BRIEF

COVID's impact on science achievement: Trends from 2019 through 2024

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KEY FINDINGS

- COVID-19 school closures caused science achievement to drop early in the pandemic, resulting in one to 2.3 months of unfinished learning by spring 2021.
- There is evidence of uneven recovery by spring 2024 in science achievement across the elementary and middle grades. Science achievement returned to near-2019 levels for grades 3 through 5 but continued to decline for grades 7 and 8.
- The largest declines are evident for eighth-graders who are approximately 3.2 months behind. This was true for students from all racial/ethnic groups, but Hispanic students in 2024 are farthest behind their 2019 peers, and Black students remain far below the overall 2019 mean despite rebounding.

This brief continues ongoing research by NWEA® examining the degree to which the COVID-19 pandemic, and its associated school closures, influenced student learning. Our prior research focused on math and reading and found that the pandemic's negative impact steadily accumulated during the 2020–21 school year, with significant disparities in achievement and growth compared to prepandemic trends (Lewis, Kuhfeld, Ruzek, & McEachin, 2021). Although there were modest rebounds in reading and math during the 2021–22 school year, progress toward pandemic recovery largely stalled in 2022–23 and 2023–24, with achievement and growth trends still trailing behind prepandemic levels (Kuhfeld & Lewis, 2022; Lewis & Kuhfeld, 2023; Lewis & Kuhfeld, 2024).

Building on our previous research series focused on math and reading achievement, we now explore how the pandemic influenced student achievement in science. To our knowledge, this represents the first large-scale, in-depth analysis of how science achievement in the US[1] was influenced by the COVID-19 pandemic.[2]

We examined science test scores across seven school years to understand how COVID-19 influenced science achievement. We use the term "achievement gaps" to indicate the difference between recent test scores (spring 2021 or spring 2024) and those from students before the pandemic (spring 2019). We use the term "disparities" to capture racial/ethnic group differences. Achievement gaps allow us to examine whether students are achieving at levels comparable to their peers before the pandemic to better understand the extent of unfinished learning. Disparities allow us to examine inequities in our education system.

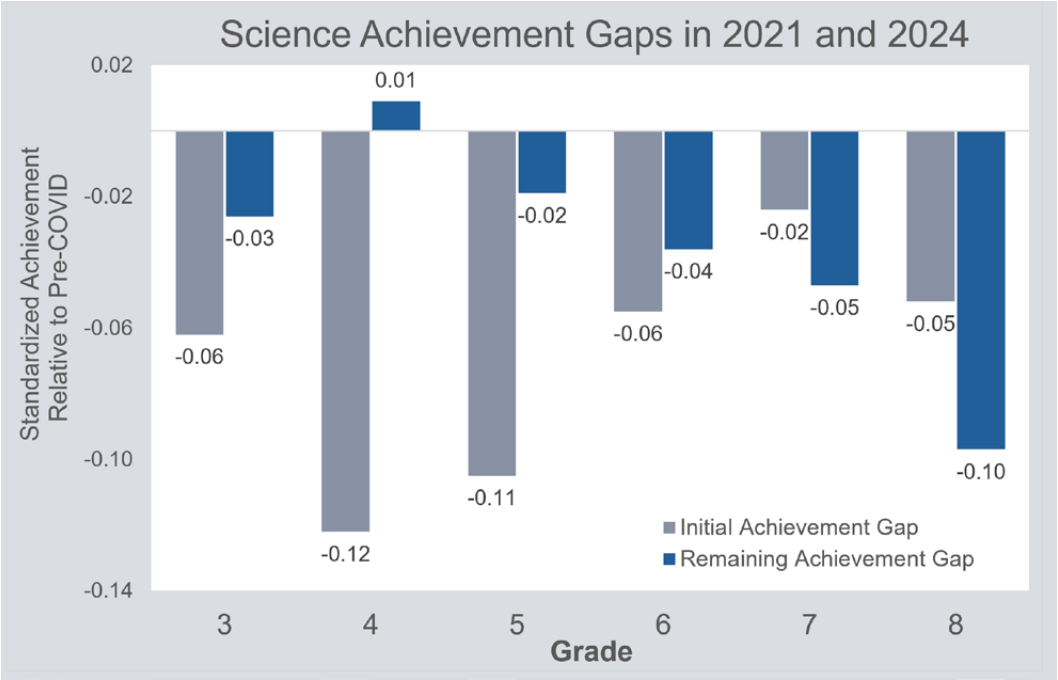
1 An international study reported US science scores following the pandemic in a global context, but the analysis did not examine US science scores in-depth.

2 This report differs from the math and reading reports mentioned above in that it focused on a far smaller and narrower sample. Our analysis is based on data from the 621 schools that a) consistently administered the MAP® Growth™ Science assessment from spring 2017 through spring 2024, and b) consistently tested the same grades within those schools (i.e., if grade 3 was tested in 2017, the school also tested grade 3 consistently between 2018–2024). As a result, comparisons between this report's findings and those related to math and reading should be made with caution. More details about the sample can be found in the technical report.

Science achievement dropped by spring 2021 for all grades

Figure 1 compares students' scores at two pandemic timepoints: a) spring 2021 (early in the pandemic) and b) spring 2024 (when recovery might be expected), relative to achievement levels that might have been anticipated if the pandemic had not occurred (spring 2019). Bars below zero reflect scores lower than 2019 levels, and bars above zero reflect scores that were higher than 2019 levels. The light grey bars show initial achievement gaps (the standardized achievement differences between spring 2021 and spring 2019), while the dark blue bars show remaining achievement gaps (the standardized achievement differences between spring 2024 and spring 2019).

Figure 1. Achievement gaps relative to spring 2019.



The grey bars in Figure 1 make clear that across grades, achievement in spring 2021 was lower than spring 2019 (initial gaps). The magnitude of 2021 achievement gaps relative to spring 2019 ranged from -0.02 standard deviations in seventh grade to -0.12 standard deviations in fourth grade.

Achievement gaps for students in grades 3–6 decreased by 2024

The dark blue bars in Figure 1 indicate that 2024 science achievement gaps (remaining gaps) for students in grades 3–6 decreased relative to 2021 gaps (initial gaps). The largest reductions occurred in grades 3–5 (50% reduction for third grade; elimination of the gap in fourth grade; 82% reduction for fifth grade), with a smaller reduction for sixth grade (33%). Elementary student achievement in 2024 is now closer to that of their 2019 peers. Although the gap reduction for sixth-grade students is smaller than that seen for grades 3–5, the overall trend for sixth-graders more closely resembles results for elementary students than middle school students.

Achievement for students in grades 7–8 in spring 2024 was lower than that of their spring 2019 and spring 2021 peers

The dark blue bars in Figure 1 for students in grades 7–8 in spring 2024 indicate persistent unfinished learning. What's more, achievement levels in these grades are even lower than those in spring 2021. Thus, seventh- and eighth-grade average achievement has not rebounded; instead, achievement gaps have increased.

One to three months of additional instruction are required to catch up to 2019 achievement levels

To add practical context to the magnitude of the achievement gaps, we calculated the months required to close the gap and catch up to 2019 achievement levels. We computed a ratio with the difference in achievement between academic years for a given grade compared to the expected growth in a single year for that grade and then multiplied the ratio by nine months in a school year (see the technical appendix for more information). Table 1 lists achievement gaps and months to catch up by grade level.

Table 1. Achievement gaps and months to catch up by grade

	Initial gaps (2021)		Remaining gaps (2024)	
GRADE	**ACHIEVEMENT GAP**	**MONTHS TO CATCH UP**	**ACHIEVEMENT GAP**	**MONTHS TO CATCH UP**
3	-0.06	1	-0.03	0.4
4	-0.12	2.3	0.01	
5	-0.11	1.8	-0.02	0.3
6	-0.06	1.9	-0.04	1.2
7	-0.02	0.9	-0.05	1.7
8	-0.05	1.7	-0.1	3.2

Note: The greyed-out cell indicates that the group has exceeded pre-COVID achievement levels.

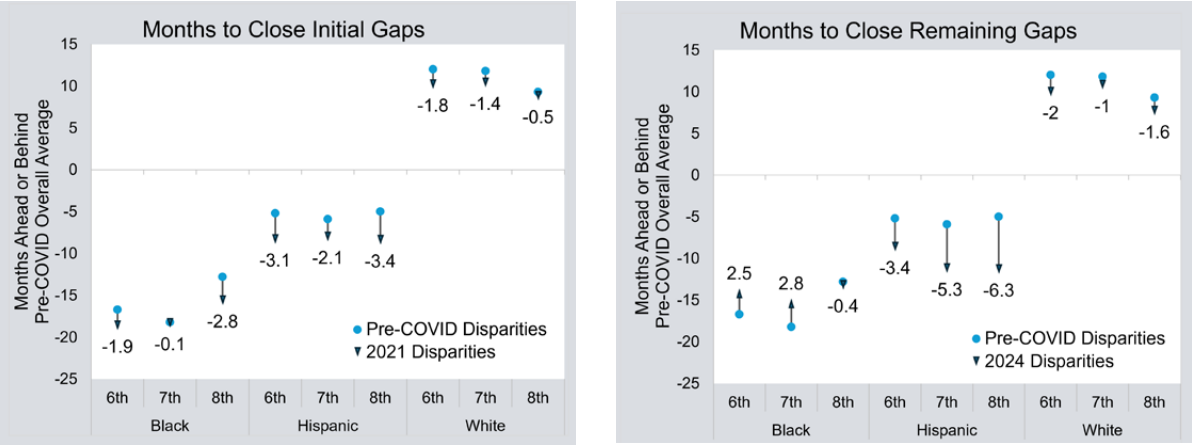
Table 1 makes clear that grade 3–5 students in 2024 are achieving at levels close to that of their peers in 2019, with fourth-graders ahead and third- and fifth-graders fewer than two weeks behind their 2019 peers. Sixth-graders, however, remain more than a month behind in 2024. Although an achievement gap of 0.04 for sixth-graders is similar in magnitude to an achievement gap of 0.03 for third-graders, sixth-graders in 2024 require triple the time to catch up because of differences in expected annual growth.

Preexisting racial/ethnic disparities remain stark and in some cases have widened due to uneven recovery, particularly for middle school students

Finally, we explore whether there are differences in recovery patterns across racial and ethnic groups in science.[3] Although we identified large preexisting differences between racial/ethnic groups in elementary students prior to the pandemic, we see only modest differences in impact from COVID by 2021; by 2024, elementary student racial/ethnic achievement gaps and achievement levels were largely unchanged from their 2019 levels. See the technical appendix for more details.

In contrast, initial impact and recovery are more uneven across racial/ethnic groups for middle schoolers. Figure 2 captures group achievement levels in terms of months ahead or months to catch up to the overall mean of 2019 peers. This figure shows preexisting group disparities from the overall prepandemic mean (the location of the base of the arrow), and more recent disparities from the prepandemic mean (the location of the tip of the arrow). The length of the arrows shows the months of instruction required to close initial achievement gaps (spring 2021, left panel) and remaining achievement gaps (spring 2024, right panel). For instance, in 2021, it would have taken 2.8 months of instruction to close the gap between Black eighth-graders' achievement levels in 2021 compared to 2019. By 2024, this gap has shrunk, now requiring 0.4 months of instruction to bridge the gap. However, even though that gap has narrowed considerably, it would require over 13 months of instruction to address preexisting disparities for Black eighth-graders and raise achievement levels to equal overall prepandemic averages.

Figure 2. Months of instruction required to close initial and remaining achievement gaps by race/ethnicity for middle school students.



The left panel of Figure 2 shows that all groups of middle school students suffered initial losses, but the magnitude of the losses differed slightly by group. Achievement gaps from 2019 to 2021 were larger for Hispanic students (2.1 to 3.4 months) than for White students (0.5 to 1.8 months) and Black students (0.1 to 2.8 months).

The right panel of Figure 2 shows that remaining achievement gaps are more uneven. Black middle school students in 2024 have largely rebounded from initial losses. This "rebound," however, means that by 2024, average achievement for Black students has returned to or slightly exceeds 2019 levels—levels that were well below the overall student mean in 2019. Remaining differences for White sixth- and seventh-grade students are relatively unchanged from their initial declines but have widened for White eighth-graders. The most

3 We focus racial/ethnic group analyses on comparisons among White, Black, and Latinx/Hispanic students because we have sufficient sample sizes to allow for meaningful comparisons.

notable increase in achievement gaps, however, is evident for Hispanic students. Achievement gaps have continued to widen for all Hispanic middle school students, with the amount of additional instruction required to catch up increasing markedly between 2021 and 2024 for Hispanic seventh and eighth-graders. As a result, the disparities in science achievement between Hispanic and White students are wider in 2024 than they were in 2019 or 2021.

Framing

We recognize that focusing on differences across racial and ethnic groups can have negative implications, as it can perpetuate a deficit-oriented perspective that blames students and fails to recognize academic strengths, which may not be accurately reflected in standardized metrics. At the same time, it is crucial to disaggregate outcomes by race and ethnicity to shine light on the profound inequities existing within our education system. Those inequities were stark before the pandemic and remain deeply problematic in 2024.

In this context, we share data on how harm affected students from different racial/ethnic groups during the pandemic, not to assign blame but to highlight the students to whom we owe, as Gloria Ladson-Billings (2006) coined, the greatest "educational debt." These data underscore the scope of the resources and supports schools must provide to address the cumulative impacts of the pandemic and rectify the harm these students have experienced.

Conclusions

We found learning losses across grades 3–8 early in the pandemic, and uneven recovery by 2024, with the largest remaining achievement gaps in middle school. Uneven recovery has ossified preexisting racial/ethnic gaps and, in some cases, widened them.

Science learning losses are smaller than losses in reading and math. To contextualize losses in science, we compared months of additional learning required to catch up across reading, math, and science. Lewis and Kuhfeld (2024) found larger achievement gaps across all grades in reading and math, with up to 9.0 months lost in reading, and up to 9.3 months lost in math. By comparison, the average achievement gaps for science are modest (up to 3.2 months lost in science).

But the modest averages, particularly in middle school, belie the serious needs of Black and Hispanic middle school students in science. Hispanic eighth-grade students were five months behind in 2021 and fell to a total of more than 11 months behind by 2024. Black middle school students rebounded by 2024 to pre-COVID achievement levels but remain 13 to 15 months behind.

It is unclear why learning losses in science were smaller than those in reading and math. We speculate that it may reflect the reduced attention science receives in elementary school relative to math and reading, even in the best of times. A 2018 national survey found that science received an average of 27 minutes of instructional time per day—far less than reading (82 minutes) or math (63 minutes). In the event of school closures, a loss of 27 minutes of science instructional time per day might have smaller effects than a loss of 82 minutes per day in reading, for example.

Notably, the achievement gaps for seventh- and eighth-grade students in reading and math are meaningfully larger than the gaps for elementary students. This finding parallels the result for science achievement gaps, with larger gaps emerging for older students.

Older students show greater lingering impacts on science achievement than younger students. Why might the pandemic's impacts be lingering more so for older students? We consider it relevant that seventh- and eighth-grade students in 2023–24 were in fourth and fifth grade during the 2020–21 school year. Elementary school science tends to be emphasized only in upper elementary grades, with 30 states testing elementary students in science exclusively in fifth grade and another 17 testing elementary students exclusively in fourth grade (Achieve, 2018). Because schools tend to focus instruction on science only when it is part of accountability calculations (Judson, 2013), science instruction often receives the greatest focus in fourth or fifth grade.

Students in the 2020–21 school year experienced the greatest disruption from school closures. We speculate that schools further de-emphasized science that year or were simply unable to teach it virtually. If so, many 2020–21 fourth- and fifth-graders may not have received even the limited science instruction that often takes place in elementary school. A loss of science instruction in fourth and fifth grades may be the source of lasting impacts as seen in the achievement scores of seventh- and eighth-graders from the 2023–24 school year.

Achievement scores for seventh- and eighth-graders in 2024 are concerning, with eighth-grade results most alarming. As the eighth-grade class of 2024 begins high school, they begin as the least prepared class in science since spring 2019. In two short years, this group will be taking college entrance exams. In four years, they will be starting college. If they are to be successful in either, they will require an accelerated pace of instruction to make up for pandemic-era losses in science. The need exists for eighth-grade students from all racial/ethnic groups, with the greatest need among Black and Hispanic students.

Recommendations

Integration of subjects could have important benefits. Schools have options to help the students catch up in science. Given concomitant and enduring losses in reading and mathematics (Lewis & Kuhfeld, 2024), schools might consider integrating science instruction with reading, mathematics, or both. Research has demonstrated the positive impact of integration of science with other disciplines on enhanced mathematics, literacy, and science outcomes. That is, addressing science by integrating science instruction with math and reading could accelerate student achievement in all three subjects beyond what addressing any subject in isolation (such as math or reading) might yield.

Summer programming can help students catch up. Another option is for districts to provide summer school opportunities in Summer 2025, and Summer 2026, supporting students in mastering science concepts they missed during COVID closures. Davison and colleagues (2024) have summarized how summer school can be designed to best support enhanced student learning, not only in mathematics and reading, but also science.

An added benefit of engaging and motivating science summer school programs is the potential to improve attendance. One of the greatest barriers to recovery is that no intervention can help students bounce back if they never receive it due to being chronically absent. An analysis of 2022–23 school year data suggests that while there has been improvement in most states, chronic absenteeism is still 75% higher than prepandemic levels. Even the best interventions will not matter if students never receive them. Engaging students in meaningful science activities in the summer can help them catch up and help them maximize their science learning opportunities in subsequent school years by improving attendance.

ESSER funds to support enhanced instruction in the wake of COVID are ending. Yet science achievement for the eighth-grade class of 2024 remains well below that of their 2019 peers. Science achievement remains a national priority. It is urgent that schools take steps to mitigate the continued negative impacts of COVID on science achievement. We recognize that schools have limited resources—both in terms of time and finances—to address multiple needs of students resulting from COVID-related school closures. We hold that schools should not have to choose between addressing gaps in science, reading, and math.

ABOUT THE AUTHORS

Dr. Susan M. Kowalski is a lead research scientist at NWEA who uses quantitative and descriptive approaches to understand how state and district educational policy decisions influence science instruction in the US. Her research includes a wide range of topics, from science curriculum and professional development research to meta-analysis. Susan's work has been published in the *Journal of Research on Educational Effectiveness*, the *American Educational Research Journal*, the *Journal of Research in Science Teaching*, and *Science Education*. Before NWEA, Susan was a senior research scientist and director of research at BSCS Science Learning. She also spent several years teaching high school physics and physical science in Bloomington, MN. She completed her PhD in curriculum & instruction at the University of Minnesota.

Dr. Scott J. Peters is the director of research consulting partnerships at NWEA and specializes in educational assessment and data use, gifted and talented student identification, equity within advanced educational opportunities, and effectiveness of educational policy. His research focuses on how schools can leverage assessment data for maximum school and student benefit. His ongoing projects relate to balancing cost, sensitivity, and equity in gifted and talented student identification; how to proactively screen students for advanced learning opportunities; examining growth trajectories for advanced learners; and how to ensure all students have access to advanced learning opportunities.

Prior to coming to NWEA, for 13 years, Dr. Peters served as a professor of assessment and research methodology at the University of Wisconsin—Whitewater. His scholarly work has appeared in the *Australian Educational Researcher*, *AERA Open*, *Teaching for High Potential*, the *British Journal of Educational Psychology*, *Exceptional Children*, *Gifted Child Quarterly*, and many other publications. He received his PhD from Purdue University in educational psychology and applied research methodology.

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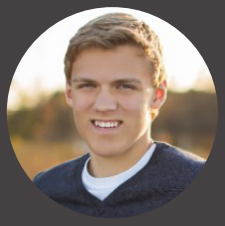

Gustave (Gus) Robinson is a data analyst for NWEA's Research and Policy Partnerships team. His research draws on NWEA's national data sets to answer questions about students' access to high-quality K-12 curricular offerings and the impact of inequitable school-based learning opportunities on student growth and achievement. Prior to joining NWEA, Gus completed a bachelor's degree in quantitative economics and international relations at Tufts University.

Dr. Karyn Lewis is vice president of research and policy partnerships at NWEA, where she leads a team of researchers who operate at the intersection of K–12 education research, practice, and policy. Her research interests focus on the interplay between students' academic achievement and growth, their social-emotional development and well-being, and how they experience their school's climate. Prior to joining NWEA, she was a senior researcher at Education Northwest/REL Northwest, where she led a diverse portfolio of applied research, technical assistance, and evaluation projects centered around social-emotional learning. Dr. Lewis is a former data fellow with the Strategic Data Project at the Harvard Center for Education Policy Research. She completed a National Science Foundation funded postdoctoral fellowship at the University of Colorado Boulder and earned a PhD from the University of Oregon in social psychology.

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For more than 40 years, NWEA has been a pioneer in educational research and assessment methodology with a focus on improving learning outcomes for every student. NWEA continues this discovery through dedicated research that explores foundational issues in education, practical challenges in today's schools, and the evolving role of technology in the lives of students. As a mission-based educational research organization, NWEA's research agenda reflects our commitment to attacking big challenges in education and measurement and empowering education stakeholders with actionable insights.

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