BRIEF

School's in for summer:

A scalable and effective post-pandemic academic intervention

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KEY FINDINGS

- Summer school consistently boosted students' math achievement in 2022 and 2023 but had no impact on reading. The math gains were modest, equivalent to about 2 to 3 weeks of learning during the school year.
- Districts offered optional programs that generally fell short of best-practice recommendations for duration and intensity.
- Summer school's scalability and consistent impacts across districts nevertheless make it a reliable intervention for supporting district-wide math recovery.

Despite receiving an influx of federal funds in the wake of the pandemic, public schools in the US have struggled to boost student achievement. On average, the gap between 2019 and 2024 test scores has slightly closed in math and has widened in reading in the aftermath of the pandemic (Lewis & Kuhfeld, 2024). New evidence suggests the federal relief funds contributed to students' limited recovery in math and prevented further declines in reading, but how those funds supported recovery is largely unknown (Dewey et al., 2025; Goldhaber & Falken, 2025). Schools, districts, and states urgently need information about what interventions could make a measurable impact on student achievement moving forward.

Summer learning programs were one of the most popular strategies school districts employed to help students catch up. Over 80% of school districts offered some kind of summer program in 2023, including every urban district (Diliberti & Schwartz, 2024). Pre-pandemic research indicates summer school can improve math outcomes (Augustine et al., 2016; Lynch et al., 2023) and, to a lesser extent, reading achievement (Augustine et al., 2016; Kim & Quinn, 2013). These studies also underscore the influence of program design and implementation factors on impact: program duration, daily instructional time, attendance rates, and instructor quality all shape program effectiveness (Davison et al., 2024; Schwartz et al., 2018).

Yet the current context raises important questions about the right benchmark for pandemic-era programs. Districts faced significant barriers launching and scaling academic interventions in the years following school closures (Carbonari et al., 2024a). Programs implemented during this period—including tutoring, after-school programs, and other recovery efforts—frequently encountered staffing shortages, absenteeism, and scheduling issues that resulted in lower-than-intended dosage and limited effectiveness (Bhatt et al., 2025; Carbonari et al., 2024a, 2024b; Huffaker et al., 2025; Kraft et al., 2024a). Many of these programs also operated at a larger scale than those evaluated in pre-pandemic studies. Recent research shows a negative relationship between intervention size and program effectiveness[1] (Kraft, 2020; Kraft et al., 2024b). At the same time, even modest improvements can produce substantial district-wide benefits when programs reach large numbers of students. Understanding how post-pandemic summer school programs balanced scale and effectiveness is therefore critical to assessing their role in academic recovery.

This brief summarizes findings from studies of summer school programs delivered in 2022 and 2023 across ten large school districts. These districts participated in the Road to Recovery research practice partnership with researchers from NWEA®, CALDER at the American Institutes of Research, and Harvard University.

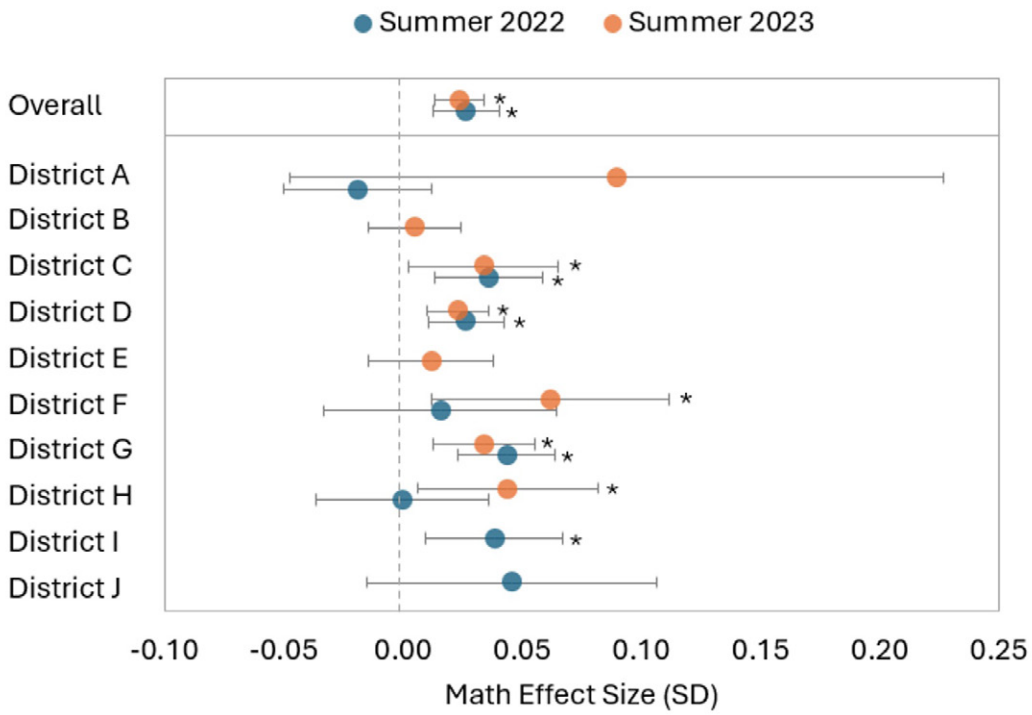
1 Kraft (2020) finds randomized control trials of education interventions with samples greater than 2,000 students (including treated and control students), the median effect size is 0.03 SD, whereas the median effect size for studies with samples of 100 or fewer students is 0.24 SD. Similarly, Kraft et al. (2024) show the (pooled) effect size of tutoring studies declines as the sample of treated students increases: from 0.55 SD for programs that treat fewer than 100 students, to 0.32 SD for programs that treat between 100 and 399 students, to 0.25 SD for programs that treat 400 to 999 students, and to 0.14 SD for programs that treat 1,000 or more students.

These districts collectively serve nearly 450,000 students. Six districts participated in both years of the study, and four participated only in one year. We first estimate the impact of summer school on students' test scores and its contribution to districts' overall recovery. We then take a broader view to describe the design and implementation of post-pandemic summer school programs and highlight differences from recommended best practices that may have hindered program effectiveness. Finally, we contextualize summer school's value by comparing it to other academic interventions in terms of scale and impact.

Summer school consistently boosted students' math achievement but had no impact on reading. The math gains were modest, equivalent to about 2 to 3 weeks of learning during the school year.

We estimate the effects[2] of participating in summer school on students' fall NWEA MAP® Growth™ math and reading test scores using value-added models that control for student characteristics and their prior achievement. The results show summer school boosted math scores by 0.027 SD on average in 2022 and by 0.024 SD in 2023. Summer school effects remained consistent across time and districts, with estimates ranging from 0.02 SD to 0.06 SD.

Figure 1. Summer school math effects by district and year



Note. Districts B, E, I, and J each participated in only one summer of the R2R study. Error bars represent 95% confidence intervals. Asterisks indicate a program's effect was statistically significant at p<0.05.

2 Our models use value-added methods with multiple prior test scores and rich covariates, which have been shown to approximate causal estimates. However, because summer school participation is not random, selection bias may remain. While supplemental models suggest this bias is reduced as covariates are added, unobservable differences between participants and nonparticipants may still influence results. Thus, estimates should be interpreted as associations that may not fully capture causal effects.

We contextualize these impacts in a few ways. First, these effects are smaller than the 0.10 SD gains associated with attending summer school in pre-pandemic studies. A 0.02 to 0.03 SD effect is also small relative to the effect of many educational interventions but is typical (and not trivial) relative to average effects of interventions with samples over 2,000 students (Kraft, 2020, 2023). Approximating the effects into the equivalent days of learning shows students gained the equivalent of approximately one school day's worth of math learning for each day of summer school. At the district level, these math gains are equivalent to about 2% of the average district's remaining recovery, after accounting for participation rates.

Reading outcomes showed no measurable improvement. We lack a clear explanation for why summer school improved math but not reading—a finding that contradicts research showing large positive effects (0.09 SD) from classroom-based summer reading interventions (Kim & Quinn, 2013). However, this pattern is consistent with pre-pandemic evidence suggesting summer school and other school-based instruction can have stronger effects on math than reading (e.g., Augustine et al., 2016; Borman et al., 2024; Jackson et al., 2014; Riehl & Welch, 2022). Students who do not participate in summer school might still practice reading over the summer, weakening or erasing any measurable program effect, especially if summer school offers limited reading instruction.

The 2023 study also finds that repeat participation may benefit students. Across four districts, returning students (those attending both 2022 and 2023) improved their math scores as much or more in the second summer as students attending for the first time in 2023. This finding echoes that of another recent study, suggesting summer school may produce cumulative benefits and districts should consider policies that encourage multi-year participation.

Districts offered optional programs that generally fell short of best-practice recommendations for duration and intensity.

Best practices from pre-pandemic research recommend designing programs to last at least four weeks—and ideally five to six weeks—with 90 minutes of math and 120 minutes of reading per day, so students will receive the recommended amount of instruction if they attend 75% of days (Davison et al., 2024; Schwartz et al., 2018). Most of the 2022 and 2023 programs we studied fell short of all three of these targets, with the biggest differences in total duration. These findings are consistent with a national survey of school districts that found 2023 summer programs were typically four weeks long.

In 2022 and 2023, districts generally offered R2R summer programs to students entering grades 1–8 in the fall, and many extended them to other grades. All programs were optional to attend. About half admitted all students in eligible grades, while the others targeted enrollment using test scores, absenteeism, course grades, or teacher recommendations. Even so, nearly all programs allowed any interested student to participate.

Program duration varied from 12 to 30 days, though most were between 15 and 20 days, spread over three or four weeks. The programs ran for a total of 4 to 9 hours per day, with 45 minutes to 2 hours of instruction in math and in reading. Daily attendance rates varied from 54% to 80%, and students received between 7 and 42 hours of instruction per subject across programs. On average, students attended 70% of days and received 18 hours of instruction in math and 19 hours in reading, well below the recommended targets of 25 and 34 hours from prior research (Schwartz et al., 2018). This dosage gap reflects a combination of shorter program durations, reduced academic intensity, and lower attendance rates.

Nevertheless, the reduced dose of summer programs students received in 2022 and 2023 does not entirely explain their reduced effects. Post-pandemic programs produced smaller math gains per instructional hour than pre-pandemic programs. This indicates either reduced effectiveness per hour or insufficient total instruction to generate larger gains. These findings suggest summer school impacts could be enhanced through closer alignment with best-practice program design and delivery, consistent with evidence from school-year pandemic-era interventions (Carbonari et al., 2024a, 2024b).

Summer school's scalability and consistent impacts across districts nevertheless make it a reliable intervention for supporting district-wide math recovery.

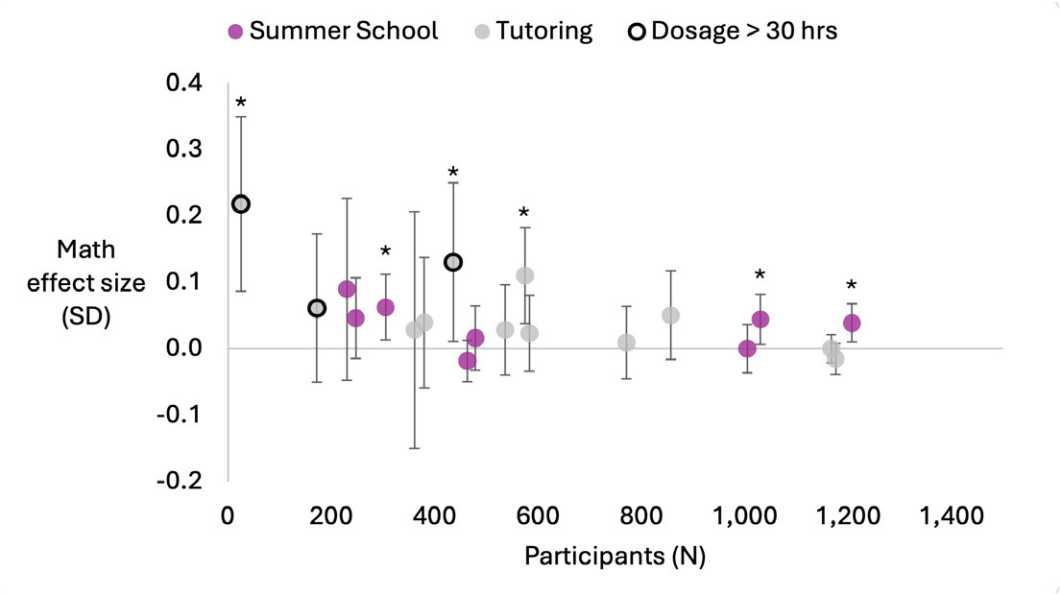
We contextualize summer school's seemingly modest role in recovery against that of another widely promoted, evidence-based recovery strategy: high-dosage tutoring. Across R2R and other studies of post-pandemic tutoring or summer school programs, we find summer school was generally larger and more likely to produce significant positive impacts when delivered at scale.

Summer programs in the R2R districts were not only typically larger than the districts' tutoring interventions but also large relative to educational interventions studied prior to the pandemic. On average, each served over 1,500 students in 2022 and over 2,500 in 2023. Approximately 13% of the districts' students in eligible grades (which generally included at least grades 1-8) participated in both years. A few districts served over 20% of their students, and the largest program had nearly 5,900 participants. Even large programs delivered significant math improvements, suggesting that program size did not limit effectiveness.

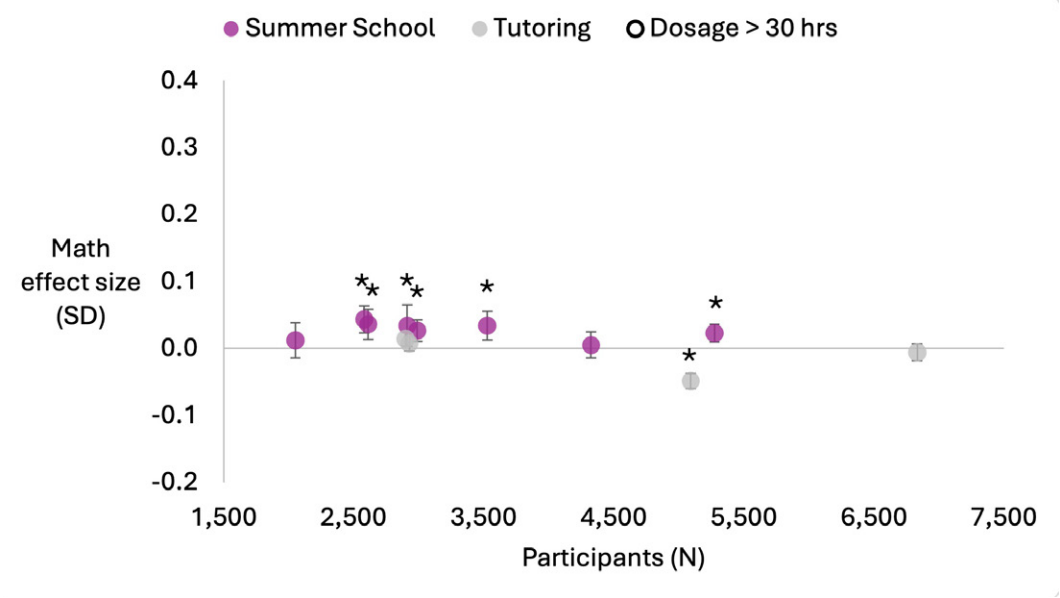
By comparison, high-dosage tutoring programs have proven difficult to implement effectively at scale (Bhatt et al., 2025; Carbonari et al., 2024a, 2024b; Kraft et al., 2024a). Many programs struggled to deliver the recommended number of tutoring hours, resulting in effects far smaller than those observed in pre-pandemic studies. Recent evaluations of large-scale pandemic-era tutoring efforts generally find no measurable impact on student achievement (Bhatt et al., 2025; Carbonari et al., 2024a, 2024b; Huffaker et al., 2025; Kraft et al., 2024a). In contrast, large pre-pandemic tutoring programs (1,000+ students) produced meaningful gains in math and reading (0.14 SD), though effects were still smaller than those of more targeted pre-pandemic programs (Kraft et al., 2024b). Pandemic-era tutoring programs that had positive impacts typically served far fewer students and delivered at least 30 hours of instruction.

Figure 2. Post-pandemic tutoring program versus summer school math effects by participation

Panel A: Summer school and tutoring COVID recovery programs with fewer than 1,500 participants



Panel B: Summer school and tutoring COVID recovery programs with 1,500 or more participants



Note. Tutoring program effects include results from Bhatt et al. (2025), Carbonari et al. (2024a), Carbonari et al. (2024b), Huffaker et al. (2025), and Kraft et al. (2024a). The Bhatt et al. (2025) estimates include the TOT estimates for the HDT programs in the study. Error bars represent 95% confidence intervals. Asterisks indicate a program's effect was statistically significant at p<0.05.

The findings suggest summer school and tutoring may be best suited as complementary programs with distinct purposes. Tutoring may be most effective as a targeted intervention for small groups of students who need the most support, whereas summer school can advance district-wide recovery by producing modest gains in math achievement for a much larger share of students. Summer school's smaller per-student impacts should not be discounted, as they reflect meaningful progress when achieved at scale.

The table below illustrates this tradeoff between program reach and individual impact from the perspective of district-wide recovery. It presents two hypothetical tutoring programs that would yield the same overall recovery effect as the median summer school program in R2R districts, for a district of 25,000 students. The tutoring participation rates and math effects are based on realistic, pandemic-era results but represent best-case scenarios—the two highest effect sizes reported in the tutoring studies summarized above. In contrast, the summer school results show larger-than-typical programs also yield effects around 0.02 to 0.03 SD.

Table 1. Summer school and tutoring programs with equivalent district-wide recovery impacts for a district of 25,000 students

Program	Participation rate	Total participants (N=25,000)	Math effect per participant	District-wide recovery impact
Summer school	13.0%	3,250	+0.025 SD	+0.00325 SD
Tutoring	1.5%	375	+0.218 SD	+0.00325 SD
Tutoring	2.5%	625	+0.130 SD	+0.00325 SD

Note. District-wide recovery impact is calculated as the product of the participation rate and the average effect per participant.

Conclusions

Summer school programs implemented in 2022 and 2023 consistently produced positive effects on math achievement across a diverse set of large school districts, though the magnitude of impacts was modest compared to pre-pandemic studies. Programs provided fewer instructional hours than best-practice models and were less effective per hour of instruction than pre-pandemic programs. However, the summer programs included in these studies reached a substantial share (~13% both summers) and number of students, making their small effects more remarkable (Kraft, 2020).

By contrast, summer school had no detectable effect on reading achievement. This finding aligns with some pre-pandemic evidence suggesting school-based interventions more reliably move math scores. The null findings in reading do not imply that summer school literacy instruction should be abandoned, but rather that more work is needed to identify effective program designs and to understand how participants' reading trajectories compare to those of nonparticipants.

Taken together, these findings position summer school as a viable, reliable, and scalable intervention for supporting math recovery in the post-pandemic context. While academic recovery looms large, summer school is one of the few strategies that has delivered measurable district-wide gains and is reliably comparable in terms of district-wide impacts to best-case scenario pandemic-era tutoring programs. With stronger program design and sustained investment, it could play an even greater role in boosting student achievement.

Recommendations

1. Sustain and expand summer school to support math recovery

Our evidence shows summer school is a viable means of systematically improving district-level achievement in math, and maintaining and expanding programming will support national academic recovery. While the contributions to math recovery seem modest, they stand out from many other efforts that have struggled to boost achievement at all. Expanding programs may seem particularly challenging without ESSER funds, but some districts are managing with help from local funds and nonprofits. We think it is a worthwhile effort, as the programs' broad reach is essential to their role in recovery.

2. Align program design and implementation with best practices

Increasing program duration and intensity to meet pre-pandemic recommendations—at least four, but ideally five to six weeks of programming with at least 90 minutes of math and 120 minutes of reading instruction per day—and improving daily attendance rates to 75% or higher are promising strategies for boosting summer school's impact. Most post-pandemic programs fell short of these benchmarks. These changes are likely to be most effective when paired with other best practices for summer school design and implementation. Future research should examine how dosage thresholds for impacts might differ for math and reading.

3. Encourage multi-year participation

Students who attended in 2023 benefited as much or more from the program if they had also participated during 2022, suggesting students benefit each year they take part. Districts should reduce barriers to re-enrollment and explore family engagement strategies to promote sustained participation across summers.

4. Strengthen summer literacy approaches

The lack of positive reading impacts across the R2R summer programs highlights the need to strengthen summer literacy approaches. Districts could experiment with more intensive literacy instruction, targeted interventions for struggling readers, or partnerships with community organizations to provide complementary reading supports.

5. Leverage complementary interventions

Summer school and tutoring should be viewed as complementary. Whereas summer school can most effectively support district-wide recovery by modestly improving math achievement for many students, tutoring may be best utilized as a targeted intervention for smaller groups of students most in-need of support. Future research should continue to explore how to maximize summer school's contribution to broader recovery and evaluate its cost-effectiveness relative to other large-scale academic interventions.

ABOUT THE AUTHORS

Emily Morton's research focuses on estimating the effects of K–12 education policies and programs related to instructional time and learning environments on student outcomes. She uses applied econometrics and causal inference as well as qualitative methodologies to investigate these topics. She conducts much of her research in partnership with schools and districts, with the intention of producing actionable findings that will directly inform policy and practice and serve to reduce inequality. Most notably, her recent work focuses on examining impacts of the four-day school week and academic COVID recovery interventions on student outcomes. Dr. Morton's research has been published in leading peer-reviewed economic and education journals such as *American Economic Review: Insights, Educational Researcher*, *Economics of Education Review*, and *Educational Evaluation and Policy Analysis*.

Before rejoining NWEA in 2025, Dr. Morton was a researcher at the Center for Analysis of Longitudinal Data in Education Research at the American Institutes of Research. Prior to that, she was a research scientist at the Center for School and Student Progress at NWEA. She holds a PhD in education and a master of public policy from Stanford University, where she was an Institute for Educational Sciences fellow.

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