

Virtual Education in New Hampshire during the Pandemic

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Dover, New Hampshire

December 9, 2021

Introduction

The COVID-19 pandemic has and continues to disrupt the lives of people worldwide. In the United States, the impact has been felt by everyone, especially in the education of students. One of the most prominent ways in which student education was disrupted is in the way in which students attended school. Beginning in Spring 2020, remote education — where students attended class virtually from home — became a widely utilized mode of education. Continuing into the 2020-2021 school year, substantial numbers of students attended school virtually for at least some of their school year.

Given the rapid onset of the pandemic and the ensuing rapid changes to the way students attended school, it was impossible to know to what extent virtual modes of education would provide the same academic benefits to students that in person schooling did. Statewide spring summative assessments in New Hampshire in 2021 coupled with student-level mode of education data provides a data source capable of rigorously examining how students were impacted academically due to virtual education.

In late summer 2021, the Center for Assessment undertook a similar investigation in Indiana of the academic impact of virtual education on students. The Indiana State Board of Education was particularly interested in understanding how mode of education impacted students academically so as to better inform stakeholders throughout the state. Results from that investigation compared student outcomes based upon whether the student participated in school during the 2020-2021 remotely, in hybrid-fashion, or in-person.

In this study we examine the academic impact that virtual education had on students in New Hampshire using SAS state assessment data in two ways:

1. Using individual level indications of the extent students undertook education in 2020-2021 virtually, we examine the academic growth of those students to see whether their learning benefited or was impeded by the mode of education.
2. Using individual level indications of individual virtual learning, we create school level aggregates characterizing the average extent to which students at each school in New Hampshire participated in education virtually. Using these characterizations of schools we then look at the academic growth of students at these schools to see whether their learning benefited or was impeded by the mode of education predominantly found at the school.

The intent is to examine across both the individual and school level whether mode of education was associated with different levels of student learning.

Data and Analyses

Data utilized for these analyses were supplied by the New Hampshire Department of Education. Student assessment data from the annual state summative assessment (SAS) was supplied in Fall 2021. These data were combined with historical data from previous years' growth data in order to derive annual student growth percentile results. Data for the SAS assessment includes results in both ELA and mathematics for grades 3, 4, 5, 6, 7, and 8.

To examine the extent to which student learning decreased between 2019 and 2021, we utilize pre-pandemic growth norms established from 2017 to 2019. Baseline coefficient matrices were created in June 2021 using 2019 and prior SAS data in preparation for SGP analyses using spring 2021. When Spring 2021 SAS data was delivered to the Center for Assessment in September 2021, both cohort and baseline referenced SGPs were calculated. For the years which the baseline referenced SGPs are based upon (in this case, 2017 to 2019), the median SGP by grade and content area is 50. Deviations below 50 are indicative of the academic impact associated with COVID where academic impact covers the multitude of factors the combined to disrupt student education, in particular, whether students attended school in person or remotely.

In November, 2021, New Hampshire Department of Education delivered student level data indicating the percent of the 2020-2021 academic year that each student in the state was in virtual (i.e., remote) education. Qualifying remote/virtual education is an extremely difficult task and belies reduction to a single percentage. For example, a student indicated as 50 percent virtual could have attended half the year entirely in-person and the other half entirely remote. Or, a student indicated as 50 percent virtual could have attended half of each week virtually and half in-person. Moreover, remote/virtual education was delivered in numerous ways across the state so even if the percentage refers to the same remote/in-person breakdown for the school year, the educational experience of students could be very different.

Even with those difficulties in defining and coding what remote/virtual education is, there is likely enough commonality given the impacts seen to examine whether students, on average, benefited or were impeded academically based upon the amount of virtual education they participated in. To examine how amount of remote education was associated with student academic growth we create 5 categories from the variable indicating the percent of virtual education associated with each student: 0 to 20 percent, 21 to 40 percent, 41 to 60 percent, 61 to 80 percent, and 81 to 100 percent.

Results

We examine baseline student growth across two dimensions to provide as clear a picture as possible about what impact, if any, virtual learning may have had on student learning. The first examination looks at individual level student results by the amount of time (broken into quintiles) the student experienced virtual learning during the 2020-2021 academic year. Tables 1 and 2 provide median SGPs and counts for ELA and mathematics respectively by percentage virtual education quintile and grade.

Note that 50 is the historical, pre-pandemic median associated with students in each grade and content area. Moreover, an examination of the different quintile subgroups shows that 50.0 is a good approximation of what that quintile subgroup of students would have had for growth in 2017 to 2019 as a basis of comparison. Comparing results from ELA to mathematics, a result to take note of is that there was, on average, a much larger academic impact (deviation below 50) in mathematics than in ELA. This is consistent with what has been found in many states. The impacts in mathematics (deviations from 50 in the high teens and twenties) is typical of what we have observed in the dozen states that the Center has examined academic impact. However, the modest deviations observed in

ELA (low to mid single digits) is less than what has been observed in other states. At the present time we do not have an explanation for the resiliency of learning in ELA in New Hampshire that was not matched in mathematics.

Looking within each table across the quintiles, a general pattern emerges (particularly in mathematics) where the higher the percentage of virtual learning, the lower the median baseline SGP. For example, in mathematics Grade 6, those students whose percentage of virtual education was between 0 and 20 percent had median baseline growth of 35.0 (substantially less than 50.0 — typical pre-pandemic growth). Going from the 2nd, to 3rd, to 4th quintile (increasing amount of virtual education) the median SGPs are 25.0, 26.0 and 20.0. Moreover the counts of students in these groups is substantial suggesting a broad swath of students.¹

Virtual Education Percentage Quintile	ELA			
	Grade 5	Grade 6	Grade 7	Grade 8
1st Quintile (0 to 20 percent)	50.0 (3,199)	45.0 (2,395)	51.0 (2,178)	45.0 (2,245)
2nd Quintile (21 to 40 percent)	53.0 (1,950)	43.0 (2,055)	53.0 (2,051)	46.0 (2,184)
3rd Quintile (41 to 60 percent)	43.0 (1,976)	41.0 (2,308)	46.0 (2,348)	42.0 (2,289)
4th Quintile (61 to 80 percent)	45.0 (1,521)	37.0 (1,313)	38.0 (1,239)	41.0 (1,328)
5th Quintile (81 to 100 percent)	53.0 (467)	47.0 (352)	56.0 (367)	46.0 (336)

Table 1: Median baseline SGP for mathematics by percentage virtual education quintile, grade.

Virtual Education Percentage Quintile	Mathematics			
	Grade 5	Grade 6	Grade 7	Grade 8
1st Quintile (0 to 20 percent)	37.0 (2,947)	35.0 (2,674)	36.0 (2,207)	35.0 (2,252)
2nd Quintile (21 to 40 percent)	34.0 (1,623)	25.0 (2,317)	26.0 (2,053)	33.0 (2,186)
3rd Quintile (41 to 60 percent)	28.0 (1,917)	26.0 (2,350)	22.0 (2,354)	23.0 (2,294)
4th Quintile (61 to 80 percent)	21.0 (1,509)	20.0 (1,365)	25.0 (1,263)	27.0 (1,340)
5th Quintile (81 to 100 percent)	26.0 (443)	29.0 (371)	27.0 (361)	29.0 (337)

Table 2: Median baseline SGP for mathematics by percentage virtual education quintile, grade.

In the appendix at the end of this report are a series of figures showing a more nuanced view of academic impact based upon the prior achievement (i.e., 2019 pre-covid achievement). The figures show the same averages indicated in Tables 1 and 2 but got further to explore whether impacts were uniform across low to mid to high achieving students.

School Level Results

Examining associations between student growth and virtual learning at the school level is premised on the idea that schools likely promoted particular types of virtual education to the majority of its students. That is, mode of education (e.g., virtual versus in-person) was primarily driven by school policy so that students at that school generally conformed to what the school did. We recognize that

¹One caveat in examining the results. The fifth quintile (students receiving between 81 and 100 percent virtual learning) is composed of much fewer students who have historically engaged in virtual learning.

there is certainly instances at a school where, for example, a student might have been completely virtual for the year whereas his/her classmates were all in person. However, examination of the virtual education percentages show such cases to be very rare.

Examination of the virtual education percentages at the school level show that the the most frequently observed virtual education percentage quintile (the mode of the individual virtual education percentage quintiles for the school) were observed more than 50 percent of the time in almost all schools. That is, the data support the premise that the majority of students at each school conformed to a mode of education that the school provided. Given this fact it is of interest to examine student growth at the school level based upon the amount of virtual education students received. Using the individual level categorizations from Tables 1 and 2, Table 3 shows the decrease in learning from 2019 to 2021 based upon the primary mode of education provided by the school.

Mode of Virtual Education Percentage Quintile	ELA			Mathematics		
	Mean 2019	Mean 2021	Difference 2021 - 2019	Mean 2019	Mean 2021	Difference 2021 - 2019
1st Quintile (0 to 20 percent)	52.8 (142)	50.9 (142)	-1.9	52.9 (140)	40.5 (140)	-12.4
2nd Quintile (21 to 40 percent)	51.5 (74)	49.1 (74)	-1.4	51.1 (75)	33.2 (75)	-17.9
3rd Quintile (41 to 60 percent)	49.1 (73)	42.7 (73)	-6.4	49.0 (73)	29.2 (73)	-19.8
4th Quintile (61 to 80 percent)	48.9 (41)	39.3 (41)	-9.6	49.9 (41)	20.3 (41)	-29.6
5th Quintile (81 to 100 percent)	48.5 (4)	52.6 (4)	4.1	45.8 (4)	30.3 (4)	-15.5

Table 3: Decrease in school level median baseline SGPs between 2019 and 2021 by primary mode of education at school.

Table 3 provides an even clearer picture than the individual level analyses of the impact of student learning from increasing levels of virtual learning. Mean 2019 is the mean of the school level median SGPs across each of the 5 quintile levels. These results are near parity indicating that in 2019 these schools demonstrated comparable levels of growth. In 2021, depending upon the amount of virtual learning, student growth dramatically changed at those schools. For example, for the 41 schools with students whose modal amount of virtual education was between 61 and 80 percent, decreases in median SGP were large in ELA (-9.6) and severe in mathematics (-29.6). The differential impact based upon amount of virtual education is apparent in the results with higher amounts of virtual education being associated with lower rates of student learning.

Conclusion

Using spring 2021 New Hampshire state summative test data, this report examines student learning based upon the mode of education (virtual versus in-person) associated with the student during the 2020-2021 academic year. Analyses were conducted at both the individual level as well as clustered at the school level. Both sets of analyses lead to the same conclusion: Higher amount of virtual education are associated with lower rates of student learning. Decreases in learning are much larger in mathematics than in ELA. The changes observed are of such a large magnitude that we doubt that confounding factors can account for these changes.

These results align to those found in the other states collecting similar data investigating academic impact based upon mode of education. There are several avenues of further investigation possible with these data:

- Are there schools who managed to support virtual education better than others that could be used to inform virtual education practice going forward.
- Are there specific demographic subgroups who benefited from or were hurt from virtual education.

- What are the characteristics of virtual education that appear to lead to lower rates of learning?
Can those aspects be ameliorated?

Appendix

Each of the following figures shows the academic impact associated with the pandemic on student SAS scores. Each figure is specific to students in one of the five quintile groupings based upon virtual education percentage the student received. The top panel is a scatter plot depicting students' 2019 scale score versus their 2021 scale score (2 year/2 grades later) in either ELA or Mathematics. Two curves are fitted to these data:

1. Conditional status (i.e. growth) from 2017 to 2019 (pre-pandemic progress)
2. Conditional status (i.e. growth) from 2019 to 2021 (pandemic progress)

In general, 2019 to 2021 progress is less than 2017 to 2019 progress so that the fitted 2019 to 2021 curve lies under the 2017 to 2019 curve. The shaded red area indicates the extent of academic impact. The bottom panel provides magenta lines when show the height difference (i.e., academic impact) between the pre-pandemic growth and pandemic growth. Browsing through the figures across quintiles shows larger academic impact as was illustrated in Tables [1](#) and [2](#).















































































