The Decline in Standard Exam Pass Rates Due to Schooling Modes During the 2020–2021 Academic Year in the United States*

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Abstract

This report assesses the influence of the type of instruction—specifically, in-person compared to a mix of online and traditional learning or entirely online—provided by US school districts during the 2020–2021 academic year on the pass rates of standard exams for students from the third to the eighth grade across eleven states. We observed a decrease in pass rates from 2019 to 2021, with an average drop of 12.8 percentage points for mathematics and 6.8 for English language arts (ELA). By examining the differences in educational modes within the same state and commuting zones, our findings suggest that districts that maintained full in-person instruction experienced notably smaller reductions. Furthermore, the benefits of in-person education were more pronounced in districts with a higher percentage of African American students.

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*A GitHub Repository containing all data, R code, and any additional files used in this report is located at: https://github.com/julianmarrero/Pandemic-Schooling-Mode-and-Student-Test-Scores; Replication on Social Science Reproduction platform located at:

1 Introduction

During the 2020–2021 academic year, U.S. schools faced unprecedented challenges due to the COVID-19 pandemic, leading to various instructional approaches including virtual, in-person, and hybrid models. This period of educational disruption prompted an investigation into its effects on standardized test pass rates for students in grades 3-8 across 11 states (McLeod and Dulsky, 2021; Kaufman and Diliberti, 2021). The study revealed a significant decline in pass rates from 2019 to 2021, averaging a drop of 12.8 percentage points in math and 6.8 in ELA, with the largest decreases observed in Virginia and the smallest in Wyoming. It was found that less in-person instruction and higher populations of Black students were associated with larger declines.

The distribution of schooling modes varied widely, reflecting broader national trends. For instance, districts in Virginia engaged in in-person instruction for an average of just 9.7% of the school year, whereas Wyoming districts did so for 86.5% (National Forum on Education Statistics, 2021). In-person schooling was more prevalent in politically conservative areas and those with higher COVID-19 community rates, suggesting a complex interplay between political, demographic, and health-related factors in determining schooling modes.

To assess the causal impact of these varied instructional modes on pass rates, the study utilized a panel data approach, controlling for local economic and demographic factors. The analysis indicated that districts with full in-person or hybrid learning modes experienced significantly smaller declines in pass rates compared to those with fully virtual learning. Notably, in-person learning showed a positive interaction with districts having a higher proportion of Black students and those eligible for free and reduced-price lunch, particularly in math scores.

This research contributes to the understanding of how educational disruptions during the COVID-19 pandemic have affected student achievement across the United States. It underscores the potential long-term educational implications of the pandemic and suggests targeted interventions may be necessary to address learning losses, especially among the most vulnerable student populations (Kogan and Lavertu, 2021; Fuchs-Schündeln et al., 2021). The findings also caution against the future use of school closures as a response to crises, highlighting the need for policies that support continued access to in-person learning.

2 Data

2.1 Source

The paper used for this replication is from the American Economic Review: Insights which discusses the effect of different schooling methods (i.e., in-person, online, and hybrid) on US student pass rates for mathematics and English (Jack et al. 2023). My reproduction aims to address the findings made from the original paper and discuss the implications of these findings. The claims that will be discussed are: (1) Does the mode of schooling affect a student's ability to learn? (2) Does a student's background affect what mode of schooling works best for them?

2.2 Methodology

This paper will replicate the summary statistics by States, the pairwise correlations between in-person learning on district demographic and pandemic variables, and finally the average change in pass rates of state standardized tests in Spring 2021 versus Spring 2016-2019. These figures and tables will be replicated using the cleaned dataset supplied by the original paper.

The raw data extracted in the original paper came from seven sources: (1) state test score data from the 11 states, (2) schooling mode (learning model) data from the COVID-19 School Data Hub, (3) average COVID-19 case counts from USA Facts (4) National Center for Education Statistics Common Core of Data Demographic Data, (5) commuting zone labor market data, (6) Bureau of Labor Statistics unemployment data, and (7) Republican vote share in the 2020 election (Jack et al. 2023).

3 Results

Figure 1 displays some summary statistics of the dataset depicting key aspects of each state. "Number of Districts" refers to the number of schooling districts included in the sample. "Average Years" is the average number of years of assessment data for that given state. "In-Person(%)", "Hybrid(%)", and "Virtual(%)" refer to the average percent of the school year that the state school's district offered for each schooling mode. "Black & Hispanic(%)" refers to the percent of students in the schooling districts of that state that identify as Black or Hispanic. "Free/Reduced Lunch(%)" and "English Language Learners(%)" refer to the percentage of students that qualify for these programs. Massachusetts does not report Free/Reduce Lunch program data thus it is omitted from the table.

Summary of Statistics

State	Number of Districts	Average Years	In-Person (%)	Hybrid (%)	Virtual (%)	Black & Hispanic (%)	Free/Reduced Lunch (%)	English Language Learners (%)
CO	136	4.713235	28.9	43.8	27.3	37.8	41.4	11.5
CT	160	4.950000	47.4	36.3	9.1	35.1	37.4	6.7
MA	284	4.000000	27.4	54.4	18.2	26.9	NaN	9.1
MN	340	4.891176	16.2	69.1	14.7	17.6	36.4	7.5
MS	134	4.895522	66.7	18.4	14.9	51.5	73.9	2.3
OH	606	5.000000	50.0	32.1	17.1	19.0	43.7	3.1
RI	37	2.918919	44.5	41.8	8.2	31.5	44.7	8.8
VA	132	5.000000	9.7	51.8	38.6	37.4	40.4	8.7
WI	396	4.989899	51.5	22.1	18.4	19.9	39.1	5.4
WV	55	5.000000	37.6	41.4	17.4	6.1	49.2	1.1
WY	48	3.000000	86.5	6.2	0.7	14.7	37.0	3.0

Figure 1: Summary Statistics by State

From Figure 1, in-person learning rates are highest in Wyoming (86.5%) and Mississippi (66.7%) and lowest in Minnesota (16.2 percent) and Virginia (9.7 percent). Contrarily, Virginia, and Colorado have the highest share of district time spent in fully virtual learning at 38.6% and 27.3%, respectively. States in the sample vary across demographic characteristics as well, including their share of students who are Black and Hispanic, eligible for FRPL programs, and those who are ELLs.

Figure 2 displays the linear regression analyses that assess the association between various demographic and educational variables with the share of in-person learning. Robust standard errors are reported in the parentheses for each separate regression.

	No Fixed Effects	State Fixed Effects	Commute Zone Fixed Effects
Previous Pass Rate	0.140 (0.052)	0.585 (0.042)	0.541 (0.035)
Share Black	-0.463 (0.028)	-0.745 (0.028)	-0.736 (0.025)
Share Hispanic	-0.466 (0.046)	-0.341 (0.045)	-0.298 (0.043)
Share FPRL	-0.111 (0.036)	-0.250 (0.034)	-0.333 (0.029)
Share ELL	-1.349 (0.080)	-0.880 (0.070)	-0.776 (0.066)

Figure 2: Regression Analysis of In-Person Learning Share by District Demographics and Pandemic Impact

From Figure 2 the ”Previous Pass Rate” row indicates a positive association with in-person learning across all models, with the strongest association observed in the state fixed effects model. The ”Share Black” and ”Share Hispanic” rows have negative coefficients in all three models suggesting that districts with higher proportions of Black or Hispanic students tend to have a lower share of in-person learning. The magnitude of the coefficients increases (more negative) when state fixed effects are included, which could indicate that within states, districts with higher proportions of these demographic groups had even less in-person learning. The negative coefficients in Share FPRL indicate that districts with a higher proportion of students eligible for free or reduced-price lunch (a common indicator of lower socioeconomic status) are associated with a lower share of in-person learning. This negative association is consistent across all model specifications. There is a substantial negative association between the proportion of ELL students in a district and the share of in-person learning. The coefficients are quite large compared to other variables, suggesting a strong relationship. The fact that the standard errors are relatively small compared to the coefficients suggests that the coefficients are statistically significant.

4 Discussion

4.1 Findings

From Figure 2, the inclusion of state and commute zone fixed effects generally increases the magnitude of the coefficients for the Previous Pass Rate and decreases the magnitude for demographic variables, which may reflect underlying structural differences that are accounted for by the fixed effects. The coefficients in the fixed effects models (state and commute zone) are likely to be more reliable as they control for unobserved heterogeneity at these levels. This could mean that regional factors play a significant role in the relationship between district demographics and the mode of schooling.

4.2 Limitations

One limitation of this paper is that the data used for analysis was the cleaned dataset provided by the (2023) original report made by Jack et al. Therefore, there may be other variables that may have been of interest that were excluded from the analyses that may have affected the findings. The choice of using the pre-cleaned dataset was made to save time and effort in making this report.

Additionally, throughout this report, the analysis conducted was done on the aggregate scores/data from the students in grades 3-8. It would have been useful to conduct further analysis of the separate grades individually, as there may be variation of pass rates between grades due to the attention span of students at different ages.

Furthermore, the data utilized only represents 11 out of the 50 states in the U.S. Therefore, the findings may not be representative of the entire country, as different states employed different regulations for schooling mode during the COVID-19 pandemic.

4.3 Future Research

Some potential future research that can be conducted is analyzing the impact of the different schooling modes for higher grade levels such as high school students. As high school students study a greater range of subjects rather than just math and English, analyzing their grades using the different schooling modes may indicate if the trend is consistent among all areas of study.

5 References

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