Balanced math summative assessments were used for the grade 8 cohort. The 2 prior years of Smarter Balanced math summative assessments and the prior year math course grades were assessed for baseline equivalence to determine the absolute effect size difference between the treatment and comparison groups. Once the matching was completed and baseline equivalence on the 2 prior years' Smarter Balanced math scale scores and the prior year math course grade was assessed, WestEd explored the impact of the Elevate [Math] summer program on math achievement.

The matched treatment and comparison students were included in a regression equation to determine whether there was a positive and statistically significant impact on the outcome for students attending Elevate [Math] for one summer. The model takes the following form to answer the research question:

$$\text{Outcome}_i = \alpha + \beta_1(\text{Elevate}_i) + \beta_2(\text{SBACMath}_i) + \beta_3(\text{MathGPA}_i) + \beta_4(\text{StudChar}_i) + \varepsilon_i$$

where Outcome is student i's outcome on math achievement as measured by the math course grade of their first semester after attending the summer math program and the other outcome is a standardized math assessment. For the math course grade, there are two binary outcomes—passing the math course during the first semester with at least a D or higher or receiving a B or higher in math during the first semester after attending the summer program. β_1 is the binary variable indicating that the student attended the Elevate [Math] program for one summer. $SBACMath_i$ is student i's math scale score on the Smarter Balanced summative assessment for the prior 2 years (before starting Elevate [Math]). MathGPA is the prior year's course grade before starting Elevate [Math]. StudChar is a vector of student characteristics that include grade level, gender, ethnicity (categorical), and language status. α is the intercept. β_1–β_4 are parameters to be estimated from the data. ε_i is the independent and identically distributed error. β_1 is the average difference between the treated and comparison students on the outcome variable after controlling for covariates included in the model.

A similar model was used for the math standardized assessment outcome. Since the 10 school districts had different standardized math assessments, a z-score was created for each school district. The z-score was standardized within school district and within grade level.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