

The COVID-19 Pandemic and Student Achievement on Ohio's Third-Grade English Language Arts Assessment*

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I. Overview

The global COVID-19 pandemic has caused unprecedented disruptions in Ohio’s educational system. All elementary and secondary schools in the state closed for in-person learning on March 16, 2020, forcing both students and educators to adjust to new and unfamiliar modes of instruction, and some public school districts remained fully virtual this past fall. Children also have experienced new challenges outside of school that likely had a significant impact on their learning. Hundreds of thousands of Ohioans have become infected with the novel coronavirus and thousands have died. Many families have also faced financial hardships as unemployment reached record levels. This report draws on data from the fall administration of Ohio’s annual Third-Grade English Language Arts assessment to provide an initial look at how these events have affected student learning in the state.

In recent months, private testing companies used by some school districts have reported inconsistent findings based on district-administered diagnostic tests. Using national samples, some have found that student achievement at the beginning of the current academic year fell well below previous years, while others have suggested fairly minimal impacts—especially in reading and in higher grades.¹ Our analysis has several advantages when it comes to assessing the impact of COVID-related disruptions on student learning. First and foremost, our analysis employs Ohio data, providing better evidence for Ohio families, educators, and policymakers. Second, the achievement data we examine come from proctored state exams completed by students in person and on site, addressing growing concern that diagnostics taken at home may paint a distorted picture of where students currently stand.² Third, the state assessment covers a near-universe of Ohio third graders and can be linked to detailed administrative data, allowing us to examine COVID’s impact on various student groups and school districts, and to account for students who did not participate in state testing this past fall. Specifically, we use detailed information on all Ohio third graders—including their performance on second-grade reading diagnostic tests—to adjust estimates so that they account (at least partially) for the change in the characteristics of tested students between fall 2019 and fall 2020.³

Here are the main findings:

- Average achievement on the Ohio Third-Grade English Language Arts (ELA) assessment declined by approximately 0.23 standard deviations between fall 2019 and fall 2020. This is roughly equivalent to one-third of a year’s worth of learning. The proportion of students scoring at the

¹ Amplify, “Instructional Loss Due to COVID-19 Disruptions,” https://amplify.com/wp-content/uploads/2020/12/mCLASS_Flyer_CovidBrief-LearningLoss_v8.pdf; Curriculum Associates, “Understanding Student Needs: Early Results from Fall Assessments,” <https://www.curriculumassociates.com/-/media/mainsite/files/i-ready/iready-diagnostic-results-understanding-student-needs-paper-2020.pdf>; Megan Kuhfeld Beth Tarasaw, Angela Johnson, Erik Ruzek, and Karyn Lewis, “Learning During COVID-19: Initial Findings on Students’ Reading and Math Achievement and Growth,” NWEA, <https://www.nwea.org/research/publication/learning-during-covid-19-initial-findings-on-students-reading-and-math-achievement-and-growth/>.

² Kristen Huff, “National Data Quantifies Impact of COVID Learning Loss; Raises Questions About At-Home Testing,” Curriculum Associates, <https://www.curriculumassociates.com/-/media/mainsite/files/i-ready/ca-impact-of-covid-learning-loss-fall-2020.pdf>.

³ We cannot conclusively address this sample selection bias because there are likely factors we cannot observe that affect both student test participation and performance. We provide details of our statistical procedures in the methodological appendix at the end of this document.

“proficient” level fell by approximately 9 percentage points and the proportion of students scoring sufficiently high to satisfy previous requirements for promotion to fourth grade decreased by approximately 8 percentage points. (The state adjusted promotion requirements during the pandemic.⁴)

- Black students experienced test score declines that were nearly 50% larger than white students—for a total decline of approximately one-half of a year’s worth of learning. The scores of economically disadvantaged students also fell more than scores of students not identified as such.
- Although most Ohio school districts experienced declines in third-grade test scores, there was considerable variation in test score changes across the state. For example, over 10 percent of districts (over 60 districts) experienced no test score declines during the pandemic.
- A substantial portion of these student achievement impacts are tied to how significantly COVID affected unemployment, with larger test score declines in areas that experienced the sharpest job losses. It appears that COVID-related unemployment explains approximately one-third of the decrease in average test scores statewide.
- Achievement declines were more pronounced among districts that began this academic year using fully remote instruction compared to districts using either hybrid instruction or in-person instruction. These differences in test score changes across modes of instruction remain even if we account for the severity of COVID-related economic and health shocks.

We caution that the analysis examines student achievement in just one grade and one subject, so the full cycle of state exams this spring will provide a much more complete picture of how the COVID pandemic has affected student learning in Ohio. Nevertheless, the data reveal both large negative impacts on average, as well as substantial variation in those impacts among student subgroups and school districts.

The remainder of this report describes the specific empirical questions posed by the Ohio Department of Education (ODE) and the corresponding answers the analysis provides. Readers should note that the figures and statistics presented below may not be comparable to other publicly available data or information reported on official state report cards because the analysis does not incorporate the full set of business rules used to determine which students are exempt from testing requirements, whose test scores are included for accountability purposes, and how individual students are linked to school buildings and districts.⁵

⁴ According to ODE, “In 2020-2021, no district, community school, STEM school or chartered nonpublic school shall retain a student in the third grade who does not meet the promotion score of 683 on the Ohio’s Third-Grade English Language Arts assessment if the student’s principal and reading teacher agree that other evaluations of the student’s skills in reading demonstrate the student is academically prepared to be promoted to the fourth grade.” Legislation pending at the time of this report seeks to make additional changes to these requirements.

⁵ The imputation procedure we used to account for missing test scores is another reason why the numbers in this report will not always exactly match other data sources.

II. Full Results

This section reviews the results. We order the presentation of findings according to the questions that the Ohio Department of Education (ODE) posed (*italicized and in bold*). After presenting answers to these questions in bullet form, we present figures that summarize what we consider to be central take-home points as well as tables that include a fuller set of results. The methodology we used for the raw calculations and to generate statistical estimates that adjust for test participation appear in the methodological appendix (section III).

1. How have participation rates and student test scores on the third-grade English language arts test changed between fall 2019 and fall 2020?

2. How have the proficiency percentages on the third-grade English language arts test changed between fall 2019 and fall 2020?

3 & 4. How have the Third Grade Reading Guarantee promotion score percentages changed between fall 2019 and fall 2020?

Summary of results:

- Student participation rates for the fall administration of the Third-Grade ELA assessment declined by approximately 14 percentage points between fall 2019 and fall 2020, from approximately 95 percent to approximately 81 percent.⁶
- Student achievement on the fall administration of the Third-Grade ELA assessment declined by approximately 0.23 standard deviations. Nationally, average year-to-year student achievement gains in reading between second and third grade are approximately 0.6 standard deviations.⁷ Thus, the decline of 0.23 standard deviations is roughly equivalent to one-third of a year's worth of learning.
- The decline in scaled scores corresponds to a decline in the proficiency rate of approximately 9 percentage points, and a decline of 8 percentage points in the proportion of students obtaining a score previously required for promotion. (The state adjusted promotion requirements during the pandemic.⁸)

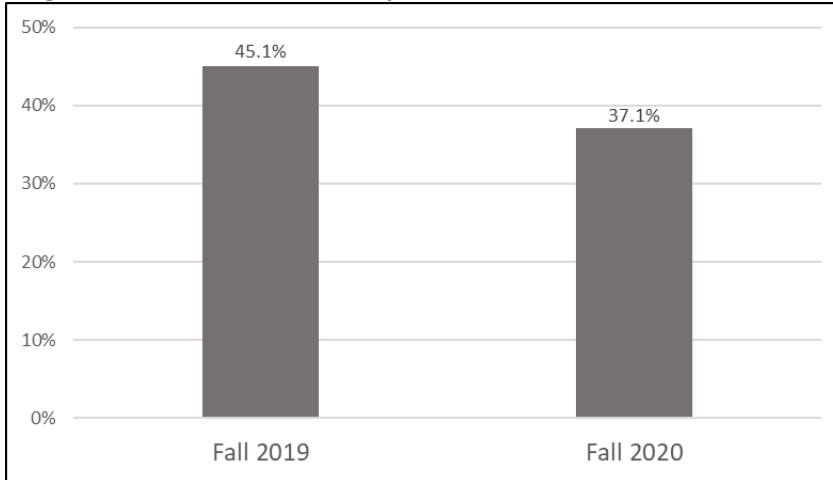
⁶ We calculated participation rates using fall third-grade enrollments as a baseline and do not exclude students with disabilities who are not required to take the third-grade test. The participation rate goes down by approximately 11 percentage points (instead of 14) if we remove four districts with participation rates close to zero (Athens City, Warrensville Heights City, Middletown City, and Cleveland Municipal). The achievement results we present in this report are not sensitive to the inclusion of these districts in the analysis.

⁷ See Bloom, H. S., Hill, C. J., Black, A. B., & Lipsey, M. W. (2008). "Performance trajectories and performance gaps as achievement effect-size benchmarks for educational interventions." *Journal of Research on Educational Effectiveness*, 1(4), 289–328.

⁸ According to ODE, "In 2020-2021, no district, community school, STEM school or chartered nonpublic school shall retain a student in the third grade who does not meet the promotion score of 683 on the Ohio's Third-Grade

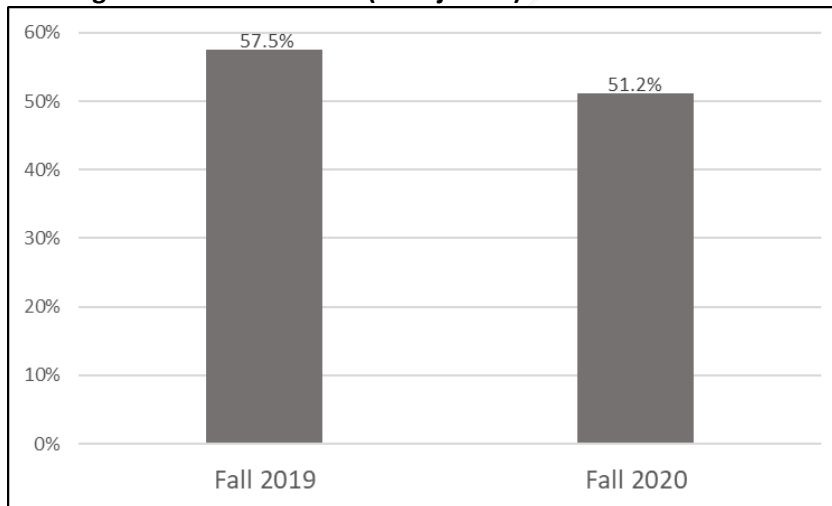
Figures:

Figure 1. Percent of students above the “proficient” threshold on the 3rd grade ELA assessment (unadjusted).



Note: The figure presents the raw, unadjusted percentage of students deemed “proficient” based on the fall administration of Ohio’s Third-Grade English Language Arts (ELA) assessment. Specifically, it indicates the percent of third grade students who took the exam and who received a scaled score of 700 or above.

Figure 2. Percent of students above the “promotion” threshold on the 3rd grade ELA assessment (unadjusted).



Note: The figure presents the raw, unadjusted percentage of students earning the minimum score necessary for promotion to the fourth grade based on the fall administration of Ohio’s Third-Grade English Language Arts (ELA) assessment. Specifically, it indicates the percent of third grade students who took the exam and who received a scaled score of 683 or above—the score students needed for promotion to the fourth grade prior to the pandemic.

English Language Arts assessment if the student’s principal and reading teacher agree that other evaluations of the student’s skills in reading demonstrate the student is academically prepared to be promoted to the fourth grade.” Legislation pending at the time of this report seeks to make additional changes to these requirements.

Tables with complete results:

Table 1. Test participation using fall attendance files as baseline

	Fall 2019		Fall 2020	
	Percent	Count	Percent	Count
Valid test score	95.06	118,655	80.90	100,890
No valid test score	4.94	6,161	19.10	23,820
Total	100.00	124,816	100.00	124,710

Note: We calculated participation rates using fall third-grade enrollments as a baseline and do not exclude students with disabilities who are not required to take the third-grade test. Thus, although changes in participation rates between 2019 and 2020 should be accurate, participation rates for each year are lower than official participation rates that districts might report.

Table 2. Differences in participation rates and test scores, fall 2019 to fall 2020

	Participation Rate	Scaled Score (z-score)	Percent w/ scaled score above 700	Percent w/ scaled score above 683
Fall 2019	95.1	0.103	45.1	57.5
Fall 2020	80.9	-0.0952	37.1	51.2
<i>Raw difference</i>	<i>-14.2</i>	<i>-0.198</i>	<i>-8.0</i>	<i>-6.3</i>
<i>Adjusted difference</i>	<i>--</i>	<i>-0.228</i>	<i>-9.4</i>	<i>-7.5</i>

Note: We estimated the “adjusted difference” by imputing missing scaled scores and estimating regressions that control for students’ characteristics when they were in second grade, as per the methodology we present in the appendix. The scaled scores in the second column were converted to z-scores, so that effect sizes are comparable to those in other studies. The differences in normalized scaled scores can be interpreted as the change in student achievement in standard deviations.

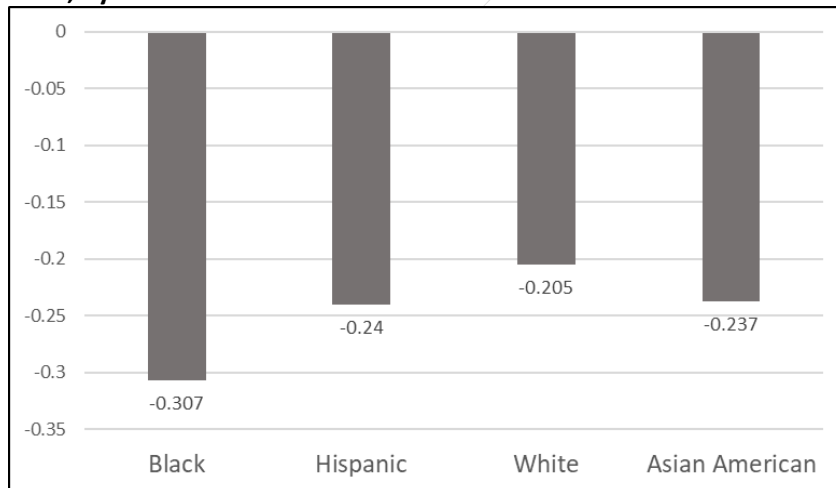
5. How did the magnitudes of these year-to-year changes vary across student demographic groups (particularly by achievement level, race, and poverty status)?

- Declines in test participation rates are far more pronounced among minority students, students who reside in districts with low average achievement levels, and economically disadvantaged students.
- Achievement declines are more pronounced among Black students (0.307 standard deviations) than among Hispanic and Asian American students (0.240 standard deviations) and White students (0.205 standard deviations). The decline of 0.307 standard deviations is roughly equivalent to half of a year’s worth of learning.

- Racial differences in COVID’s impact are more pronounced when it comes to declines in the proportion of students earning a score high enough for promotion to fourth grade (a scaled score of 683 or greater, which was the requirement prior to the pandemic). The proportion of students reaching the previous promotion minimum score declined by 13.8 percentage points for Black students, 9.3 for Hispanic students, 5.8 for White students, and 3.4 for Asian American students.
- Achievement declines are more pronounced among economically disadvantaged students (0.252 standard deviations) than among students not identified as such (0.200 standard deviations). Once again, differences are more pronounced for declines in the proportion of students earning a score high enough for promotion to fourth grade (based on the pre-pandemic cutoff). The decline in the fraction of students reaching the previous promotion minimum score is around twice as large for economically disadvantaged students.⁹
- Declines in average scaled scores are similar between groups of students defined by prior achievement levels in their districts (across four quartiles of baseline achievement). However, the proportion of students reaching the previous promotion minimum score declined 8.9 percentage points for students in districts in the bottom achievement quartile, as compared to 6.5 percentage points for students in districts in the highest achievement quartile.

Figures:

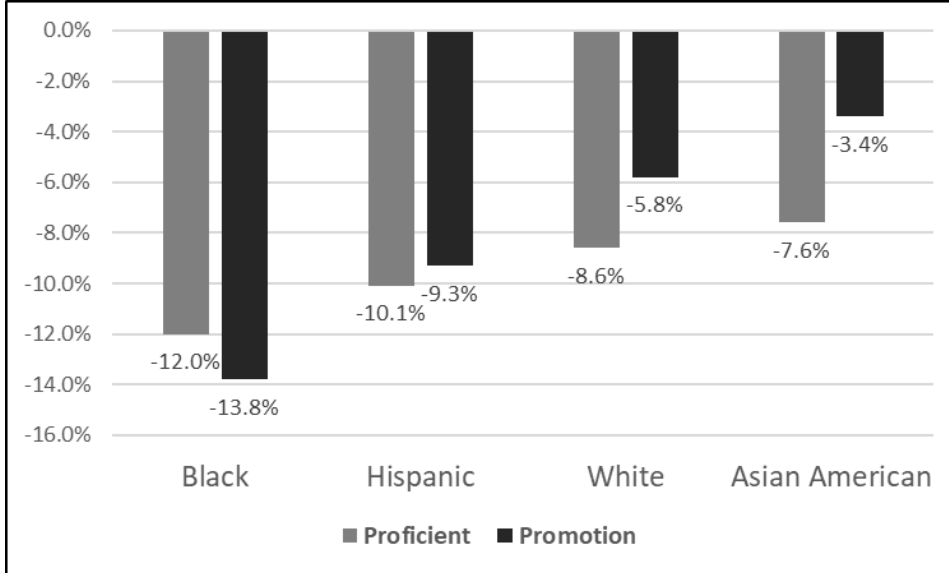
Figure 3. Changes in standardized scaled scores from fall 2019 to fall 2020, by race



Note: The figure presents the average differences in normalized tests scores in standard deviation units between fall 2020 and fall 2019. These are regression-adjusted estimates intended to partially account for differences in student test participation between 2019 and 2020, which we generated using the methods described in the methodological appendix. According to Bloom et al. (2008), one year’s worth of learning between grade 2 and grade 3 is approximately 0.60 standard deviations.

⁹ Economic disadvantage is measured with error, as some schools and districts identify all of their students as such for the purpose of federal lunch programs. This measurement error likely makes attenuates the differences in test participation and achievement impacts that we report.

Figure 4. Changes in percentage of students scoring above “proficient” and “promotion” thresholds from fall 2019 to fall 2020, by race



Note: The figure presents the estimated changes in the percentage of students deemed “proficient” as well as the changes in the percentage of students earning the minimum score previously necessary for promotion to the fourth grade based on the fall administration of Ohio’s Third-Grade English Language Arts assessment. Specifically, it indicates the percent of third grade students who took the exam and who received a scaled score of 700 or above (for proficiency) and a scaled score of 683 or above (a requirement for promotion to fourth grade prior to the pandemic). These are regression-adjusted estimates intended to partially account for differences in student test participation between 2019 and 2020, which we generated using the methods described in the methodological appendix.

Tables with complete results:

Table 3. Changes from fall 2019 to fall 2020, by race

	Black	Hispanic	White	Asian Amer.
<i>Participation rate</i>	-28.7	-17.6	-9.5	-14.2
<i>Test score (SDs)</i>	-0.307	-0.240	-0.205	-0.237
<i>Percent >700</i>	-12.0	-10.1	-8.6	-7.6
<i>Percent >683</i>	-13.8	-9.3	-5.8	-3.4

Note: We estimated achievement effects by imputing missing scaled scores and estimating regressions that control for students’ characteristics when they were in second grade, as per the methodology we present in the appendix. The differences in normalized scaled scores can be interpreted as the change in student achievement in standard deviations.

Table 4. Changes from fall 2019 to fall 2020, by economic disadvantage

	Economically Disadvantaged	Not Econ. Disadvantaged
<i>Participation rate</i>	-19.3	-7.8
<i>Test score (SDs)</i>	-0.252	-0.200
<i>Percent >700</i>	-10.7	-7.9
<i>Percent >683</i>	-9.8	-4.9
<p>Note: We estimated achievement effects by imputing missing scaled scores and estimating regressions that control for students' characteristics when they were in second grade, as per the methodology we present in the appendix. The differences in normalized scaled scores can be interpreted as the change in student achievement in standard deviations.</p>		

Table 5. Participation and test score changes from fall 2019 to fall 2020, by baseline district achievement

	1 st (Bottom) Quartile	2 nd Quartile	3 rd Quartile	4 th (Top) Quartile
<i>Participation Rate</i>	-23.5	-8.0	-8.1	-7.8
<i>Average score (SDs)</i>	-0.233	-0.203	-0.227	-0.239
<i>Percent >700</i>	-9.7	-8.4	-9.4	-9.5
<i>Percent >683</i>	-8.9	-7.1	-6.2	-6.5
<p>Note: We estimated achievement effects by imputing missing scaled scores and estimating regressions that control for students' characteristics when they were in second grade, as per the methodology we present in the appendix. The differences in normalized scaled scores can be interpreted as the change in student achievement in standard deviations.</p>				

6. Is there significant district-level variation in these year-to-year changes?

- The typical (median) district experienced a decline in test participation of 5 percentage points; but ten percent of Ohio school districts experienced declines of over 13 percentages points and ten percent experienced no declines.
- The typical (median) district experienced a test score decline of 0.23 standard deviations; but ten percent of districts experienced declines of over 0.46 standard deviations (roughly three quarters of a year's worth of learning) and ten percent of districts experienced no declines.
- The typical (median) district experienced a decline in proficiency rates of approximately 10 percentage points; but ten percent of districts experienced a decline of over 20 percentage points and ten percent of districts experienced an increase greater than 1 percentage point.

Table 6. Variation across districts in terms of changes in test participation and scores

District Percentile	Participation Rate	Scaled Score (z-score)	Percent w/ scaled score above 700	Percent w/ scaled score above 683
10 th percentile	-13.3	-0.462	-21.1	-19.6
25 th percentile	-8.4	-0.346	-15.3	-13.3
50 th percentile	-4.9	-0.227	-9.7	-7.9
75 th percentile	-2.4	-0.108	-4.0	-1.8
90 th percentile	0.3	0.000	1.4	3.6

Note: The test score calculations are based on imputed scaled scores, as per the methodology described in the appendix.

7. Did year-to-year participation rates and test score changes depend on broadband connectivity?

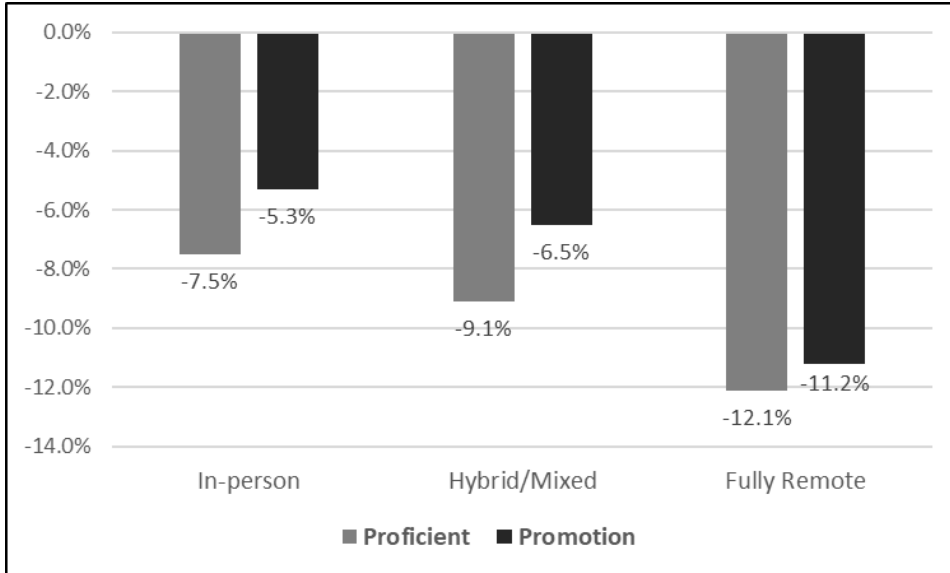
- Using publicly available data on broadband access from the Federal Communications Commission, we found only minor differences between districts with higher and lower rates of high-speed connectivity. We do not report these estimates because the FCC data are coarse and may not properly characterize impacts by high-speed internet access.

8. Did year-to-year participation rates and test score changes depend on district-level mode of instruction (e.g., fully remote, in-person, hybrid) in the fall?

- We coded districts based on the primary mode of instruction they utilized at the beginning of fall 2020: 1) in-person (43 percent), 2) fully remote (22 percent), and 3) hybrid or mixed (35 percent). Note that some districts with fully in-person instruction still provided virtual learning options for families, and we do not know what fraction of students in these districts ultimately attended classes in person this fall.
- Declines in student achievement were more pronounced among districts with fully remote instruction (0.278 standard deviations) than those using hybrid instruction (0.233 standard deviations) and in-person instruction (0.182 standard deviations). The declines are even more pronounced when looking at the proportion of students who achieve the minimum promotion score in place prior to the pandemic.
- Accounting for differences in county-level unemployment shocks and COVID health impacts (number of positive tests, hospitalization rate, and deaths per 100,000 population for the county in which each district is located) does not alter the relative differences between in-person, hybrid, and remote modes of instruction.

Figure:

Figure 5. Changes in percentage of students scoring above “proficient” and “promotion” thresholds from fall 2019 to fall 2020, by mode of instruction



Note: The figure presents the estimated changes in the percentage of students deemed “proficient” as well as the changes in the percentage of students earning the minimum score previously necessary for promotion to the fourth grade based on the fall administration of Ohio’s Third-Grade English Language Arts assessment. Specifically, it indicates the percent of third grade students who took the exam and who received a scaled score of 700 or above (for proficiency) and a scaled score of 683 or above (required for promotion to fourth grade prior to the pandemic). These are regression-adjusted estimates intended to partially account for differences in student test participation between 2019 and 2020, which we generated using the methods described in the methodological appendix. Mode of instruction is determined based on weekly data submitted to the Ohio Department of Education for the period Sept. 10 through Nov. 5. Some districts with fully in-person instruction still provided virtual learning options for families, and we do not know what fraction of students in these districts attended classes in person this fall.

Tables with complete results:

Table 7. Changes from fall 2019 to fall 2020, by mode of instruction

	In-person	Hybrid/Mixed	Fully Remote
<i>Participation Rate</i>	-5.6	-8.5	-32.7
<i>Average score (SDs)</i>	-0.182	-0.233	-0.278
<i>Percent >700</i>	-7.5	-9.1	-12.1
<i>Percent >683</i>	-5.3	-6.5	-11.2

Note: We estimated achievement effects by imputing missing scaled scores and estimating regressions that control for students’ characteristics when they were in second grade, as per the methodology we present in the appendix. The differences in normalized scaled scores can be interpreted as the change in student achievement in standard deviations.

9. How much of the year-to-year changes in test scores were due to the impact of COVID on local employment?

- A substantial portion of student achievement declines relate directly to how significantly COVID affected unemployment rates in the counties where students reside. Counties experienced increases in unemployment rates of between 0.7 percentage points to 7.73 percentage points between fall 2019 and fall 2020, with an average increase of 3.88 percentage points. Each percentage point increase is associated with a decline in student achievement of 0.02 standard deviations. Thus, on average, COVID-related unemployment accounts for a decline of about 0.08 standard deviations in student achievement—about one-third of the average overall decline between fall 2019 and fall 2020.



III. Methodological Appendix

The analysis estimates the impact of the COVID-19 pandemic on student achievement by examining changes in student participation and performance on the fall administration of the Ohio Third-Grade English Language Arts assessment between 2019 and 2020. We employ two approaches. First, we estimate raw differences in test participation rates and student test scores between these two administrations of the ELA assessment. Second, we estimate differences in student test scores between these cohorts of students using statistical models that account for differences in the number and characteristics of students tested in fall 2020—to estimate what changes in test scores would have looked like if all students had taken the test. This second analysis is meant to account for the significant decrease in participation rates in fall 2020 and to ensure that the raw differences we report do not lead to a misunderstanding about the true impact of COVID-19 on student achievement in Ohio. Third, we also estimate the impact of COVID-related unemployment shocks and health impacts on student achievement using a model similar to the model we use to generate “adjusted” estimates.

Raw Estimates

The analysis employs EMIS data on students who were first-time third-graders in the fall 2019 or fall 2020 to establish the baseline population of district students in each year. We then retrieved these students’ fall reading scores using the preliminary vendor test file that ODE received in December of each year. The participation rate we report above is the proportion of the students in the third-grade fall attendance file who have test scores in the vendor file. We attribute the student’s score to the district in which a student spent the most time this fall. Similarly, changes in test scores from fall 2019 to fall 2020 capture changes in scores for students we observe in the third grade attendance data during each year. Nearly all test scores in the vendor file are associated with students in the fall attendance files.

Adjusted Estimates

Based on third grade attendance files, we estimate that the statewide participation rate on the third-grade fall ELA assessment declined from over 95 percent in fall 2019 to approximately 81 percent in fall 2020. There is reason to believe that the fall 2020 test scores of students who did not participate in the examination would have been below the statewide average. Specifically, we show that participation fell substantially more among Black students and districts utilizing fully virtual learning this fall, both factors associated with larger achievement declines. Thus, raw differences in observed test scores are likely to understate actual changes in student achievement between fall 2019 to fall 2020. To address this possibility, we generated predicted test scores for all students based on their observed characteristics while in second grade, substituted those estimated scores for students who did not take the exam, and then recalculated test score changes holding constant student characteristics observed when they were in second grade.

Specifically, we estimated the following Ordinary Least Squares (OLS) regression models to generate predicted values of student test scores for each year (2019 and 2020 separately):

$$y_{id} = \alpha_d + X_i' \theta + \epsilon_{id} \quad (A1)$$

where y_{id} is a test score for student i in district d . The model features fixed effects for students' district of residence (α_d) and a vector of student characteristics observed in second grade (X_i). The second-grade characteristics include variables capturing a student's race and gender; whether he or she is disabled, economically disadvantaged, and deemed to have limited English proficiency; whether the student was ever reported as being homeless or involved in a disciplinary incident; the number of schools the student attended (as a measure of mobility); and, importantly, whether the student participated in district second grade reading diagnostics and whether those diagnostics indicated the student was on track to reach reading proficiency in third grade. Finally, the model included interactions between a student's district of attendance and indicators related to race, disciplinary incidents, and performance on reading diagnostics. We also examined alternative model specifications and found that they made no qualitatively significant impact on the results we report above.

After generating predicted values and using those predicted values for students with missing test scores, we estimated changes in student achievement between 2019 and 2020. Specifically, this time using a pooled dataset that includes student test scores from 2019 and 2020, we estimated the following OLS model:

$$y_{idt} = \alpha_d + X'_{it}\theta + \beta 2020_{it} + \epsilon_{idt} \quad (\text{A2})$$

where y_{idt} is a test score (or predicted test score) for student i in district d and school year t . Once again, the model features fixed effects for students' district of residence (α_d) and the vector of student characteristics observed in second grade (X_i). Additionally, the model includes a variable (2020_{it}) that indicates whether the test score observation is from fall of 2020 or fall of 2019. Thus, the parameter β captures the difference between the average test score in fall 2020 and the average test score in fall 2019, holding constant students' second-grade characteristics (including their performance on second-grade diagnostics). For the statewide analysis, we used standard errors clustered by school district of residence.