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COVID-19: A Developing Crisis for Quantitative Reasoning

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COVID-19: A Developing Crisis for Quantitative Reasoning

Abstract

Assessment data show substantial learning losses resulting from pandemic-era teaching and learning. While all learning domains have been affected, mathematics performance shows particularly large losses among elementary and secondary school students. Advocates for quantitative reasoning in high schools and colleges should anticipate weaker levels of basic numeracy among entering cohorts for a decade to come. As a consequence, the urgency to reform curricula and student support has never been greater.

Keywords

numeracy, quantitatively literacy, quantitative reasoning, COVID-19, learning proficiency, student support

Cover Page Footnote

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For most, it was likely apparent from the start of the pandemic. But now we have data that won't be ignored: the pandemic and resulting educational policies will deepen the quantitative reasoning crisis for years to come.

Headlines from around the country capture growing anxieties: "Student Math Scores Take a Hit After Year of COVID Remote Learning [NH][1]," "Minnesota Students' Reading and Math Scores Slipping Amid COVID Pandemic[2]," "Proficiency Scores Dropped During the Pandemic [IL][3]," "Student Test Scores Drop As Predicted during Pandemic Year in Missouri[4]," "'Concerning' Test Results in Newark [NJ] Give Insight into Pandemic Learning Loss[5]," and "First Maryland Standardized School Tests since Start of Pandemic See Dramatic Drop in Student Achievement Scores[6]."

While learning gains fell in all subject domains, research shows that effects have been larger in mathematics. Drawing on NWEA MAP Growth scores of approximately 6.1 million students enrolled in grades 3–8 at more than 14,000 public schools, Lewis et al. (2021) report substantially lower median gains in mathematics than in reading. While the median reading student grew about 5 percentile rank points less in 2021 than in 2019, the growth of the median mathematics student fell approximately 10 percentile rank points. Halloran et al. (2021) report similar findings of muted mathematics and English language learning in each of 12 states. Again, losses were notably greater in the former than the latter.

To see what this might look like in a more tangible sense, consider the case of Maryland (Bowie 2021). In 2019, 33% and 43% of students achieved proficiency—worryingly low pass rates—in mathematics and reading, respectively; in 2021, those figures fell to 15% and 35%, respectively. Clearly, the pandemic has had a negative impact on both mathematics and reading education. But the data also leave little doubt that learning losses have been more pronounced in quantitative learning.

Some state higher education officials have argued that these data must be viewed with skepticism due to lower participation rates in 2021 testing. To be sure, test-taking records show lower participation rates during the pandemic, consistent with broader patterns of higher absenteeism. What is less clear is why this would

[1] https://newhampshirebulletin.com/2021/12/28/student-math-scores-take-a-hit-after-year-of-covid-remote-learning/

[2] https://minnesota.cbslocal.com/2021/08/27/minnesota-students-reading-and-math-scores-slipping-amid-covid-pandemic/

[3] https://www.wqad.com/article/news/education/rock-island-school-scores-pandemic/526-abb4ac81-4461-4806-8225-5a0211538cb9

[4] https://www.stltoday.com/news/local/education/student-test-scores-drop-as-predicted-during-pandemic-year-in-missouri/article_07f77aa0-3844-5b75-8f3d-6fc3a9932963.html

[5] https://newark.chalkbeat.org/2021/12/10/22828196/newark-test-start-strong-results-pandemic-learning-loss

[6] https://www.baltimoresun.com/education/bs-md-maryland-test-scores-20211208-wk5aen5r5bfx5eag2p57pamjcy-story.html

lead to a negative bias in estimates of learning gains. Higher education officials making these observations argue implicitly that the absent students are those with higher than average learning gains. It seems at least as likely that selection works in the opposite direction as students with less parental support show smaller gains and are more prone to absenteeism. Holloran et al. (2021) find evidence in support of this alternative selection mechanism such that reported learning losses underestimate the magnitude of the problem.

Research provides insight into correlates of diminished learning growth. Halloran et al. (2021) find that pandemic effects were approximately 2/3 smaller among students who remained fully in-person. Unfortunately, this description applies to a minority of students in half of the states covered in their study.

Lewis and Kuhfeld (2021) find that learning gains were lower—and math gains particularly so—among students studying in districts with high poverty rates. In other words, the past two years of pandemic education have deepened rather than mitigated learning gaps across districts. While predictable, this result is also deeply discouraging.

Mathematics fluency and quantitative reasoning are different constructs. (Karaali et al. [2016] provides a good introduction to this topic.) Still, the two are clearly connected. With lower mathematics learning gains in K–12 years, we must expect greater challenges to quantitative reasoning moving forward.

For those of us working in higher education, what this might mean is a decade of student cohorts affected by the pandemic. Now is the time to consider commitments to quantitative reasoning centers and curricular reforms that support student development in this critical domain.

We can hope that a return to more typical educational environments at the end of the pandemic (or sooner) might mitigate losses seen in the youngest elementary students today. But, as the saying goes, hope is not a strategy.

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