

Math Corps' Tutoring Program: Math Knowledge Impacts and Participant Math Perceptions

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March 2023

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Middle Years Math Grantee Report Series

This report is one in a series of six reports on math tutoring programs. Over the 2020–2021 and 2021–2022 school years, the Bill & Melinda Gates Foundation invested in rapid-cycle evaluations of a cohort of 10 tutoring providers to learn about their innovative approaches to tutoring as part of its Middle Years Math body of work.¹ The goal of these investments was to understand how different tutoring models might create positive student experiences and lead to improved academic outcomes for students in the foundation’s priority communities—those who are Black, Latino, and/or experiencing poverty. These investments were grounded in the substantial body of evidence supporting the effectiveness of tutoring in improving student math knowledge (Nickow et al., 2020).

To build on this existing evidence of effectiveness, the Gates Foundation sought to develop new early evidence about the success of a range of tutoring approaches. Specifically, these investments targeted two key learning priorities. First, the foundation sought to learn how innovative technologies and tutoring program design features might simultaneously improve the quality and lower the cost of tutoring, making high-quality tutoring available to a large number of students in priority communities. The second priority was to learn the extent to which tutoring programs resulted in positive experiences for participating students. To learn about tutoring design features, the foundation invested in tutoring programs with a wide range of approaches, including group and one-on-one tutoring, virtual and in-person models, professional teachers as tutors, or volunteer tutors who shared aspects of identity with tutored students. Tutoring programs also used different approaches to tutoring curriculum and pedagogy. The goal of this report series is to inform the tutoring field more broadly and support the provision of high-quality tutoring to as many students in the priority communities as possible.

To learn rapidly about tutoring providers’ innovative approaches, Mathematica worked with each one to identify the most rigorous study design that would be feasible for district partners within a one-to-three-month planning period. Some providers were able to design and implement randomized controlled trials; others used quasi-experimental designs such as matched comparison approaches. One study compared growth in math knowledge among participants to the growth observed in national samples because it was not possible to obtain student-level data for comparison students who did not receive tutoring. These relatively small studies were right-sized to the development stage of the tutoring program and sought to demonstrate early evidence of success before moving on to larger-scale effectiveness studies. To help synthesize findings about student experiences from multiple providers, studies used the same student survey measures of tutor relationship, math confidence, and sense of belonging in tutoring sessions. Most of the studies used standardized math knowledge assessments aligned with Common Core State Standards.

Each study also aimed to inform providers’ efforts to refine their programs and support successful implementation. These studies measured the amount of tutoring offered, attendance, and staff impressions about implementation challenges while also gathering qualitative data on students’ experiences. Findings from these studies have helped to direct tutoring providers’ next steps in refining and scaling their tutoring programs.

¹ This publication is based on research funded by the Bill & Melinda Gates Foundation. The findings and conclusions contained within are those of the authors and do not necessarily reflect positions or policies of the Bill & Melinda Gates Foundation.

Executive Summary

What is the tutoring program we studied?

Math Corps is an evidence-based tutoring program serving students in grades 4 through 8 that increases opportunities to learn and practice fundamental math skills related to understanding whole and rational numbers. AmeriCorps tutors are matched with a school and provide support to approximately 24 students, in pairs or groups of three, for 90 minutes each week in 30- to 45-minute, in-person sessions. The success of the program is built on the collective value of three core features: tutors who share backgrounds or lived experiences with the students they serve, personalized tutoring using evidence-based curriculum, and tutor training and coaching.

What questions does this study answer?

1. Among students identified to participate in Math Corps, what is the average attendance rate? Does attendance vary based on student characteristics?
2. Do students who participate in Math Corps score higher on the Star math knowledge assessment than similar students who do not participate in Math Corps?
3. Do students who participate in Math Corps report having a high-quality relationship with their tutors?
4. Do students who participate in Math Corps report high levels of sense of belonging? Among students participating in Math Corps, are sense of belonging levels correlated with reported quality of their relationships with their tutors?
5. Do students who participate in Math Corps report high levels of math confidence? Among students participating in the program, are math confidence levels correlated with reported quality of their relationships with their tutors?

How was the study conducted?

Study design. The study is a quasi-experimental, mixed methods analysis of the Math Corps program that uses data collected in the 2021–2022 school year at three majority-Black traditional public and charter schools across Georgia and Minnesota. Teachers selected students to participate in Math Corps using students' baseline math assessment scores and other criteria. We estimate the effect of Math Corps on students' math knowledge by comparing students who participated in Math Corps to those with similar baseline assessment scores who did not participate in Math Corps (a regression-adjusted matched comparison design) and report estimates adjusted using Bayesian methods. The report also describes average student attendance and the results of a survey on Math Corps students' perceptions of their relationship with their tutors, sense of belonging in the program, and math confidence. We supplement these with findings from focus group and interviews with participants and tutors.

Measures and analysis. The study collected several data sources before, during, and after the study period to measure outcomes of Math Corps: the Renaissance Star math assessment, a survey of student perceptions and beliefs, student attendance data, and focus groups with tutors and participants. We examined the impact of Math Corps on math achievement using a linear regression model, which controlled for students' baseline Star math scores, gender, race, grade level, and state, then performed a Bayesian adjustment on

these estimates. The student survey drew from several existing scales: the relationship scale came from a Search Institute–developed relationships instrument, the math confidence scale was drawn from the Patterns of Adaptive Learning Scale, and the belonging scale was drawn from the Copilot-Elevate survey. Only students who participated in Math Corps completed a survey. We present end-of-year data for student–tutor relationship quality and sense of belonging in Math Corps and growth from midyear to the end of the year for math confidence. The sample included 193 students in the math achievement analysis, 106 students with complete survey data measuring relationships, and 107 students with complete survey data measuring math confidence and belonging. Additionally, we interweave findings from interviews with six Math Corps participants, one focus group with four tutors, and one tutor interview.

Limitations. Although the study team accounted for differences in baseline test scores, race, and gender in the analysis, these statistical adjustments may not fully account for all differences between students who participated in Math Corps and the comparison group (see Appendix B for details). Additionally, students who did not respond to the survey or take the Star math assessment may differ from those who did in ways related to the study’s outcomes (for example, students who did not complete a survey may have not felt connected to the program), so the estimates may not represent the effects of Math Corps for all students. Lastly, due to a delay in obtaining study approval, most students in the sample did not complete a beginning-of-year survey. Thus, survey findings focus on growth from midyear to the end of the year. Without baseline survey measures, we cannot calculate full-year changes in reported student math confidence.

What did the study find?

Attendance. Average student attendance was 91 percent throughout the year. Attendance varied little by gender.

Math knowledge. Students who participated in Math Corps demonstrated moderate growth in math knowledge compared to similar students who did not participate in Math Corps, with a 98 percent probability of a positive effect, based on a Bayesian analysis. The estimated effect was 0.18 standard deviations, the equivalent of a student gaining approximately 7 percentile points on the spring math test. This is consistent with effects observed in prior research on the effect of Math Corps (Parker et al., 2019; Coddling et al., 2022).

Student perceptions and beliefs. Survey results showed that 94 percent of Math Corps participants had a high sense of belonging in the tutoring program and a positive view of their relationship with their tutor at the end of the year. There was a strong correlation between students’ sense of belonging and the reported strength of their relationship with their tutor ($r = 0.65$). Additionally, students’ math confidence grew by 27 percentage points from the middle to the end of the year. Thematic analysis of focus groups and interviews with tutors and students support these findings, as tutors attended to students’ emotional needs, were patient and engaging, and had high expectations for students in math and life.

Unlike previous studies that have focused on majority-White populations, this study focuses on the implementation and success of Math Corps in majority-Black schools in areas experiencing poverty. Additionally, survey and qualitative findings from this study may help Math Corps to embed more relationship-building strategies into the program as it expands to more states.

Introduction

Math Corps is an initiative of ServeMinnesota's National Service and Science Collaborative, a laboratory for combining the evidence of what works with implementation support from AmeriCorps members. Math Corps tutoring is led by trained community members who use student data and receive coaching from education experts to deliver personalized support. Its intent is that all students, in particular students who are Black, Latino, and/or experiencing poverty, will reach grade-level proficiency in math. Math Corps serves students in grades 4 through 8 and provides increased opportunities to learn and practice fundamental math skills. Through the program, AmeriCorps tutors are placed in a school and provide support to approximately 24 students, in pairs or groups of three, for 90 minutes each week in 30- to 45-minute, in-person sessions. The success of the program is built on the collective value of three core features: tutors who share backgrounds or lived experiences with the students they serve, personalized tutoring using student data and an evidence-based curriculum, and tutor training and coaching.

This study aims to provide evidence of the impact of the Math Corps tutoring program on student math achievement through a regression-adjusted matched comparison design, as well as descriptive evidence about program attendance and participants' math confidence, sense of belonging in Math Corps, and student–tutor relationship quality and focus group data. In this evaluation, we sought to answer the following research questions:

1. Among students identified to participate in Math Corps, what is the average attendance rate? Does attendance vary based on student characteristics?
2. Do students who participate in Math Corps score higher on the Star math knowledge assessment than similar students who do not participate in Math Corps?
3. Do students who participate in Math Corps report having a high-quality relationship with their tutors?
4. Do students who participate in Math Corps report high levels of sense of belonging? Among students participating in Math Corps, are sense of belonging levels correlated with reported quality of their relationships with their tutors?
5. Do students who participate in Math Corps report high levels of math confidence? Among students participating in the program, are math confidence levels correlated with reported quality of their relationships with their tutors?

Summary of Findings

Participating in Math Corps was associated with improvements in students' math knowledge and positive student assessments of student–tutor relationships, sense of belonging, and confidence in math. Students who participated in Math Corps demonstrated moderate growth in math knowledge compared to similar students who did not participate in Math Corps, consistent with growth observed in prior research on the effect of Math Corps (Parker et al., 2019; Coddling et al., 2022). In addition, results from a student survey showed that students had a high sense of belonging in the tutoring program and a positive view of their relationships with their tutors, and students' math confidence grew from the middle to the end of the year. There was a strong correlation between students' sense of belonging and the reported strength of their relationship with their tutor.

Key Findings

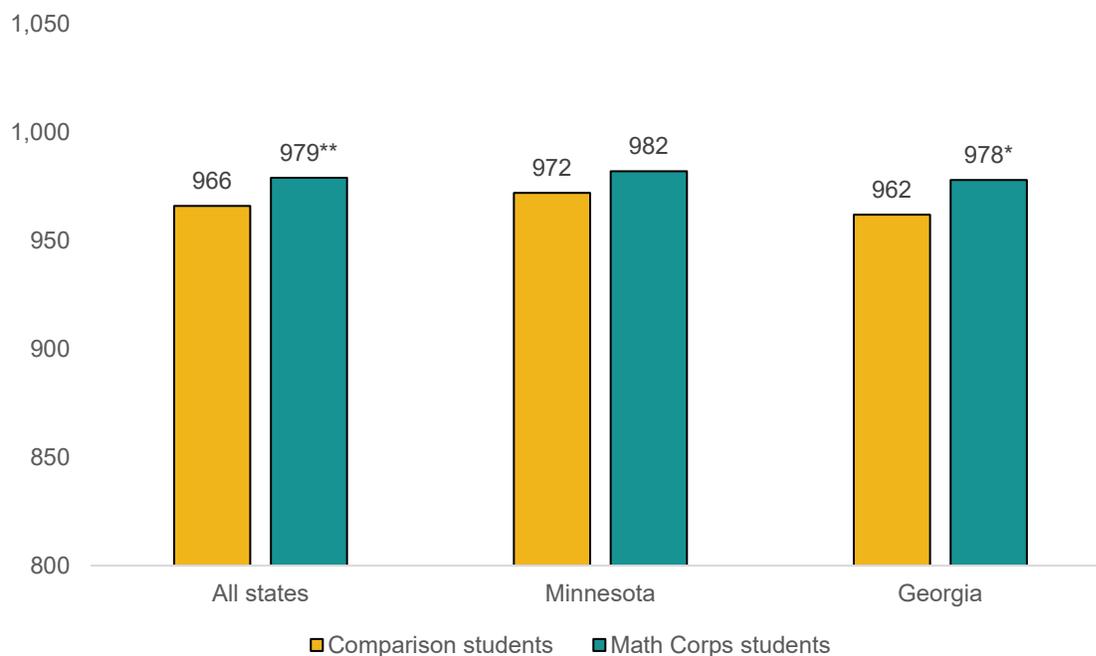
Attendance in Math Corps was high.

Student attendance in Math Corps sessions averaged 91 percent throughout the year, which was at the upper end of the range of attendance rates the study team observed among Middle Years Math tutoring programs. Attendance varied little by gender (90 percent for male students versus 92 percent for female students). A large majority of students in the sample were Black, and thus the subgroup sizes were not large enough to conduct meaningful analysis of differences in attendance based on race and ethnicity.

Students participating in the Math Corps program improved more on the Star math assessment than similar students who did not participate in Math Corps.

Students who participated in Math Corps tutoring scored 0.18 standard deviations higher than similar nonparticipants, after adjusting for factors such as grade, gender, and race and applying an adjustment to incorporate prior evidence in a Bayesian framework (Figure 1 shows spring 2022 Star math scores). This is equivalent to the average student gaining approximately 7 percentile points on the spring 2022 Star math test. Using a Bayesian interpretation, there is a 98 percent probability that Math Corps increased students' Star math scores. The results are similar to findings from previous rigorous evaluations of Math Corps of about 0.17 standard deviations, although we did not formally compare our results to estimates from prior work (Parker et al., 2019; Codding et al., 2022). The analysis did not detect significant differences in the effect of Math Corps for students in different states.

Figure 1. Math Corps students had higher spring 2022 Star math scores than comparison students



Source: Star math assessment data, scored on a scale of 0 to 1,400.

Note: Figure shows regression-adjusted end-of-year Star math scores for Math Corps students in the sample across all sites ($N = 118$), in Minnesota ($N = 32$), and in Georgia ($N = 86$), compared to scores for a

comparison group ($N = 75$ across both sites, 43 in Minnesota, and 32 in Georgia). The regression adjusts for students' fall scores, gender, race, and grade.

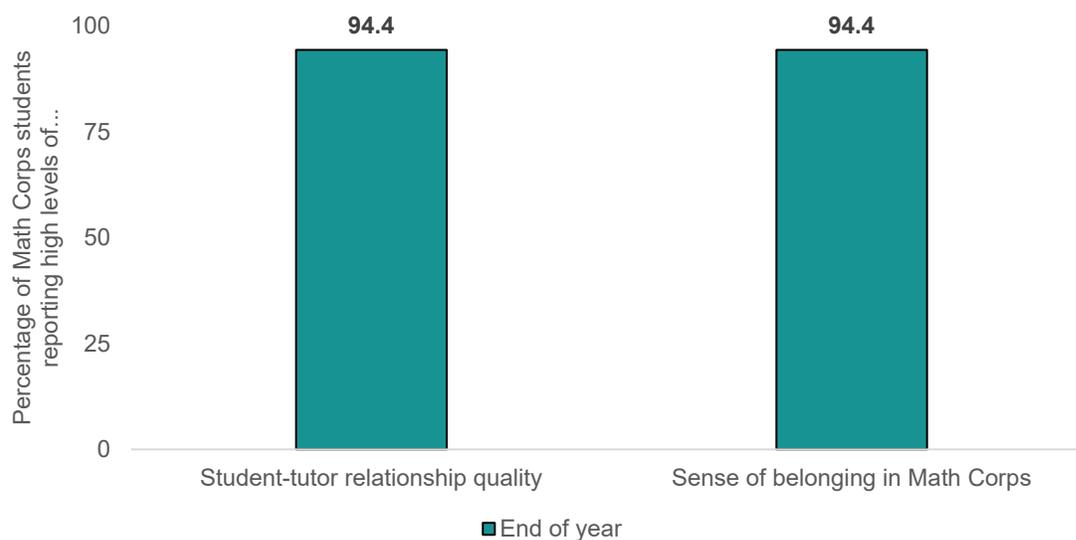
* Significantly different from comparison group at the 0.10 level, two-tailed test.

** Significantly different from comparison group at the 0.05 level, two-tailed test.

Students reported high-quality relationships with their Math Corps tutors and a high sense of belonging.

Nearly all (94 percent) Math Corps participants reported having a high-quality relationship with their tutor at the end of the year. A high-quality relationship, as defined in the Search Institute's survey measures of student–tutor relationship quality, includes students' perceptions that their tutor demonstrated practices such as treating them with respect, helping them accomplish their tasks or goals, and challenging them to be their best (Figure 2).

Figure 2. Math Corps students highly rated their student–tutor relationship and sense of belonging in math at the end of the year



Source: End-of-year student survey.

Note: The figure summarizes responses for students who responded to the end-of-year survey ($N = 106$ for relationship quality, $N = 107$ for belonging). The bars represent the percentage of students who reported an average rating of 4 or higher on a scale of 1 to 5, with 5 being the most favorable, on questions related to each construct.

Additionally, 94 percent of students rated their sense of belonging in Math Corps as high or very high at the end of the year (Figure 2). A high sense of belonging is defined as agreeing or strongly agreeing with statements describing opportunities to interact with other students during tutoring sessions, a welcoming tutoring environment, and a tutor who values and supports students from different backgrounds. Students' reported sense of belonging in Math Corps was strongly positively correlated with their reported relationships with their tutors ($r = 0.65$). The overlap is logical because students' sense of belonging in math is in part informed by interpersonal experiences that benefit from a strong relationship with their tutor. The correlation might also be in part a byproduct of the ceiling effect, or students' highly rating both their relationships and sense of belonging. Due to variation in the sample composition from the middle to the end of the year, there are not enough

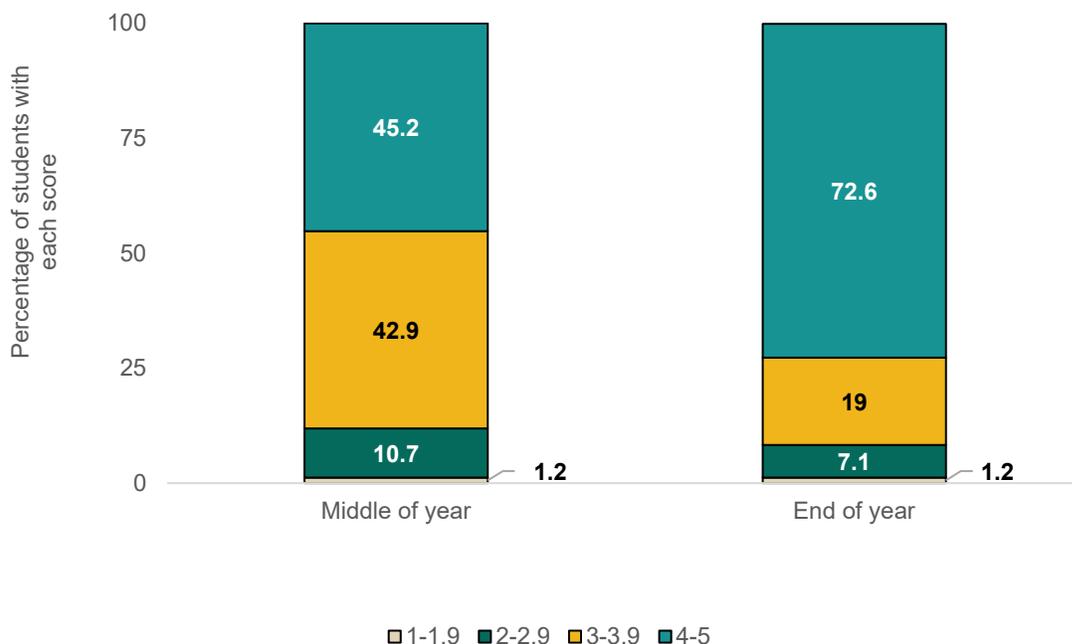
data to assess any differences between program sites in different states for any of the student survey findings.

The survey results on student–tutor relationships and students’ sense of belonging were supported by qualitative findings from interviews and focus groups with tutors and students. These suggested that Math Corps tutors attended to each student’s emotional needs, including navigating through stress and trauma, which provided a foundation for high-quality student–tutor relationships. Other aspects of high-quality student–tutor relationships in Math Corps—which may also be associated with students’ sense of belonging—included drawing on students’ funds of knowledge, being patient with students, fostering a collaborative relational climate, and connecting math to students’ lived experiences. Moving forward, the focus groups and interviews also suggested that tutors could give more agency and youth voice to students during tutoring sessions.

Students’ reported math confidence increased over the program.

Among students who completed both the middle-of-year and end-of-year surveys, the percentage who ranked their math confidence as high or very high grew 27.4 points from 45.2 percent in the middle of the year to 72.6 percent at the end of the year (Figure 3). (Among all students who completed the end-of-year survey, 63.6 percent rated math confidence as high or very high.) Math confidence, as measured through the Patterns of Adaptive Learning survey scale, includes students’ perceptions that they can learn everything taught in math and complete even the most difficult math homework problems (Midgley et al., 2000).

Figure 3. Math Corps students improved their math confidence from the middle to the end of the year



Source: Middle-of-year and end-of-year surveys.

Note: The figure reports results for students who completed both the winter middle-of-year and spring end-of-year surveys ($N = 84$). The bars represent students' ratings of math confidence on a scale of 1 to 5, with a score of 5 being the most favorable.

Overarching Conclusion and Next Steps

The findings from this yearlong evaluation contribute to a growing body of research highlighting the positive impact Math Corps has on students' math achievement. Overarching findings include the following:

- **Positive findings related to math knowledge are generally consistent with the existing body of rigorous research on Math Corps.** On average, students improve their math knowledge when they have access to a Math Corps tutor. This study presents findings from three majority-Black schools in areas experiencing poverty across two states, adding to the research on Math Corps that previously focused on majority-White schools in one state (Parker et al., 2019; Codding et al., 2021). Math Corps intends to focus future research on equitable impact by seeking sufficient sample sizes and representation to support further subgroup analyses, including for Latino students.
- **Survey and qualitative data revealed that the program supports developmental relationships with students.** The qualitative findings highlight several positive practices Math Corps tutors used to support strong relationships, such as expressing care by attending to students' emotional needs beyond math topics. In addition, the qualitative findings suggested an opportunity to improve the program by sharing more power with students—for example, by empowering them to take increasing agency in their own learning.
- **Survey data revealed that students' math confidence increased while receiving tutoring.** Survey data indicated that math confidence grew among students who participated in Math Corps. Moving forward, Math Corps will continue to train tutors to challenge students to grow. For example, Math Corps will continue to encourage tutors to ask students to explain their reasoning when solving math problems to their tutor or peers.

Overall, findings from this study will help drive Math Corps' expansion to new states and embed more intentional relationship-building strategies into the program.

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Appendix A. Detailed description of program

Math Corps' tutoring program aims to increase access to evidence-based instruction that is provided by trained community members and informed by student data and expert coaching. Its intent is that all students, in particular students who are Black, Latino, and/or experiencing poverty, will reach grade-level proficiency in math.

As articulated in its theory of change, Math Corps seeks to foster high-quality student–tutor relationships and improved student math confidence in the short term. In turn, these would reinforce a virtuous cycle of high student attendance and engagement in tutoring sessions. Together, these would contribute to an improved knowledge of math facts and improved student performance on end-of-year state math assessments. In the long term, Math Corps hopes to increase student enrollment and engagement in advanced math coursework and increase enrollment in higher education.

Math Corps tutoring uses three key components:

- Recruiting tutors who share backgrounds or lived experiences with the students they are serving (as defined by racial and ethnic demographics)
- Providing individualized tutoring support with groups of two or three students in 30- to 45-minute sessions for 90 minutes a week using an evidence-based curriculum
- Training tutors and supporting them to use specific strategies to establish culturally responsive tutoring experiences for students

Math Corps serves students in grades 4 to 8 who are identified as performing below grade level on state math assessments from the previous school year. Across the nation, 5,888 students at 260 schools in seven states participated in Math Corps in the 2021–2022 school year.

Math Corps tutors aimed to provide about 90 minutes of tutoring per week in 30- to 45-minute sessions for at least 12 weeks. On average, students across the three schools participating in this study received 68 minutes of tutoring weekly across 17 weeks of service and attended 91 percent of their tutoring sessions.

Appendix B. Methods

Study design. The study is a quasi-experimental, mixed methods analysis of the Math Corps program that used data collected in the 2021–2022 school year at three public and charter schools across Georgia and Minnesota. Student participation in Math Corps followed a three-step process. First, students were considered potentially eligible for the program based on criteria such as prior math performance (e.g., state proficiency assessments) and teacher observation of math performance in the classroom. Next, students identified as potentially eligible completed a baseline Star math assessment at the beginning of the school year. Finally, among students who met eligibility criteria on the Star math assessment, teachers chose which students would participate in Math Corps based on their scores and teachers' professional judgement.

Program data included a variable indicating students selected for Math Corps. However, the study team observed that those indicators conflicted with data on attendance in Math Corps sessions, with numerous examples of students not marked for Math Corps participation receiving tutoring. Math Corps staff suggested that data on session attendance could have counted baseline, interim, or end-of-year assessments as tutoring sessions, even for comparison group students who did not participate in tutoring. To distinguish students who received tutoring from those who did not, the study team examined attendance data and observed a natural break in the data at five tutoring sessions. We therefore considered students to have been part of the Math Corps program if they attended more than five tutoring sessions. Among the initial sample of 216 students with complete Star math data, 125 students attended at least six tutoring sessions (the treatment group) and 91 attended five or fewer sessions (the comparison group). Among the 91 comparison group students, 17 were recorded as attending up to five tutoring sessions and the remaining 74 were recorded as attending no sessions. Results do not differ meaningfully if those 17 students are excluded from comparison.

We used a regression-adjusted comparison design to estimate the impact of participating in Math Corps on student math knowledge, and we provided descriptive analysis using midyear and end-of-year survey data for math confidence, belonging, and tutoring relationship quality, which we supplemented with qualitative findings from focus groups with tutors and students, as well as a cumulative analysis of program attendance.

Measures. The study collected several data sources before, during, and after the study period to measure the program's outcomes: the Renaissance Star math assessment of math knowledge, a survey of student attitudes, and attendance data recorded by session. The survey drew from several surveys; the sense of belonging in tutoring scale contained six items and was adapted from the Copilot-Elevate survey, the math confidence scale contained four items and was drawn from the Patterns of Adaptive Learning Scale, and the relationship scale contained five items and came from a Search Institute-developed relationships instrument (Search Institute, 2021). Details on the Copilot-Elevate survey and Patterns of Adaptive Learning Scale are available in Mathematica's menu of high-quality middle years math student outcome measures, which were selected in consultation with external measurement experts (Bruch et al 2022). Additionally, the Search Institute conducted one 90-minute virtual focus group with four tutors each, one 60-minute interview with another tutor, and six 30-minute virtual interviews with six student participants each, to explore topics related to the survey.

Students participating in the study took the Star math assessment in September 2021 and May 2022. Math Corps participants took an online survey measuring math confidence, sense of belonging in Math Corps, and tutoring relationship quality in January and May 2022.

The measures used in this study are reliable. The Star math assessment has a reliability estimate of 0.92 for students in grade 4; 0.93 for students in grades 5, 6, and 8; and 0.94 for students in grade 7 (Renaissance Learning, 2021). To assess the reliability of survey measures, we calculated the Cronbach's alpha for each survey measure, and all measures exhibited values substantially above the U.S. Department of Education's What Works Clearinghouse (WWC; 2022) acceptable threshold of 0.60. This study's reliability coefficients (alpha) were 0.78 for the confidence and belonging scales and 0.71 for the relationship scale.

Analysis. To arrive at the final analysis sample, the analysis team used propensity scores to identify students who differed on observed characteristics such as fall Star math score, grade level, race, gender, and state. A propensity score is a student's predicted treatment status based on observable characteristics. Using these scores, we dropped 17 students with observed characteristics who were considered outliers because they had propensity scores near zero, and six students with missing data on gender or race, for a final analysis sample of 118 treatment and 75 comparison students, or 193 students total.

To conduct the analysis, we specified a preliminary regression model that adjusted for fall Star math scores, gender, race, grade level, and location. The research team chose linear regression as an estimation method over nearest-neighbor matching because the estimates have lower variance and subgroup differences could easily be examined. This preliminary regression model, which used a frequentist approach, served as the foundation for the Bayesian estimates we report as the study's main finding. The frequentist model indicated that Math Corps was associated with an increase in Star math scores of 0.21 standard deviations. The Bayesian impact estimate of 0.18 standard deviations is the mean of the updated distribution that comes from combining the frequentist estimate with the information from the BASIE (BAYesian Interpretation of Estimates) tool (Deke et al., 2022). BASIE is a framework for interpreting frequentist impact estimates from evaluations using information from the WWC database to inform a prior distribution. The Bayesian approach adjusts the 0.21 standard deviation effect size to 0.18 standard deviations by considering findings from hundreds of other education studies (many of which found small or no effects) and using these to form an estimate of what effect one should expect, on average, in the absence of new information. It produces an estimate that is more likely the true effect of the tutoring program. Using the updated distribution from the BASIE tool, there is a 52 percent probability that Math Corps is associated with an increase in Star math scores of 0.18 standard deviations or larger.

To present the effect in terms of an estimated increase in percentile score, we identified the percentile-point difference for each grade associated with the 12 scale-score point treatment effect using information in the Star math technical manual (Renaissance Learning, Inc., 2021). We then calculated the weighted average of those percentile-point differences across grades, with weights equal to the share of the analysis sample represented by students in each grade.

Baseline equivalence was present on some, but not all, measured characteristics at baseline for the Star math assessment analysis sample (Table B.1). Importantly, the difference of -0.11 standard deviations in Star math pre-test scores is not a meaningful difference according to WWC standards. Additionally, differences in the gender distributions of the treatment and comparison groups were not meaningful. However, there were meaningful differences in the racial composition, grade, and site.

Our analysis included these variables as controls in the regression model. The estimates presented in Figure 1 are adjusted for differences in baseline Star math assessment scores.

Table B.1. Baseline equivalence of the Star math assessment analysis sample

Characteristic	Overall	Treatment	Comparison	Difference	Standard deviation (SD)
Star math score in fall	929.80	927.08	934.07	-6.98	-0.11
Male	0.51	0.47	0.56	-0.09	-0.21
Female	0.49	0.53	0.44	0.09	0.21
Black or African American	0.92	0.94	0.88	0.06	0.47
Hispanic/Latino	0.07	0.05	0.11	-0.06	-0.49
Multiracial	0.01	0.01	0.01	0.00	-0.28
Grade 4	0.50	0.58	0.37	0.20	0.50
Grade 5	0.34	0.35	0.33	0.01	0.04
Grade 6	0.09	0.05	0.16	-0.11	-0.77
Grade 8	0.07	0.03	0.13	-0.11	-1.08
Minnesota	0.39	0.27	0.57	-0.30	-0.78
Georgia	0.61	0.73	0.43	0.30	0.78

Note: The Star math assessment analysis sample did not include any White, Asian, or grade 7 students.

Except as noted, results show the percentages of students with the listed characteristic, the percentage-point differences in the prevalence of the characteristic between the treatment and comparison groups, and standard deviation.

Baseline equivalence balance was determined based on standardized differences less than 0.25 SDs as stated in the WWC Standards Handbook, Version 4.1.

SD = standard deviation.

We used various techniques to conduct the survey analyses. We present end-of-year survey data for students' rating of their relationship quality with their tutor and sense of belonging in Math Corps, and the response rate for this survey was 68 percent ($n = 106$ for the relationship quality scale, $n = 107$ for belonging). We calculated growth in math confidence from the middle of the year to the end of the year using complete case analysis of the 84 students who completed the survey at both time points. To calculate the correlation between relationship quality and belonging and confidence, we reported the Pearson's correlation coefficient (r) at the end of the year for each pair of items.

Qualitative findings from the focus groups with tutors and students were analyzed using thematic analysis. Diane Hsieh from the Search Institute led the qualitative data collection and analysis. The tutor and student qualitative data were inductively analyzed to identify salient themes (Braun & Clarke, 2012).