Learning during COVID-19:

Initial findings on students' reading and math achievement and growth

November 2020

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KEY FINDINGS

- **In fall of 2020, students in grades 3–8 performed similarly in reading to same-grade students in fall 2019, but about 5 to 10 percentile points lower in math.**

- **In almost all grades, most students made some learning gains in both reading and math since the COVID-19 pandemic started. However, gains in math were lower on average in fall 2020 than prior years, resulting in more students falling behind relative to their prior standing.**

- **This fall, students scored better than NWEA's projections in reading, while math scores were in line with our projections for grades 4–6 and slightly above our projections in grades 7–8.**

- **Some differences by racial/ethnic groups are emerging in the fall 2020 data, but it is too early to draw definitive conclusions from these initial results. Student groups especially vulnerable to the impacts of the pandemic were more likely to be missing from our data. Thus, we have an incomplete understanding of how achievement this fall may differ across student groups and may be underestimating the impacts of COVID-19.**

The COVID-19 pandemic has disrupted traditional forms of education and continues to create challenges for K–12 school systems in the United States and the students they serve. The public health, education, and economic damages inflicted by COVID-19 are likely to exacerbate long-standing inequities disproportionately affecting Black, Latinx, and Native American students, as well as English learners and students with disabilities.[i] Beyond educating our children, schools also play important roles in providing essential services across many communities, such as after-school programs, pre-K offerings, counseling, and meal programs. Districts attempted to transition academic and non-academic activities to remote settings last spring, and many continue to do so through the fall of 2020, with varying degrees of success.[ii]

Policymakers and educational leaders have the unenviable responsibility of making difficult decisions well into the 2020–21 school year and beyond. Now, more than ever, we need data to inform evidence-based policies to support our students, teachers, and families on the path to recovery. In April 2020, NWEA released a set of projections of the potential academic impact of COVID-19 disruptions modeled on well-documented summer learning loss estimates.[iii] With actual fall data in hand, we present the latest national research, informed by several guiding questions that explored how school shutdowns impacted student achievement at the start of the 2020–21 school year. This paper is the first in an ongoing series of related work, and its purpose is to share some initial key findings and highlight actionable takeaways based on these analyses.

Using data from nearly 4.4 million students[1] in grades 3–8 who took MAP® Growth™ assessments in fall 2020, we examined three primary research questions:

1. How did students perform this fall relative to a typical school year (specifically, fall 2019)?

2. How has student growth changed since schools physically closed in March 2020?

3. How did observed fall 2020 achievement compare to NWEA's projected scenarios?[v]

Remote testing

In fall 2020, MAP Growth assessments were administered both remotely and in person. There have been concerns raised around the quality of the data from remotely administered assessments due to things like increased distractions, unfamiliar virtual meeting software, and potential connectivity challenges, among others. Our supplemental comparability analysis examined the psychometric characteristics of MAP Growth tests that were administered remotely and those administered in person in fall 2020. We also explored whether students who tested remotely in fall 2020 showed more substantial changes in test effort and performance between the 2019–20 school year and fall 2020 than students who tested in person in fall 2020. Our results suggest that the remote testing experience is consistent with in person testing for students in grades 3–8, but may qualitatively differ for the youngest students. Please see our comparability analysis[vi] for more information.

Compared to fall 2019, student achievement this fall was similar in reading, on average, but 5 to 10 percentile points lower in math

One way to examine how students in US schools have weathered the disruptions of COVID-19 is to compare the assessment scores of students in a given grade in fall of this year to those in a previous, more typical year. We examined how students in grades 3–8 scored in fall 2019 compared to students in the same grades in fall 2020. The results showed that students this fall had similar test score percentiles in reading relative to last fall. However, MAP Growth percentile scores for math were considerably lower, between 5 and 10 percentile points, on average, for children this year as compared to same-grade children last year, as seen in Figure 1. The red bars in Figure 1 show the median achievement percentile (based on the NWEA 2020 MAP Growth norms[vii]) in math in fall 2019 within each grade, while the blue bars show the median percentile for students in the corresponding grade in fall 2020. While the median percentiles in reading this fall were similar to those of students in the same grades last fall prior to COVID-19 disruptions, there was initial evidence of small declines in reading for some groups of students. Those declines were concentrated disproportionately among Hispanic[2] and Black students in the upper elementary grades (see the technical appendix[iv] for additional analyses).

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[1] We used two different analytic samples in this study. To answer the first research question around within-grade comparisons between fall 2019 and fall 2020, we limited our sample of schools to a consistent set of US public schools that tested at least 10 students in a given grade in both fall 2019 and fall 2020. The sample restriction attempted to reduce the degree to which changes in the NWEA partner base may be driving the results we observed. For our second and third research questions, we used a set of intact longitudinal cohorts of students that were followed across fall 2019, winter 2020, and fall 2020. Specifically, we followed a cohort of students from grade 3 in 2019–20 to grade 4 in fall 2020, a separate cohort from grade 4 in 2019–20 to grade 5 in fall 2020, and so on. To be included in this sample, students were required to have an observed test score in each of the three time points mentioned above. As a reference distribution for estimating "typical" growth during a pre-COVID-19 period, we relied on the prior cohorts of students who tested in winter 2019 and fall 2019 within each grade pair (for example, grades 3–4, grades 4–5, etc.). Please see our technical appendix[iv] for more details about the analytic samples.

[2] Our use of Hispanic (vs. Latinx or other terms) is consistent with the terminology used at the time of data collection to maintain the accuracy of the data reported by schools and districts.
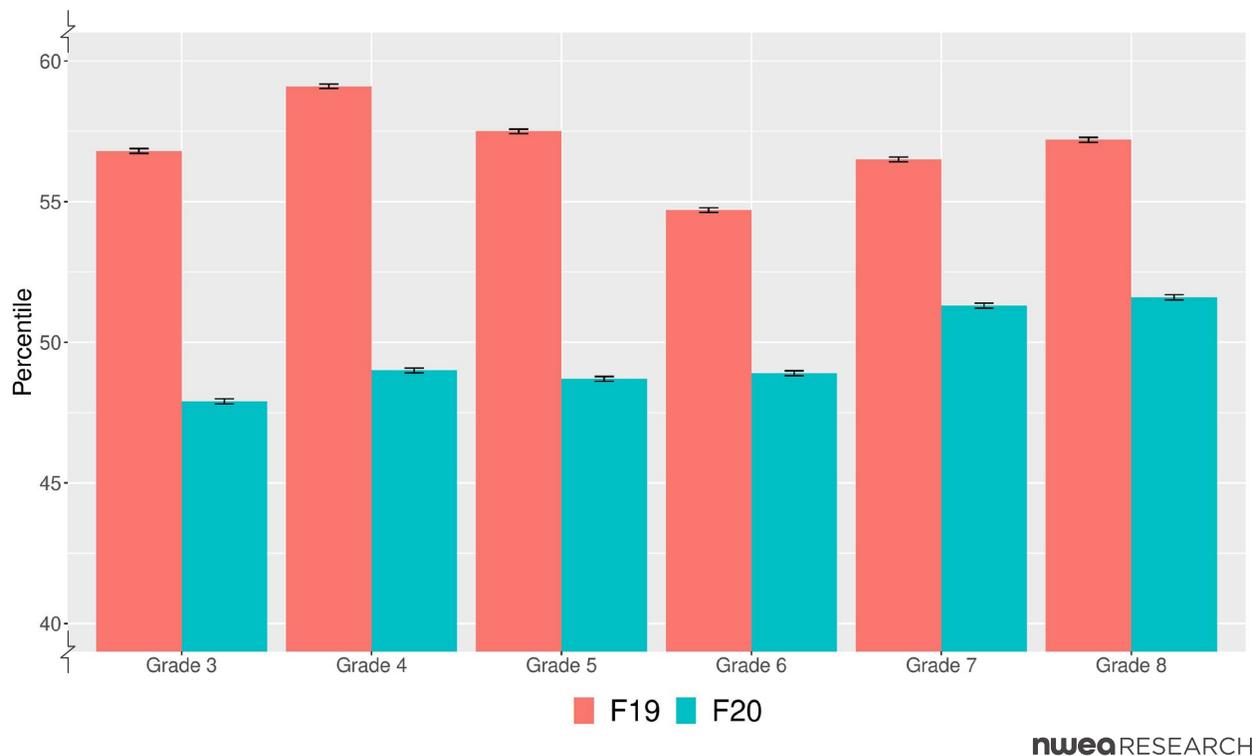
Figure 1: MAP Growth achievement percentiles in math by grade level in fall 2019 and fall 2020

Most students showed growth in both reading and math achievement since the onset of COVID-19 disruptions, but growth in math was lower than in a typical year

In addition to asking how the performance of students in our fall 2020 sample compared to students last year, educators may wish to better understand what the data show about student growth since the COVID-19 pandemic started. We examined the group of students who tested in winter 2020 (pre-COVID-19) and then again in fall 2020 to see if they made academic gains between the time schools were physically shut down and early fall 2020. As a reference point, we compared these growth patterns in 2020 to the growth observed in the same grades during the prior year (winter 2019 to fall 2019).

Focusing on within-student growth from winter 2020 to fall 2020, we saw that on average, students showed growth in both math and reading across grade levels, except for math in grades 5 and 6. In almost all grades, most students made some learning gains in both reading and math since the COVID-19 pandemic started, though gains were smaller in math in 2020 relative to the gains students in the same grades made in the winter 2019–fall 2019 period.

Figure 2 shows the distribution of change for students in different grade levels for the winter 2020 to fall 2020 period in reading (blue) as compared to same-grade students in the pre-pandemic span of winter 2019 to fall 2019 (red). For reading, the 2019 and 2020 distributions largely overlapped, suggesting similar amounts of within-student change from one grade to the next.

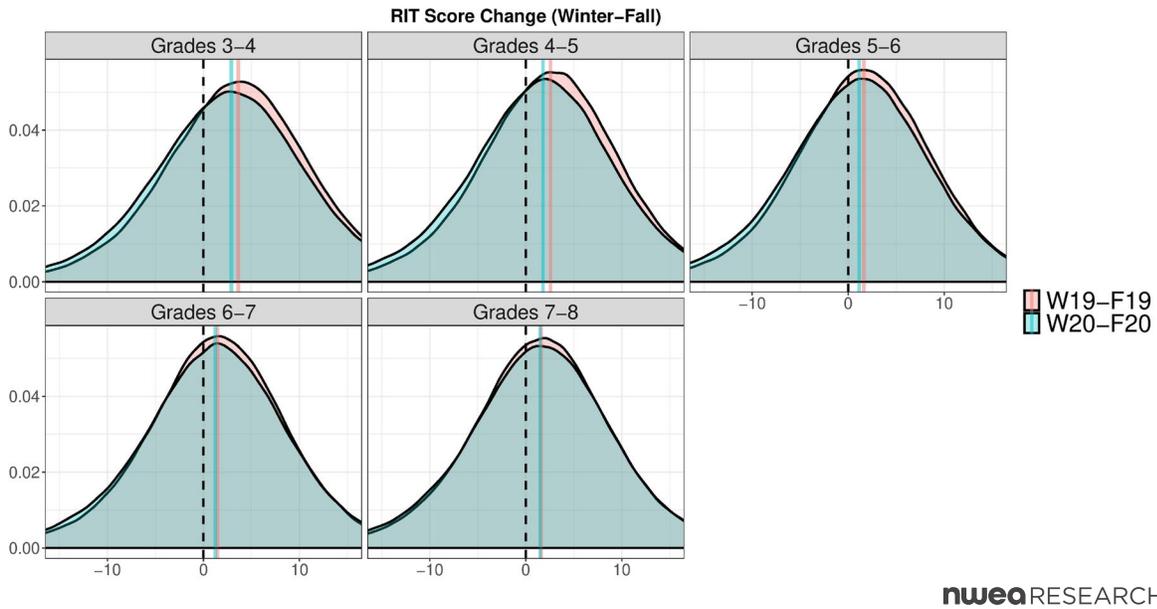**RIT Score Change (Winter–Fall)**

Figure 2: Distribution of within-student change from winter 2019–fall 2019 vs. winter 2020–fall 2020 in reading. Note: The vertical red and blue lines display the median growth estimate for winter 2019–fall 2019 and winter 2020– fall 2020 respectively. The black dashed line represents zero growth (e.g., winter and fall test scores were equivalent).

In contrast, Figure 3 shows the distribution of change for students in different grade levels for the winter 2020 to fall 2020 period in math. The results showed a downward shift: a smaller proportion of students showed positive math growth in the 2020 period than in the 2019 period for all grades.
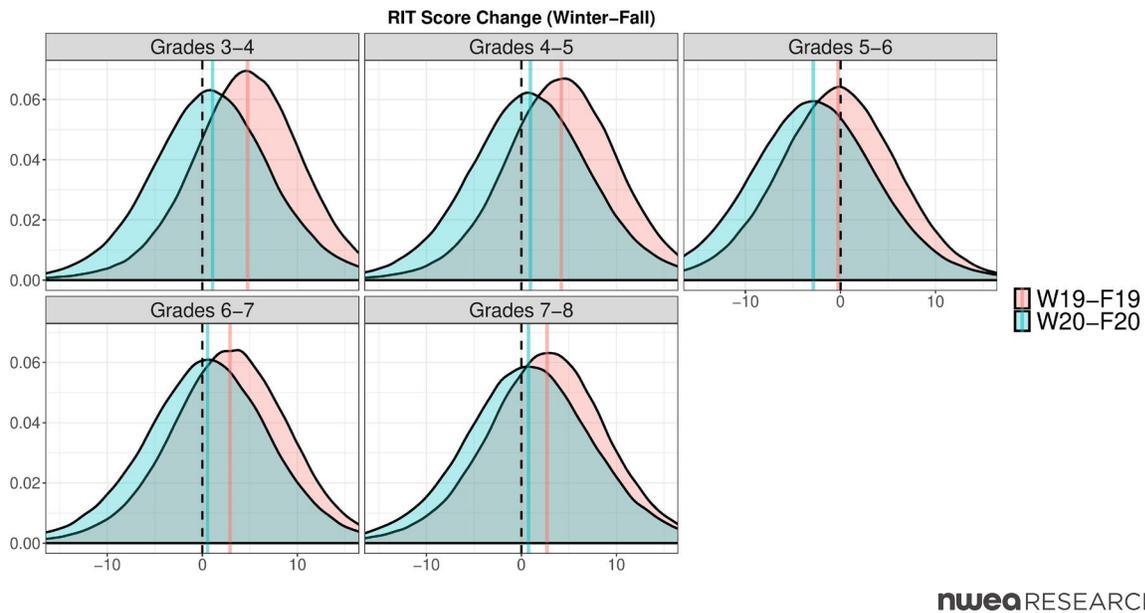
RIT Score Change (Winter–Fall)

Figure 3: Distribution of within-student change from winter 2019–fall 2019 vs. winter 2020–fall 2020 in math. Note: The vertical red and blue lines display the median growth estimate for winter 2019–fall 2019 and winter 2020– fall 2020 respectively. The black dashed line represents zero growth (e.g., winter and fall test scores were equivalent).

Another way to examine differences in growth patterns is to look at how achievement levels changed for individual students in the sample. In other words, is there evidence that students were losing ground and shifting downward in their relative position in the test score distribution over time? To explore this question, we grouped student test scores in fall 2019 and fall 2020 into achievement quintile bins (1st–20th percentile, 21st–40th percentile, etc.) based on the NWEA 2020 norms,[vii] and then examined the stability of students' relative position within quintile bins across terms. Figures 4 and 5 show the total percentage of students within each grade who moved up one quintile or more ("Gainers," green), stayed in the same achievement quintile from one school year to the next ("Maintainers," blue), or moved down one quintile or more ("Sliders," red). In reading (Figure 4), the percentage of students who were Gainers, Maintainers, or Sliders was similar in 2019 and 2020. In contrast, nearly twice as many students moved down a quintile in math this year as compared to the previous year, as shown in Figure 5.
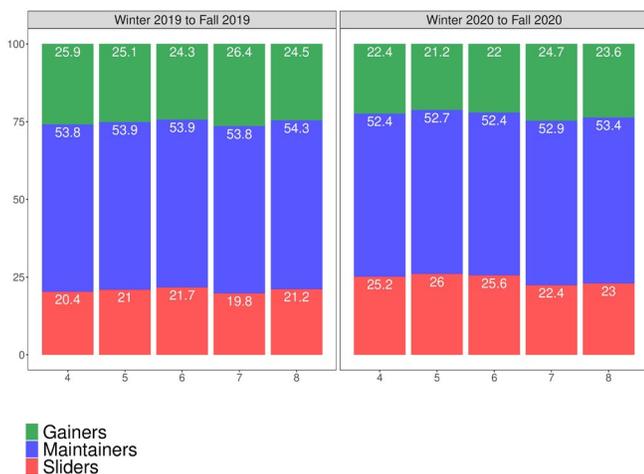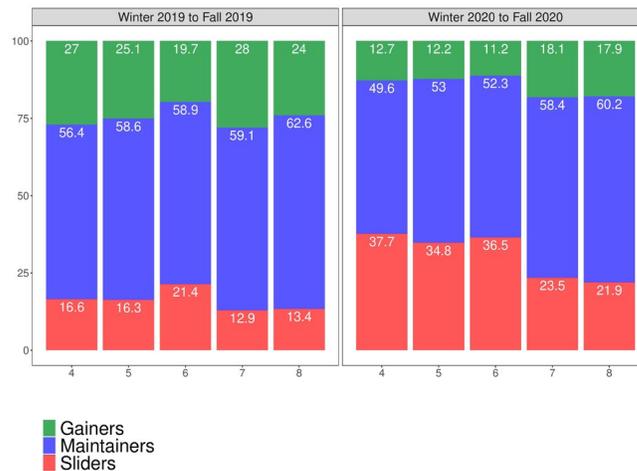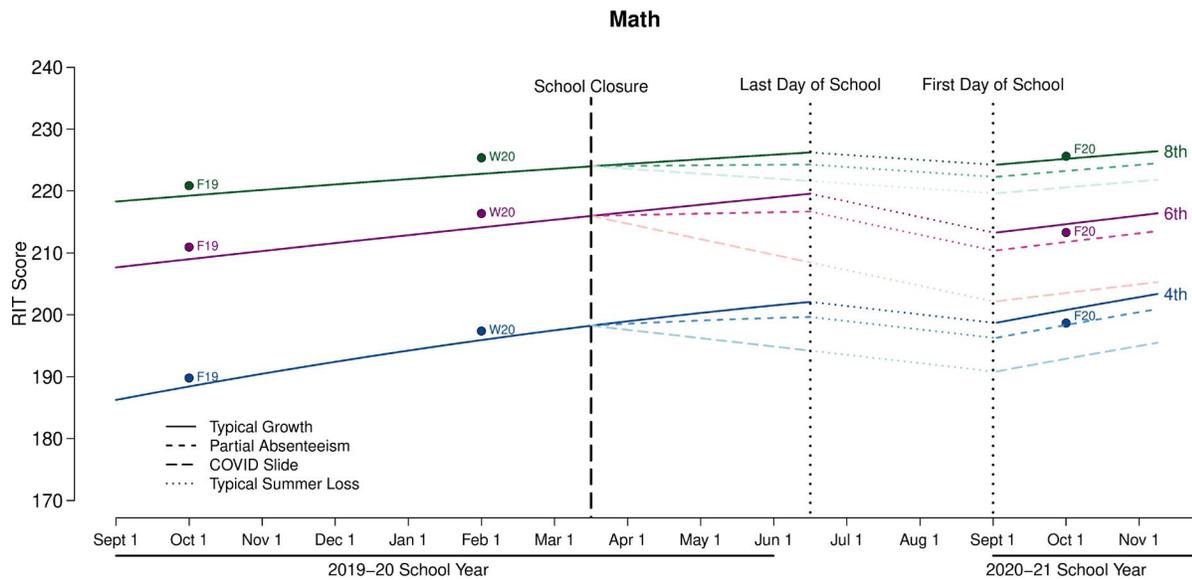
Figure 5: Percentage of students who shifted their relative position in the math test percentile distribution comparing winter 2019–fall 2019 vs. winter 2020–fall 2020

Compared to our prior projections, on average, students scored better than expected in reading; in math, student achievement in fall 2020 was in line with projections for grades 4–6 and slightly above in grades 7–8

In spring 2020, NWEA released a set of projections of potential academic impacts students might experience as a result of COVID-19 school closures in spring 2020.[iii] The projections were informed by prior NWEA research on summer learning loss, and were expanded to include a variety of scenarios to project potential academic impacts, including research external to NWEA on the effects of student absenteeism.[vi] Figure 6 shows average math test scores from fall 2019, winter 2020, and fall 2020 overlaid on three COVID-19 learning projections: typical learning (where students would be expected to be in a normal school year), partial absenteeism[vi] (assuming students received half of their normal instruction in the spring), and COVID-19 slide (where the spring school closures were assumed to operate like a typical summer break from school). Observed fall 2020 data indicated that students fell between the partial absenteeism and typical learning projections, on average, in math, while reading test scores (not shown) were aligned with typical learning projections.

Figure 4: Percentage of students shifting their relative position in the reading test percentile distribution comparing winter 2019–fall 2019 vs. winter 2020–fall 2020

Math

Figure 6: NWEA COVID-19 learning projections with observed fall 2019, winter 2020, and fall 2020 average RIT scores overlaid. Note: The projected lines were estimated based on student data collected in the 2017–18 and 2018–19 school years. The observed points (RIT score averages from the testing windows with the most observed data) reflect data from our study sample collected during 2019–20 and 2020–21, which was higher performing than average relative to the overall NWEA sample. More information about each projected scenario is available in our recent paper.[v]

Missingness matters: The lack of data on our most vulnerable students warrants caution

-Angela Johnson and Megan Kuhfeld

As educators work hard to support students in this challenging time, student achievement data are critical to needs assessment and instructional planning. Teachers need to know their students' academic skills to tailor instruction, and policymakers need data to plan programs and interventions to catch up the students who have fallen behind. However, fall 2020 assessment results, administered in person or remotely, may not be capturing a significant portion of the student population. Many schools are not administering assessments at all due to technological and other challenges. Within schools that are testing, individual students are absent from school and/or opting out of testing for economic, health, technological, or other reasons unknown to educators and researchers.

Missing assessment data can lead to erroneous conclusions and decisions when students who are not assessed are systematically different from students who are assessed. COVID-19 learning losses and achievement gaps estimated from the data with such missingness will not reflect the larger student population. The most concerning scenario is that students not testing in fall 2020 are disproportionately from disadvantaged backgrounds. Not accounting for these students would produce underestimated learning loss and achievement gaps, potentially resulting in under-provision of support and services to the neediest students. Our supplemental attrition study[viii] used MAP Growth assessment data of nearly 5.2 million students who attended any grade between kindergarten and seventh grade in fall 2019 to examine the patterns of missing data in fall 2020.

More specifically, we examined:

- In all schools that tested in 2019–20, what were the characteristics of students who were tested in 2019–20 but not in fall 2020 (students who attrited)?

- In schools that tested in both 2019–20 and fall 2020, what were the characteristics of students who attrited?

The first question looked at overall attrition from testing, whether by school or individual student. This tells us how the fall 2020 assessment student sample might have differed from the fall 2019 sample. The second question removes the school selection component by considering only schools that tested students in both fall 2019 and fall 2020, thus focusing on student attrition within the same set of schools.

Across subjects and grades, the same pattern was observed: a larger fraction of attriters were ethnic/racial minority students, students with lower achievement in fall 2019, and students in schools with higher concentrations of socioeconomically-disadvantaged students.

The findings from our attrition analyses suggest that considerable caution is warranted when interpreting fall 2020 assessment results. Students tested in fall 2020 had higher average baseline achievement and were demographically different (e.g., racially less diverse and attend higher socio-economic schools) from students who were not tested. Thus, a sizable population of the most vulnerable students were not assessed in fall 2020, and their achievement is not reflected in the data as a result. These systematic differences between attriters and students who tested mean that the impacts of COVID-19 on student achievement are likely underestimated.

Discussion

Together, these findings provide new information on how students in the United States are weathering the disruptions of the COVID-19 pandemic. While caution and care are needed in understanding what the data can tell us at this time, initial analyses comparing test results from fall 2020 to test results in fall 2019 suggest reasons for both optimism and concern—and a need for action.

In some ways, our findings show an optimistic picture: in reading, on average, the achievement percentiles of students this fall are similar to those of same-grade students last year, and in almost all grades, most students made some learning gains since the COVID-19 pandemic started. However, the results tell a less rosy story in math: student achievement was 5 to 10 percentile points lower than the pre-COVID-19 performance by same-grade students last fall, and students showed lower growth in math across grades 3 to 8 relative to peers in the previous, more typical year.

With gains in math being lower on average this year than prior years, more students are falling behind: nearly twice as many students dropped one or more quintiles on the test score distribution in fall 2020 compared to the prior fall. Lower reading scores for Hispanic and Black students in certain grades in our sample (see our technical appendix[iv]), combined with the underrepresentation of these groups in the fall 2020 data, highlight the importance of connecting to these students and families, to provide instruction and support, and to continue gathering data to understand how different groups may be coping with the ongoing pandemic differently.

Moreover, our attrition analyses suggest considerable caution is warranted when interpreting fall achievement patterns as systematic demographic differences in available assessment data suggest the impacts of COVID-19 on achievement for the most vulnerable students may be underestimated. Educational leaders should carefully consider this shift in the students tested as well as other contextual data as they make decisions on how to best support their students' growth and recovery. Future research will investigate various strategies for handling these patterns of missing data.

Analyses of assessment results cannot help us understand why students are not present in the fall 2020 testing data. However, two possibilities are that students may have opted out of testing because they lack reliable technology or because they have disengaged from school due to economic, health, or other factors. Either scenario presents an urgent call for intervention. Educators and policymakers should plan to provide ample support to students who have fallen behind and when in doubt, err on the side of more service and outreach. Interventions need to reach not only the students who are receiving instruction but also students who are not. More coordinated efforts are required to establish communication with students who are not attending school or disengaging from instruction to get them back on track. Thus, we echo Bellwether Education's[ix] concerns that there is not enough public recognition of the severity of challenges facing our most vulnerable students nor the ramifications of millions of students continuing to be disconnected from schools. Requiring schools, the public, and nonprofit service agencies to do more with less funding could do even more harm to our most marginalized students.

Finally, we are only scratching the surface in measuring the short-term and long-term academic and non-academic impacts of COVID-19. While more students are back in schools now and educators have more experience with remote instruction than when the pandemic forced schools to close their classrooms last spring, we are collectively experiencing ongoing changes and disruption. NWEA is pursuing a robust research program[3] to inform policies and practices enacted to mitigate these impacts that is explicitly focused on implications for equity, which helps move the nation forward in these difficult times.

CONSIDERATIONS & RECOMMENDATIONS

- Our findings show that the impacts of COVID-19 disruptions on student achievement were not the blanket declines many expected, but were instead uneven across subjects and across grade levels. This indicates a critical need for clear data to understand where students have fallen behind and to guide where additional resources and supports should be deployed to get them back on track. Schools will also need local data to determine if the trends we observed nationally are reflective of their students.

- School districts and states should collect and transparently report data on students' opportunity to learn (for example, attendance and completion of assignments) and academic achievement, and measure and report on their social and emotional well-being to inform our collective understanding of students' unmet needs. We can gain important insights by including data broken out to show any differences for students of color, English learners, students with disabilities, and students from low-income families, who are especially vulnerable due to a variety of barriers. As we work together to meet these new challenges in education, such crucial information allows educational leaders to best target resources to those most in need.

- Our findings of lower-than-average math gains suggest we should emphasize equitable access to high-quality math teaching and learning. For example, the National Council of Teachers of Mathematics encourages creative decisions about how students are organized for instruction (for example, to engage in mixed-level groupings both between and within classes), maintaining high expectations for learning, providing differentiated support for each student, and allowing students to move in and out of flexible interventions as needed.[4]

- The safe return to all classrooms and the additional educational and child welfare interventions needed for recovery all require additional funds. Federal and state government leaders must continue to provide funding as the pandemic will have lingering impacts on our children and school systems.

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[3] For more information about NWEA's research, please visit https://www.nwea.org/research/

[4] https://www.nctm.org/uploadedFiles/Research_and_Advocacy/NCTM_NCSM_Moving_Forward.pdf

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v.   Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impact of COVID-19 school closures on academic achievement. *Educational Researcher, 49(8)*, 549-565. https://doi.org/10.3102/0013189X20965918.

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vii. Thum, Y. M., & Kuhfeld, M. (2020). *NWEA 2020 MAP Growth Achievement Status and Growth Norms for Students and Schools.* NWEA Research Report. Portland, OR: NWEA.

viii. Johnson, A. & Kuhfeld, M. (2020). *Fall 2019 to fall 2020 MAP Growth attrition analysis.* NWEA. https://www.nwea.org/research/publication/fall-2019-to-fall-2020-map-growth-attrition-analysis/

ix.   Korman, H., O'Keefe, B., & Repka, M. (2020). *Missing in the margins: Estimating the scale of the COVID-19 attendance crisis.* Bellwether Education.

Details on the methodology behind these analyses can be found in:

Kuhfeld, M., Ruzek, E., Johnson, A., & Tarasawa, B., Lewis, K. (2020). *Technical appendix for: Learning during COVID-19: Initial findings on students' reading and math achievement and growth.* NWEA. https://www.nwea.org/research/publication/technical-appendix-for-learning-during-covid-19-initial-findings-on-students-reading-and-math-achievement-and-growth/

Suggested citation:

Kuhfeld, M., Tarasawa, B., Johnson, A., Ruzek, E., & Lewis, K. (2020). *Learning during COVID-19: Initial findings on students' reading and math achievement and growth.* NWEA.

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ABOUT NWEA

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 not-for-profit 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.

ABOUT THE
COLLABORATIVE FOR STUDENT GROWTH

The Collaborative for Student Growth at NWEA is devoted to transforming education research through advancements in assessment, growth measurement, and the availability of longitudinal data. The work of our researchers spans a range of educational measurement and policy issues including achievement gaps, assessment engagement, social-emotional learning, and innovations in how we measure student learning. Core to our mission is partnering with researchers from universities, think tanks, grant-funding agencies, and other stakeholders to expand the insights drawn from our student growth database—one of the most extensive in the world.

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