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The Impact of Virtual Summer School on Student Achievement Growth During COVID-19

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The Impact of Virtual Summer School on Student Achievement Growth During COVID-19

Alexa Prettyman and Tim Sass

Metro Atlanta Policy Lab for Education

July 2021

Highlights

- We examine a virtual summer school program for elementary and middle school students during the COVID-19 pandemic. The program was intended to be mandatory for students who needed to clear “incompletes” but was also available to other students.
- Participation in the program was low: only 25% of the students who had not completed at least 70% of their assignments by the end of the spring term—and thus expected to attend summer school—actually participated. In contrast, over 5,000 students who were not required to attend summer school chose to participate.
- Along most dimensions, the average observable characteristics of summer school participants and non-participants are similar. Two notable differences include race and assignment completion rates. Participants were more likely to be Asian and less likely to be White or Hispanic relative to non-participants. Among all participants, average spring semester assignment completion rates were lower than those of non-participants.
- On average, summer school participants experienced a one-half month gain in math achievement growth and a one-fourth month reduction in reading achievement growth relative to non-participants. The difference in reading scores, however, was not statistically significant.
- The observed achievement gains in math are primarily driven by elementary school students; effects for middle school students were not significantly different from zero.
- Positive impacts of summer school participation are driven by the students who completed all their spring semester assignments, while negative impacts are driven by the students who completed less than 70% of their spring semester assignments.

Motivation and Background

Motivation

In response to the COVID-19 pandemic, districts in metro Atlanta closed physical schools and quickly shifted to remote instruction in mid-March 2020 for the remainder of the school year. Rapid-response research showed achievement growth for students between the middle of the 2019-20 school year (SY) and early in SY 2020-21 was lower than that of similar students in pre-pandemic years. Some students, such as those eligible for free or reduced-price meals (FRPM) and English language learners (ELLs), tended to experience greater reductions in achievement growth relative to pre-pandemic trends.¹ With these effects growing during SY 2020-21 and many disparities widening, districts and policymakers need information about what strategies effectively accelerate achievement growth and whether these strategies are successful for all students.

About the Program

One of the early efforts to mitigate the effects of pandemic-induced school closures was a summer school program implemented in summer 2020 by one school district (hereafter, “the District”) in the metro-Atlanta area. Two sessions were offered, both of which were completely virtual.² The District took two steps to inform parents about summer school and encourage participation.

Step 1: The District sent an informational letter to all parents.

About four weeks before the end of the school year, the District informed parents that students who had failed a course or had not completed at least 70% of their assignments would have to attend summer school. The District encouraged parents to make sure their students completed at least 70% of their assignments to avoid being assigned an Incomplete grade. The specific language in the letter was, “Students will be required to complete a minimum of 70% of remote learning assignments to be considered engaged. All students who are not engaging in remote learning at a rate of 70% will receive an Incomplete as their final fourth quarter grade . . . Students who receive an Incomplete in reading and/or math will be expected to attend summer school... in order to clear the Incomplete.”

Step 2: The District sent a registration letter to parents of the students not engaged in remote learning.

Two weeks later, the District sent a letter to parents of students who did not complete at least 70% of their remote learning assignments with instructions to register for summer school and asked them to return the registration form by the last day of school.^{3,4} While students who received an Incomplete in reading or math were expected to attend summer school, there were no incentives or consequences for students' participation in virtual summer school.

Existing Literature

In normal times, studies indicate that participation in summer programs tends to improve math achievement; however, in reading, the impact is mixed.⁵ Interventions, ranging from summer enrichment programs in early grades to a 19-day camp for rising eighth graders, increased math achievement by 0.3 to 0.7 standard deviations for participants compared to non-participants.^{6,7} Additionally, an online summer math program for students in third to ninth grade positively impacted engagement but not academic achievement.⁸ Alternatively, a five-week summer literacy program for rising second graders struggling to read improved reading fluency.⁹ Another similar program for fourth graders did not improve reading outcomes but did improve social-emotional learning outcomes.¹⁰ Finally, students admitted to five-week summer school programs had significantly higher math achievement but similar English language arts achievement relative to those not admitted.¹¹

This report estimates the effectiveness of a virtual summer school program in elementary and middle schools in a metro-Atlanta district. This analysis is one component of a multi-phase study investigating the impacts of COVID-19 within the metro-Atlanta area.

Research Questions

This report addresses the following research questions:

1. Who participated in the virtual summer school? How do participants differ from non-participants?
2. Did virtual summer school mitigate reductions in student achievement growth associated with the COVID-19 pandemic?

While we show demographic breakouts for participation, we do not estimate the effects of summer school separately by demographic characteristics for two reasons. First, small sample sizes limit our ability to detect statistically significant impacts. Second, prior studies evaluating summer school interventions do not find differential impacts by student groups.^{12,13}

Data

We use spring assignment completion records, middle school course grades, summer school files, and student demographic and assessment data. We face two main data challenges. First, we do not have data on which students' parents received notification that their student would need to attend summer school. Second, we only know the proportion of remote-learning assignments that were completed by the end of the regular school year. Therefore, we cannot distinguish between

- students who completed enough remote-learning assignments to avoid an incomplete before summer school invitations were made and
- those students who were told they would have to attend summer school but ramped up their effort in the last two weeks of the spring semester (i.e., completed at least 70% of their remote-learning assignments and were no longer “required” to attend summer school).

With these limitations in mind, we refer to the students who completed less than 70% of their spring remote learning assignments by the end of the school year or failed a course as those expected to attend summer school and students who completed at least 70% of their assignments and did not fail a course as not expected to attend.

We use the summer school files, which contain task completion data and final grades for courses taken in the summer, to classify students as participants. Among elementary and middle school participants, engagement in summer school can also be measured by i-Ready task data. i-Ready is a set of online instructional materials produced by Curriculum Associates for students in grades K-8. The curriculum is divided into tasks with an assessment associated with each task. The i-Ready instructional data include the task name, date, time, and an indicator of whether the student passed the task. In other words, we know how many days a student participated, the number of reading and math tasks attempted and passed, and the time spent per task.

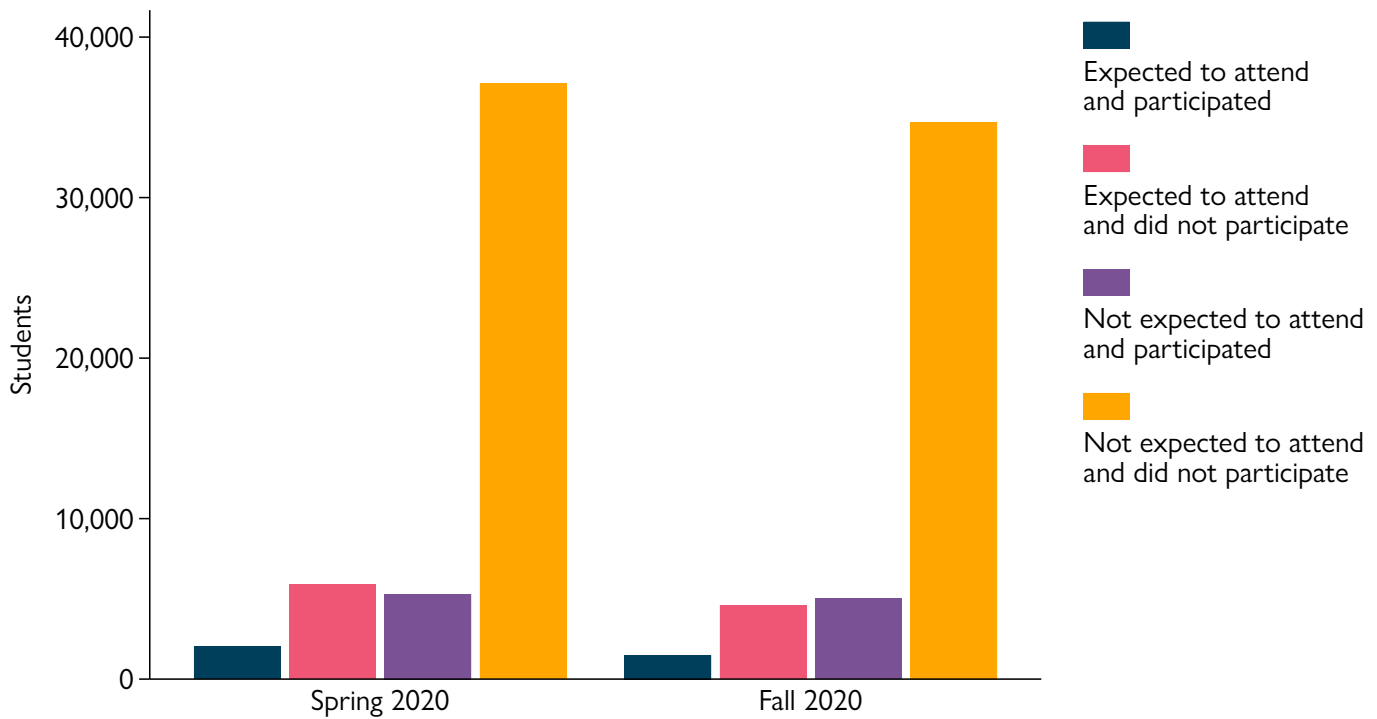
On average, summer school participants in elementary and middle school attempted 13 tasks over seven days (just under two tasks per day). Students spent about 33 minutes per task and passed just over 75% of the tasks. Of note, participants who were expected to attend summer school logged in more often, completed more tasks, and spent more time completing tasks. On average, they logged into i-Ready eight days over the summer, attempted 18 tasks, and spent approximately 38 minutes per task. It is unclear how often summer school participants were expected to log in, but logging in seven to eight days over the course of a three- or six-week program might be a sign of poor engagement in summer school.

The District's administrative records contain student demographic characteristics and i-Ready formative assessment scores for students in grades K-8 in SY 2017-18 through SY 2020-21. Pre-pandemic data (through winter of SY 2019-20) were used to determine projected fall SY 2020-21 test scores, had the pandemic not occurred. The difference between projected and actual fall 2020-21 test scores is a measure of the impact of the pandemic on student learning growth between winter 2020 and fall 2020 testing (i.e., between late January 2020 and late-August/early-September 2020) for students in grades 4-8 in the fall of 2020.^{14,15} Given the summer school program occurred in the middle of this period, we use variation in the deviation of projected and actual fall test scores to measure the impact of summer school on student achievement growth.

Methodology

Given the data limitations discussed above, we compare outcomes for summer school participants and non-participants, holding constant demographic characteristics and spring-semester assignment completion rates.¹⁶ This approach compares outcomes for similar students that only differ by summer school participation. One drawback of this approach is that selective participation might bias the estimated impact of summer school. The participants and non-participants may differ in unobservable ways that also impact their achievement growth (e.g., non-participants may be less motivated academically, or family disruptions could have reduced the likelihood of participation and impacted fall test scores). To address this concern, we also analyze program participation effects on selected groups of students.

Figure 1. Summer School Composition for Test Takers, by Semester



Comparing the size of the estimated effects provides a range of the estimated efficacy of the virtual summer school program in mitigating COVID-19-related reductions in achievement growth.

Finding 1: Summer School Participation

Summer school participation was low.

Figure 1 shows the breakdown of students who participated in summer school with i-Ready test scores early in the spring 2020 semester (i.e., scores on the winter SY 2019-20 assessment) compared to early in the following fall 2020 semester. Students fall into one of four categories:

- they were not expected to attend summer school (because they had completed at least 70% of their spring assignments by the end of the term) and did not participate;
- they were not expected to attend and participated;
- they were expected to attend (spring completion rate below 70%) and did

not participate; or

- they were expected to attend and participated.

The purple and yellow bars represent students who were not expected to attend summer school; the blue and pink bars represent students who were expected to attend. The darker shading (blue and purple) indicates participants, and the lighter shading (pink and yellow) indicates non-participants.

By the end of SY 2019-20, 16% of the i-Ready test-takers in the District (7,888 students) were expected to attend summer school. Of those expected to attend, only 25% (2,009) participated in summer school.¹⁷ Over 5,000 students were not expected to attend but did anyway.¹⁸

Across all students, test taking declined from spring 2020 to fall 2020. Approximately 9% of the students enrolled in the District in spring 2020 who took i-Ready exams did not return or did not take i-Ready exams in fall 2020. Attrition is higher among students expected to attend summer school (at 23%) than those not expected to attend (at 6%). This finding is perhaps not surprising as the students who struggled during the immediate shift to virtual learning in the spring may not have been motivated to continue in that learning modality—leading to low spring assignment completion, non-participation in summer school, and non-enrollment (and thus no i-Ready exam score in the fall). This result suggests that attrition may bias the estimated effects of the virtual summer school upward.

Virtual summer school participation also varied by grade. Figure 2 shows how summer school participation differs by grade level. Overall, summer school participation was highest among students in grades 1–5 where about one in five students participated in summer school. In grades 6–8, only about one in 10 students participated. This participation rate includes students expected and not expected to attend. For students expected to attend, the participation rate varied from one in five to one in three.

Figure 2. Summer School Composition for Test Takers, by Grade

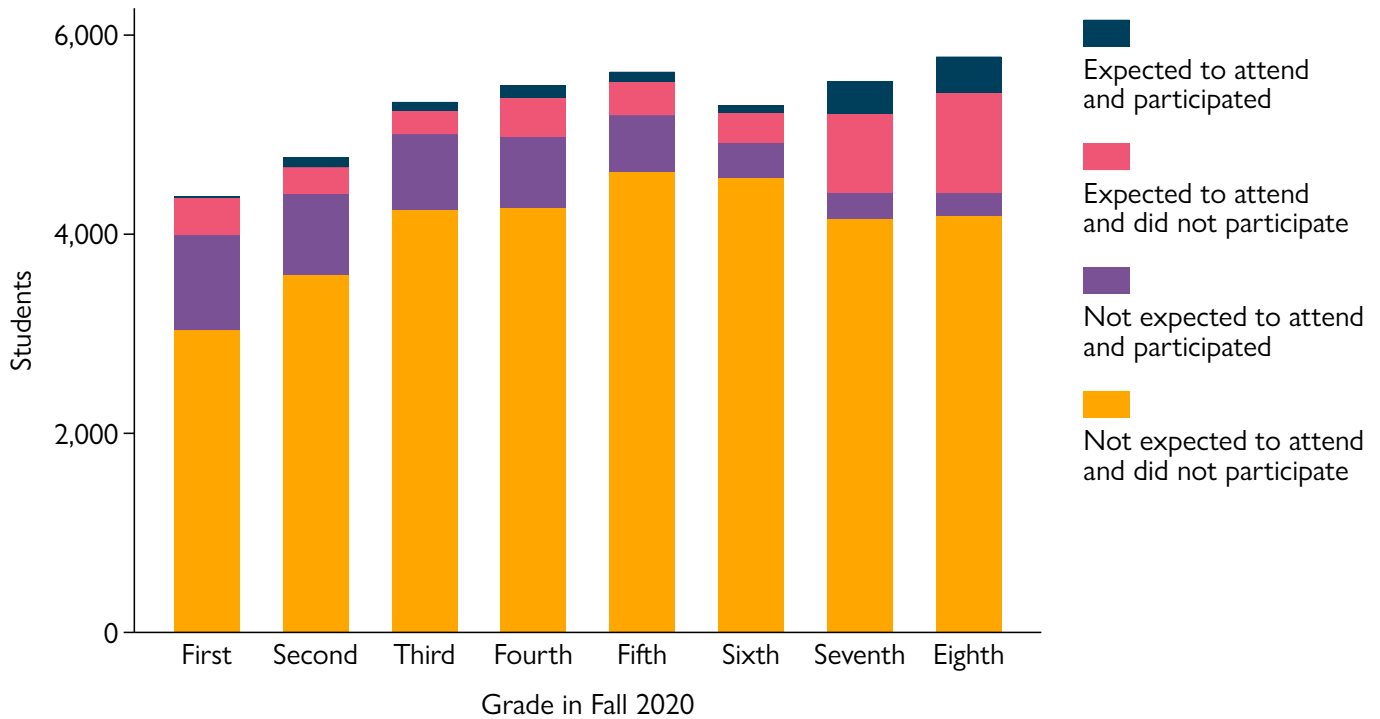
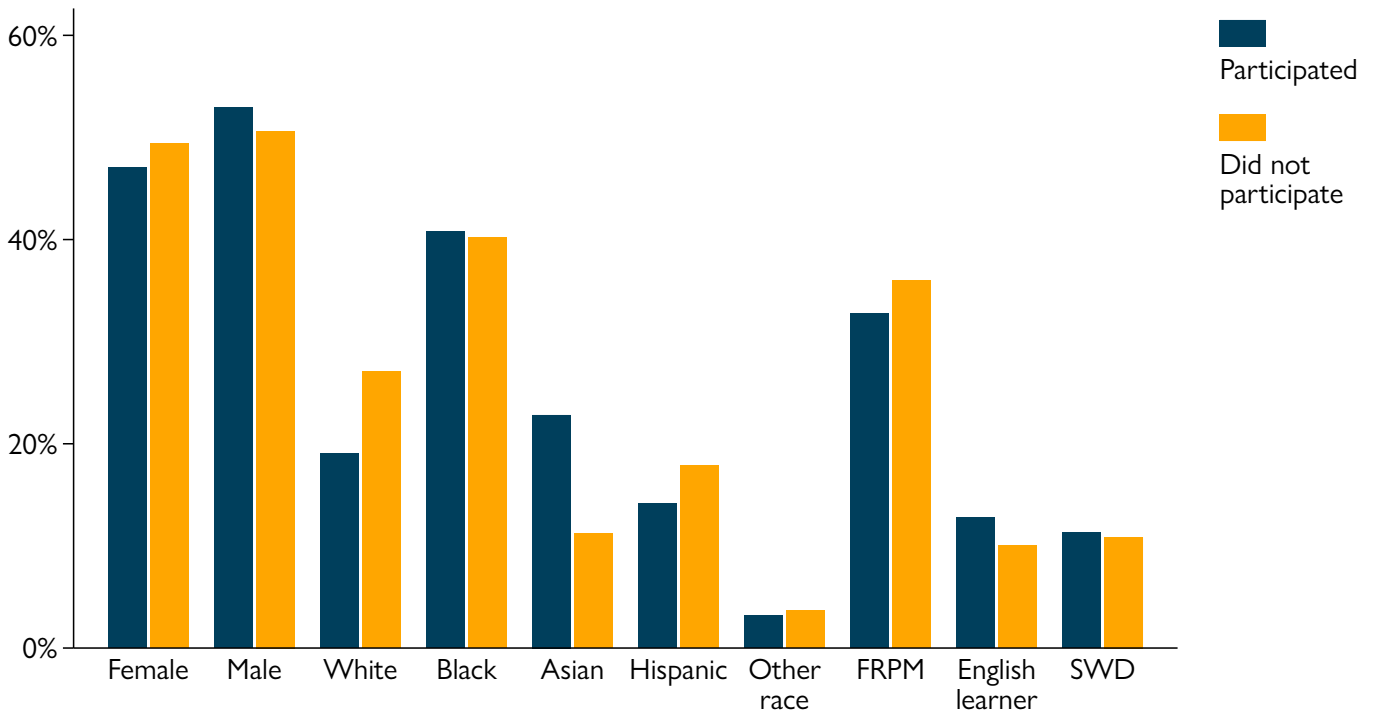


Figure 3. Summer School Participants, by Student Groups



Notes. Students who are White, Black, Asian, or another race are not Hispanic. FRPM is eligible for free or reduced-price meals. SWD is students with disabilities.

Table 1. Sample Size, by Analysis Group

	Full sample	Elementary school	Middle school	Expected to attend	Not expected to attend	Completed all spring 2020 assignments
Number of students	20,840	14,003	6,835	2,782	18,058	11,774
Number of summer school participants	2,446	1,637	809	723	1,723	1,233
Participation rate	12%	12%	12%	26%	10%	10%

Finding 2: Student Characteristics

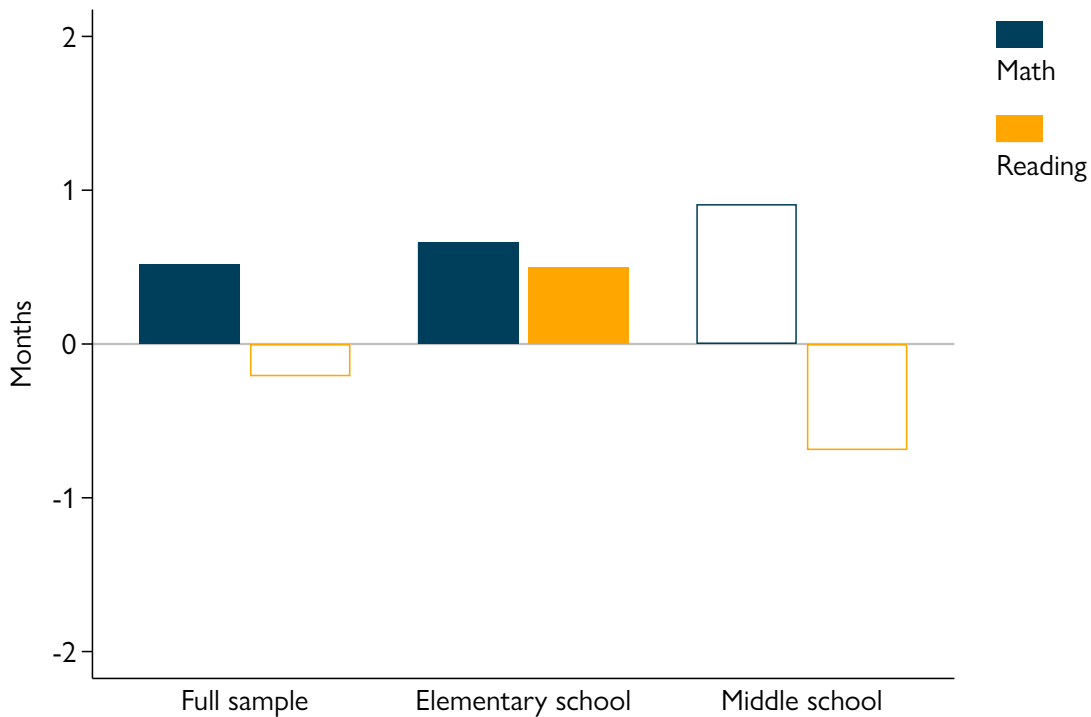
Participants and non-participants have similar observable characteristics.

Figure 3 shows the participation rate by student demographic characteristics. Along most observable characteristics, participants and non-participants look similar. One notable difference is that participants were more likely to be non-Hispanic Asian and less likely to be non-Hispanic White or Hispanic relative to non-participants. Another difference not shown in the graph is that participants had somewhat lower spring semester assignment completion rates: they completed an average of 88% of their assignments, while non-participants completed an average of 92% of their assignments. This difference is unsurprising as students who completed less than 70% of their spring assignments were expected to attend summer school, whereas those who completed at least 70% were not expected to attend.

Sample Construction

To evaluate the relationship between the virtual summer school intervention and pandemic-induced changes in achievement growth during the winter 2020 to fall 2020 period, we restrict our analysis sample to students in grades 4–8 with math and reading achievement growth estimates. Over 20,000 students make up the main analysis sample; 12% participated in summer school. The sample is also broken down by school level and expected summer school attendance.

Figure 4. Difference in Winter-to-Fall Achievement Growth Deviation from Pre-Pandemic Trends Between Summer School Participants and Non-Participants, by School Type



Notes. Solid bars are statistically significant at the 95% confidence level. Outlined bars are not statistically significant.

Table 1 reports the number of students, the number of participants in summer school, and the summer school participation rate for the various analysis samples. Among students for which achievement growth impacts can be calculated, the summer school participation rate is 12% in elementary and middle school.¹⁹ The participation rate is higher for students who were expected to attend summer school than for students who were not expected to attend. A non-trivial proportion of students (10%) participated in summer school despite completing 100% of their spring semester assignments.

Finding 3: Student Achievement Growth

Participants experienced greater achievement growth in math but not in reading compared to non-participants.

On average, summer school participants across grades 4–8 experienced just over a one-half month greater growth in math achievement relative to non-participants. In reading, participants experienced just under a one-fourth month loss relative to non-participants, though this difference is not statistically significant at the 95% confidence level.

Figure 4 shows the difference in the pandemic's impacts on achievement growth (between winter 2020 and fall 2020) between summer school participants and non-participants, measured in months of learning in a typical year for math and reading.

The first group of bars represents the difference between the deviation in achievement growth from pre-pandemic trends of participants and non-participants for the full sample of students in grades 4–8 with COVID-19 achievement growth impact estimates. The second and third groups of bars plot the differences between COVID-19 achievement growth impacts for participants and non-participants in elementary (grades 4–6) and middle school (grades 7–8), respectively.

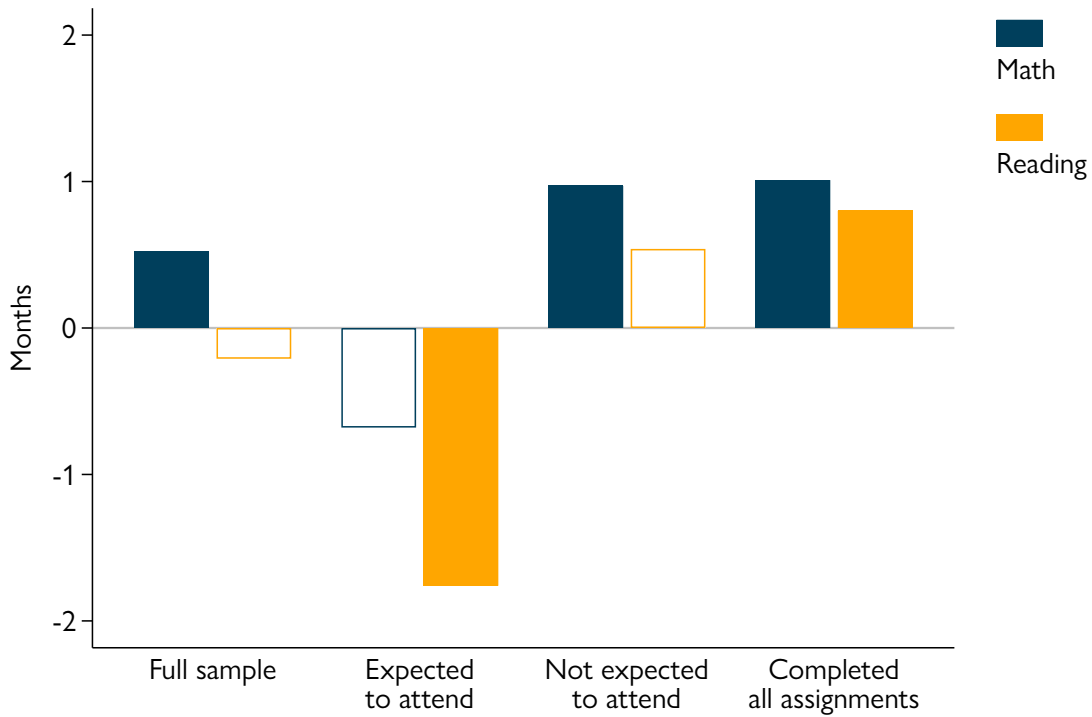
The effect size is similar in elementary and middle school for math²⁰ but varies by school level for reading. On average, elementary school summer school participants experienced achievement growth in reading that was significantly above the growth of non-participants and similar to the gains in math. Alternatively, middle school summer school participants experienced large reductions in student achievement growth in reading, but these estimates are not statistically different from those of non-participants.

Finding 4: Drivers of Achievement Growth

Achievement gains are driven by the students who completed 100% of their assignments, not the students who were expected to attend.

Next, we conduct separate analyses for students who were and were not expected to attend summer school to determine which type of students are driving the results. Figure 5 plots the differences in COVID-19-induced reductions in student achievement growth for summer school participants and non-participants in the full sample. It also shows the differences in achievement growth for students who were expected to participate, students who were

Figure 5. Difference in Winter-to-Fall Achievement Growth Deviation from Pre-Pandemic Trends between Summer School Participants and Non-Participants, by Spring Assignment Completion Rate



Notes. Solid bars are statistically significant at the 95% confidence level. Outlined bars are not statistically significant.

not expected to participate, and students who completed 100% of their assignments and did not fail a course.

In math, the magnitude of the effect is similar and statistically significant across all sample variations, except for the sample restricted to the students expected to attend. For this group, the effect is negative, although not statistically significant. In reading, the effect is more sensitive to the different samples. For students expected to attend, participants learned one and three-fourths months less relative to non-participants. The effect is statistically significant with 95% confidence. Moreover, this negative effect is concentrated among middle school students, not elementary school students. In contrast, participants who completed 100% of their spring semester assignments experienced learning gains of more than three-fourths of a month relative to non-participants who completed 100% of their assignments.²¹

Collectively, these findings suggest that students who were expected to attend summer school struggled more in reading than in math over the winter 2020

Table 2. Average Past Achievement and Attendance by Analysis Group and Summer School Participation

	Full sample		Expected to attend		Completed all spring 2020 assignments	
	Participated	Did not participate	Participated	Did not participate	Participated	Did not participate
Assignment completion rate	85.6%	92.7%	58.6%	64.2%	100%	100%
Prior math achievement	44.5	50.7	24.9	27.9	56.8	57.1
Prior reading achievement	45.5	52.8	29.0	31.3	56.0	58.5
Absences in SY 2019-20	4.7	4.7	7.2	7.0	3.3	4.3

Notes. Assignment completion rate refers to the proportion of remote-learning assignments completed by the end of SY 2019–20. Prior math achievement refers to the i-Ready Math national percentile rank from fall 2019. Prior reading achievement refers to the i-Ready Reading national percentile rank from fall 2019. Absences show the number of days absent.

to fall 2020 period. Consistent with this notion, summer school participants attempted more reading assignments than math assignments (9.5 tasks versus 8.5 tasks, respectively) and had lower task pass rates in reading than math (57% versus 68%, respectively). In addition, students who were more engaged in remote learning at the end of SY 2019-20 seemed to benefit more from summer school than those who were not engaged.

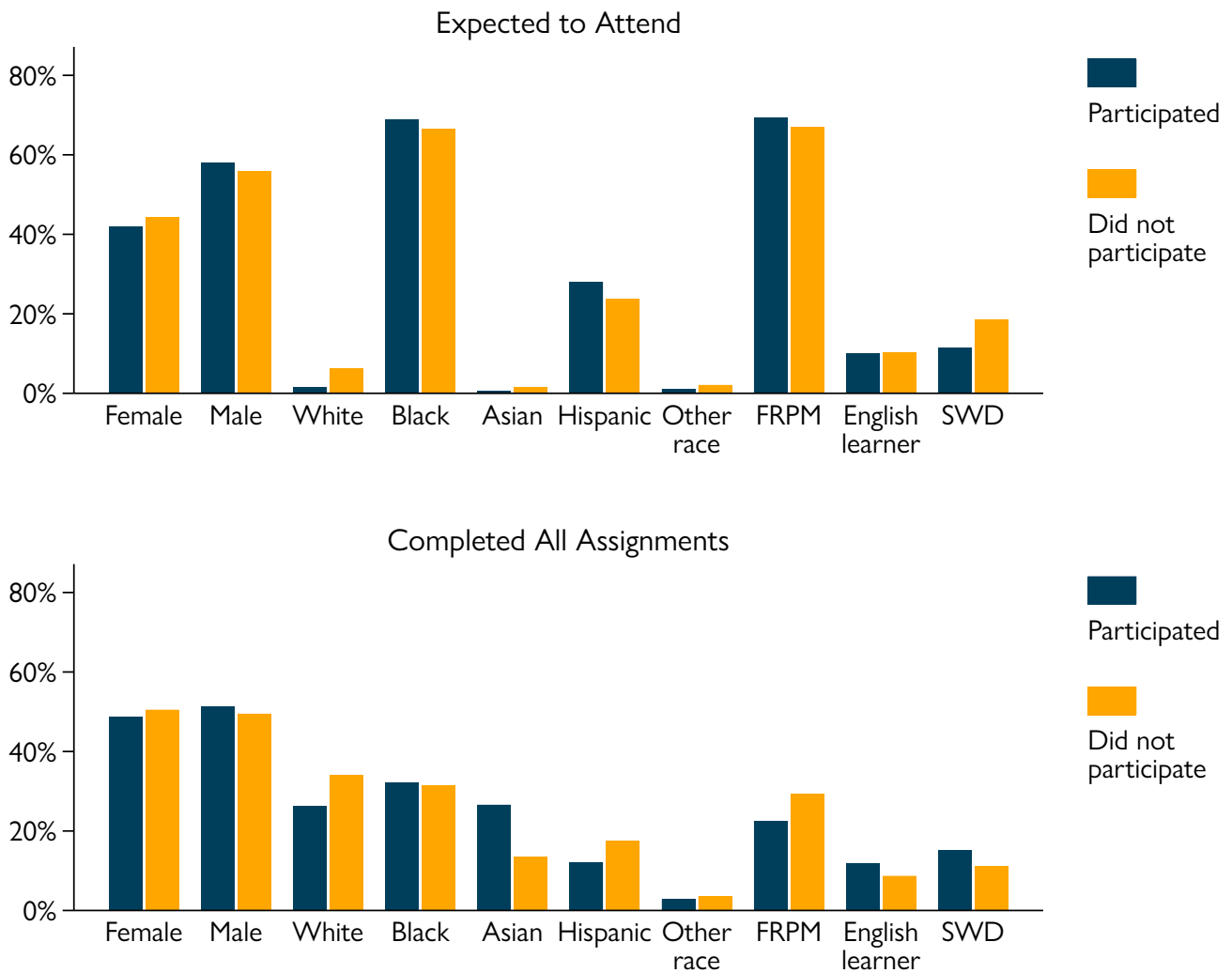
Finding 5: Achievement Gains by Student Group

Differences in achievement gains within student groups do not seem to be driven by prior achievement.

Students differ in their spring assignment completion rates. For example, Table 2 shows that students who completed all their remote-learning assignments are higher achieving (as measured by past achievement and attendance) than are the students who were expected to attend summer school. Differences across student groups, however, do not explain the differences in achievement growth within groups.

Figure 6 shows the participation rate by student demographic characteristics for the group of students expected to attend and the students who completed 100% of their remote-learning assignments.

Figure 6. Distribution of Student Characteristics for Students Expected to Attend Summer School and for Students who Completed All Assignments, by Summer School Participation Status



Notes. Students who are White, Black, Asian, or another race are not Hispanic. FRPM is eligible for free or reduced-price meals. SWD is students with disabilities.

Within the group of students expected to attend, participants and non-participants look similar using demographic categories. In addition, Table 2 shows that participants and non-participants in this group have similar past test scores and attendance.

Alternatively, participants in the group of students who completed all their assignments are more likely to be non-Hispanic Asian and less likely to be non-Hispanic White or Hispanic than non-participants. Additionally, Table 2 shows

that participants were absent one less day last year than non-participants; however, participants and non-participants in this group do not differ by past test scores.

Discussion and Next Steps

The purpose of this report is to evaluate the impact of a virtual summer school program offered in 2020 for elementary and middle school students. Given data limitations, we could not identify which students were advised to attend summer school and thus cannot determine the impact of being offered enrollment in summer school.²² We could, however, distinguish between students who participated in the program and those who did not.²³ Therefore, the analysis is limited to estimating the impact of actually participating in summer school.

In general, summer school participants experienced gains in math but not in reading compared to non-participants. The effects are larger and more consistent across different samples in math than reading. This finding is consistent with existing evidence on summer school programs. Moreover, the effect is primarily driven by elementary school students, not middle school students.

Recognizing that these estimates may suffer from self-selection bias (because summer school participation was not mandated), we conduct sub-sample analyses by expectations of attendance. Students who completed less than 70% of their spring semester assignments or failed a course in grades 6 and 7 were expected to attend summer school. Alternatively, students who completed more than 70% of their assignments and did not fail a course were not expected to attend. Positive impacts of the summer school intervention are driven by the students who completed all their spring semester assignments; negative impacts are driven by the students who were expected to attend.

While there are some obvious differences between the participants and non-participants among the group of students who completed all their assignments, the COVID-19 achievement gains do not appear to be driven by observable achievement differences. Similarly, the negative impacts for students who were expected to attend summer school do not seem to be a result of selective participation based on prior achievement. We cannot, however, rule out other potential confounders and caution against making causal claims with these estimates.

Collectively, these analyses demonstrate that the efficacy of summer school depends on the extent of student engagement in remote learning (as measured by prior assignment completion rates). Students who participated in summer school that were more engaged in remote learning in spring 2020 (i.e., completed 100% of their spring assignments) seemed to benefit more than the students who were less engaged in the spring (i.e., completed less than 70% of their spring assignments). Negative and indistinguishable-from-zero effects for the students expected to participate could be driven by low participation or poor engagement in summer school.²⁴ Participation would likely have been greater had there been significant consequences for non-participation or incentives to participate.

If school districts seek to use summer school as a mechanism for accelerating learning for students who experienced substantial reductions in achievement growth during the pandemic, they may want to consider mandating summer school participation for targeted students. They may also want to consider providing information or incentives to encourage better participation in any future programs offered during the summer or during breaks in the academic calendar. Additionally, the use of clear and objective assignment rules and better documentation of who is expected to attend summer school would better facilitate a causal analysis of the program's efficacy.

Endnotes

1. Sass, T., & Goldring, T. (2021a). Student Achievement Growth During the COVID-19 Pandemic: Insights from Metro-Atlanta School Districts. *Georgia Policy Labs*. gpl.gsu.edu/publications/student-achievement-growth-during-the-covid-19-pandemic
2. Initially, two summer school options were contemplated: a) a six-week virtual summer school program and b) a three-week blended-model. The blended-model expected in-person attendance for 16 hours a week for elementary students and 12 hours a week for middle school students. However, it was later decided to offer only virtual instruction in both sessions, so it is unclear how many hours a day students were expected to login. In elementary school, courses in both options were supposed to be taught by special education teachers, but it is unclear if they were the only teachers involved.
3. Middle school students who were failing a course also received a notice that they could recover their grade by attending the District's virtual school in the summer.
4. Families could also request that their child attend summer school, but this was rare.
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12. Augustine, McCombs, Pane, Schwartz, Schweig, McEachin, & Siler-Evans
13. Little, C., Adelson, J., Kearney, K., Cash, K., & O'Brien, R. (2018). Early Opportunities to Strengthen Academic Readiness: Effects of Summer Learning on Mathematics Achievement. *Gifted Child Quarterly*, 62:1. journals.sagepub.com/doi/pdf/10.1177/0016986217738052
14. Sass, T., & Goldring, T. (2021b). Appendix to: Student Achievement Growth During the COVID-19 Pandemic: Insights from Metro-Atlanta School Districts. *Georgia Policy Labs*. gpl.gsu.edu/publications/student-achievement-growth-during-the-covid-19-pandemic
15. These estimates were not calculated for students in third grade and below due to concerns over potential bias related to at-home testing.
16. Specifically, we control for gender, race/ethnicity, free or reduced-price lunch (FRPM) status, English Language Learner (ELL) status, disability status, grade level, school, number of disciplinary incidents, and spring semester assignment completion rates.
17. If we do not limit the sample to those who took i-Ready exams, then 16% of the students in the district (14,126 students) were expected to attend summer school. Of those expected to attend, only 22% (or 3,122 students) participated in summer school.
18. As noted above, occurrences of families independently requesting summer school were rare. The participants who were not expected to attend were most likely students who had completed less than 70% of their assignments prior to registration letters being sent but eventually completed more than 70% of their assignments and therefore were not required to attend summer school.
19. Students are classified as being in elementary school if they were in grades 3–5 in spring 2020 (i.e., grades 4–6 in fall 2020), and students are classified as being in middle school if they were in grades 6–7 in spring 2020 (i.e., grades 7–8 in fall 2020).
20. The effect is statistically significant in elementary school but not middle school.
21. This effect is statistically significant, but the effect for the sample of students of students not expected to attend is not.

22. In program evaluation terminology, this is referred to as the “intent to treat” (ITT) effect of a program. For policymaking purposes, the ITT metric can be quite useful since it accounts for the fact that policy effectiveness can be reduced if members of a targeted group choose not to participate in an offered program.

23. This is known as the “treatment on the treated” (TOT) effect of a program. The primary difference between the TOT and ITT measures is the inclusion of individuals who are offered the intervention but choose not to participate. If there is perfect compliance and all of those who are offered the program participate, the ITT and TOT measures are identical.

24. Augustine et al. (2016) also find substantial non-compliance and low attendance rates among district-led voluntary summer school programs in Boston, Dallas, Duval County (Florida), Pittsburg, and Rochester (New York).

About the Authors

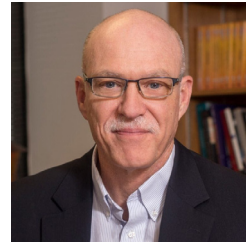
Alexa Prettyman

Alexa Prettyman is a senior statistician with the California Center for Population Research at the University of California, Los Angeles. She was a graduate research assistant with the Georgia Policy Labs. Her research evaluates and develops interventions and evidence-based policies that overcome the disparities of educational attainment for vulnerable youth, such as chronically absent students and children in foster care.



Tim Sass

Tim Sass is a Distinguished University Professor in the department of economics at Georgia State University and the W.J. Uesry Chair of the American Workplace in the Andrew Young School of Policy Studies. He is also the faculty director of the Metro Atlanta Policy Lab for Education (MAPLE). His research interests include the teacher labor supply, the measurement of teacher quality, and school choice. His work has been published in numerous academic journals and has been supported by grants from the U.S. Department of Education, the Gates Foundation, the Smith-Richardson Foundation, the Laura and John Arnold Foundation, and the Spencer Foundation. He has acted as a consultant to school systems in New York City, Washington, D.C., Charlotte, NC, the state of Florida, and the state of New York. He is also a senior researcher at the Center for Analysis of Longitudinal Data in Education Research (CALDER)



About the Georgia Policy Labs

The Georgia Policy Labs is an interdisciplinary research center that drives policy and programmatic decisions that lift children, students, and families—especially those experiencing vulnerabilities. We produce evidence and actionable insights to realize the safety, capability, and economic security of every child, young adult, and family in Georgia by leveraging the power of data. We work alongside our school district and state agency partners to magnify their research capabilities and focus on their greatest areas of need. Our work reveals how policies and programs can be modified so that every child, student, and family can thrive.

Housed in the Andrew Young School of Policy Studies at Georgia State University, we have three components: the Metro Atlanta Policy Lab for Education (metro-Atlanta K-12 public education), the Child & Family Policy Lab (supporting children, families, and students through a cross-agency approach), and the Career & Technical Education Policy Exchange (a multi-state consortium exploring high-school based career and technical education).

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