

## CHAPTER

# Overcoming Pandemic-Induced Learning Loss

by Jonathan Guryan and Jens Ludwig

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This paper was produced to provide policy-relevant evidence about current challenges confronting the American economy. Authors are invited to share their views about policy issues, which do not necessarily represent those of the Aspen Institute, members of the Aspen Economic Strategy Group, or their affiliated organizations.

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# Overcoming Pandemic-Induced Learning Loss

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## ABSTRACT

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The global COVID-19 pandemic created not only a once-a-century public health crisis but also a once-a-century public education crisis. Unfortunately, the United States federal government's financial assistance to schools to overcome pandemic-induced learning loss is about to expire – despite the fact that the country has made almost no progress remediating this learning loss. In thinking about where to go next, we first look backward to examine why so little progress was made over the past few years. Changing student learning outcomes requires changing what schools do; that has been hard partly because of the chaos in the wake of the pandemic, but also because change is difficult for all organizations. We illustrate some of the challenges within the context of one specific type of instructional content for which US Secretary of Education Miguel Cardona encouraged schools to prioritize relief funding: high-dosage tutoring, a promising technology that's been known for centuries to help students of all ages. To avoid lifelong negative consequences for a generation of 50 million school-age children, policymakers need to (1) extend the timeline over which federal assistance is available, (2) provide additional resources beyond that, and (3) nudge schools to take difficult steps that will ultimately help students through increased accountability or other means.

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## 1. Introduction

COVID-19 created not only a once-a-century public health crisis, but also a once-a-century public education crisis. We've made significant progress remedying the public health crisis; in May 2023, the federal government determined that COVID-19 was no longer a public health emergency. The same cannot be said for our public education emergency.

Data from the National Assessment of Educational Progress (NAEP), the “nation’s report card,” documented the first decline in math test scores ever recorded (for 8th graders in math, for instance, equal to about three-quarters of a grade level). Figures 1 and 2 show the losses are even larger for low-income and minority students, and in districts that stayed remote for longer.

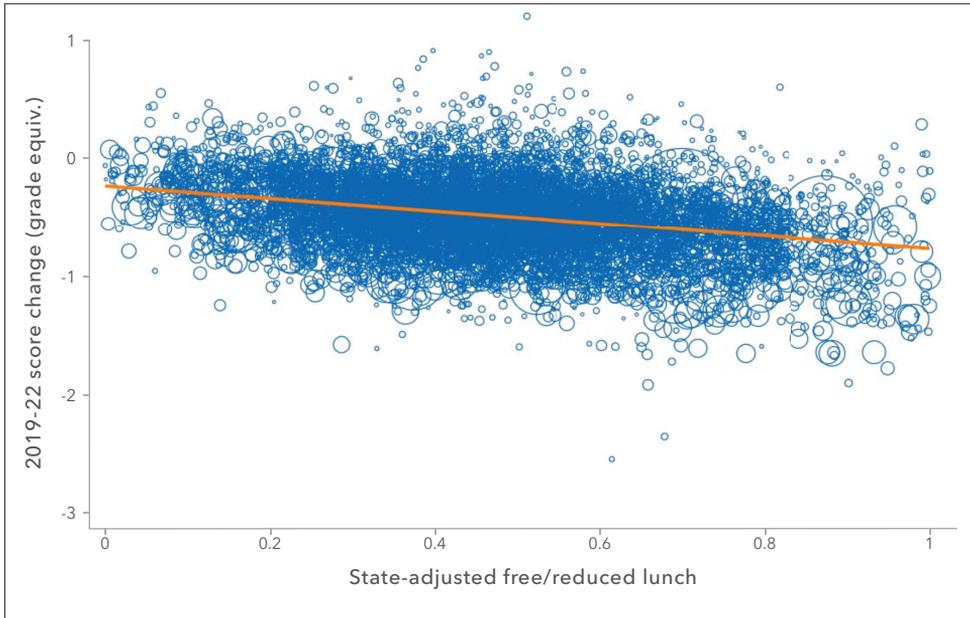
Unfortunately, little has been done to address pandemic-induced learning loss. As a *New York Times* headline put it, “US students’ progress stagnated last school year... students are not making up ground in reading and math.”<sup>1</sup> One educator noted, “We are actually seeing evidence of backsliding.” What happens to the nearly 50 million children enrolled in public K-12 schools if this learning loss goes uncorrected? Hanushek (2023) estimates an average of 2–9 percent lower lifetime income as a result. Kane et al. (2022) estimate that the drop in eighth-grade math learning alone will lead to a collective \$900 billion loss in future earnings.

Although little to no progress has been made in remediating pandemic-induced learning loss, the federal government’s pandemic relief to school districts is about to expire. Congress sent \$189.5 billion to schools through the Elementary and Secondary School Emergency Relief (ESSER) Fund between March 2020 and March 2021. While some of this funding was to replace tax revenue lost due to the pandemic, schools had to set aside at least 20 percent of their funding for evidence-based interventions to address learning loss, including things like tutoring and after-school programs (United States Department of Education 2021a).<sup>2</sup> The last round of ESSER funds must be committed by September 2024 (US Department of Education 2021b) and then the money disappears. It is as if Operation Warp Speed were shut down a few months in, long before the COVID-19 vaccine was developed, because some arbitrary bureaucratic deadline was reached.

1 <https://www.nytimes.com/2023/07/11/us/reading-math-test-scores-education-nwea.html>

2 The Every Student Succeeds Act of 2015 (ESSA) defines “evidence-based” by four tiers: “strong evidence,” “moderate evidence,” “promising evidence,” and “demonstrate a rationale.” The highest tier, “strong evidence,” includes large, multi-site randomized controlled trials with statistically significant and positive effects. Interventions that fall into the lowest tier, “demonstrate a rationale,” must be based on high-quality research findings and must include efforts to evaluate the intervention’s impact. See the Department of Education’s guidance on evidence-based interventions for additional details (2016). States were required to submit plans for ESSER fund disbursement to the Department of Education (see United States Department of Education 2023).

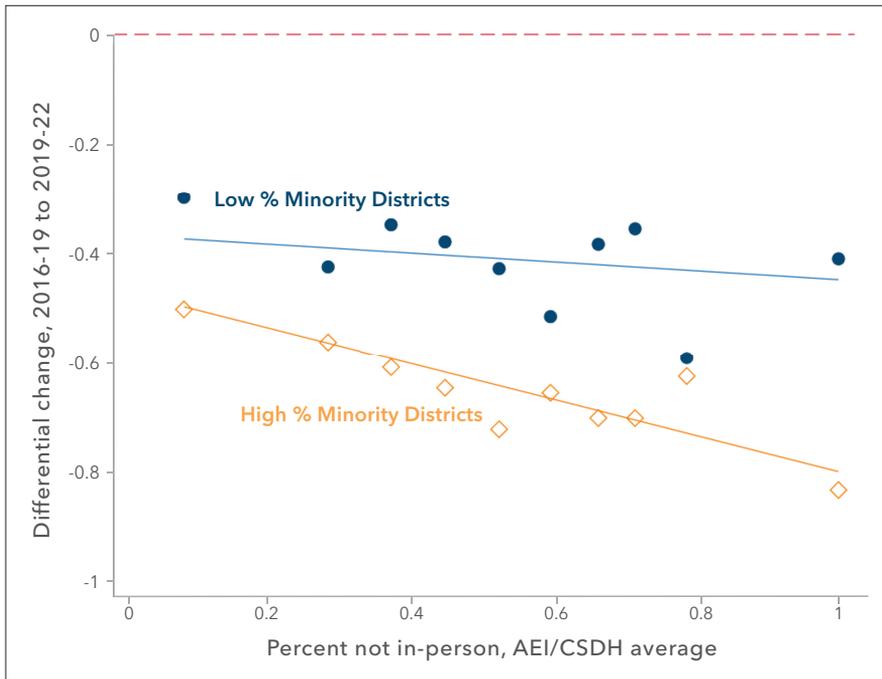
**Figure 1. 2019-2022 NAEP Math Score Changes vs. Free or Reduced-Price Lunch Rates**



**Source:** Fahle et al. (2023).

**Notes:** Figure 1 shows 2019-2022 NAEP math score changes (represented as grade equivalents) vs. state-adjusted free or reduced-price lunch rates.

**Figure 2. Pandemic-Induced Learning Loss Higher for Minority School Districts and Share of Students Learning Remotely**



**Source:** Fahle et al. (2023).

**Notes:** Figure 2 shows average district student math achievement losses vs. percentage of students learning remotely, by percentage of minority enrollment. The percentage of students learning remotely is the average of the remote learning measure from the American Enterprise Institute (AEI) and the remote learning measure from the COVID-19 School Data Hub (CSDH).

Why has so little progress been made? While part of the issue is that the ESSER funding was unlikely to have ever been enough money (even had those dollars been deployed optimally), it's also the case that changing the rate of student learning requires schools to change what they do – and those changes have been slow in coming. For example, US Secretary of Education Miguel Cardona encouraged districts to devote ESSER dollars to high-dosage tutoring programs to help overcome learning loss (Mervosh 2023). That type of tutoring can double or triple the amount of learning students achieve per year (Guryan et al. 2023). Delivering this type of tutoring in a scalable way requires changing the daily schedule to create time during the school day and adopting new human resources practices. Paraprofessionals, for instance, can offer high-quality tutoring at a lower salary than licensed teachers, which holds costs

down thus improving scalability. A combination of the inevitable chaos that came with the end of the pandemic and the change-aversion common in all organizations has led to far too little tutoring delivered nationwide given the scope of the problem.

We argue that school districts across America need (1) more time to spend down their ESSER funding, (2) more resources beyond those allocated in ESSER, and (3) more accountability, to ensure that dollars are spent on the difficult or less popular things that are most effective in helping students learn. While there would still be additional scaling challenges that need to be solved, our own work examining the strategic incorporation of technology to substitute for tutoring resources makes us cautiously optimistic that these challenges can be met – but only if there's more time, money (and nudging) for schools to fully address the challenge.

## **2. The Nature of the Challenge**

It was clear from the very beginning of the pandemic that the combination of the shift to remote learning plus the “digital divide” would wind up further widening disparities in schooling outcomes in America. For example, data from a single week in May 2020 showed that nearly a third of the Chicago Public School system's 350,000 students did not log on to even one Google Classroom or Google Meet (Chicago Public Schools 2020; n.d.). Chronic absenteeism increased dramatically across the country, with student absences fully doubling in high-remote-instruction states like Virginia and California. (Given data limitations, those figures may, if anything, even underestimate the true rise in absenteeism). The US Department of Education estimated that at least 10.1 million students missed at least 10 percent of the 2020–2021 school year (Chang, Balfaz, and Byrnes 2022).

Of course, missing this much school, and the imperfect substitution of remote school for in-person instruction, led to large learning losses, particularly for the most disadvantaged children in America. But the real public policy challenge is not merely short-term learning losses. Because education is intrinsically cumulative, there is the real possibility that pandemic-induced school disruptions may set a whole generation of students off track for the rest of their lives.

To see the problem, just reflect on your own schooling experiences. Schools are organized into grades from K through 12. Within those grades, students are taught in groups of between, say, 20 and 35 (depending on the district, school, grade, subject, etc.), usually by a single teacher. Those teachers are told their job is to teach students grade-level content. That's what their students are tested on at the end of each year, and that's what schools often judge teachers on as well. For perhaps well-intentioned reasons of not wanting some students to be stigmatized or give up

on school altogether, most students get promoted to the next grade whether or not they've mastered the skills of the grade they just finished.

The frequent result: A teacher standing in front of a classroom, trying to teach grade-level content to students whose academic levels vary enormously. Even before the pandemic, the average fifth-grade class, for instance, contained some students working at a third-grade level and some working at an eighth-grade level.<sup>3</sup> That wide range of instructional needs within each classroom has only gotten wider since the pandemic began, since the learning impact of the pandemic fell disproportionately on the most disadvantaged (Lewis et al. 2022) students. Some indications are that teachers target instruction toward something like the 60th percentile of the distribution (Bloom, 1984). So students who are behind grade level – a much larger share of children now thanks to the pandemic – will be getting instruction that's not targeted at what they need, a so-called “academic mismatch.”

Even before the pandemic, dealing with this sort of personalization challenge from teaching a classroom of students with heterogeneous academic levels and needs was regularly reported by teachers as one of the hardest parts of teaching (Guryan et al. 2023). Or, as one of our colleagues at the University of Chicago's Committee on Education put it, “dealing with heterogeneity is the problem of education.”<sup>4</sup>

The danger is that students who fall behind grade level wind up benefiting less from each subsequent year of classroom instruction because they are increasingly far behind the level of what is being taught in the classroom. While some of the measurement issues become subtle, there is some indication that the variance of student test scores widens as children progress through school (Cascio and Staiger 2012; Nielsen 2023).

The consequences of pandemic-induced learning loss, in other words, are likely to be long-term, and these consequences will be most dire for the most disadvantaged children. The potential magnitude of the long-term effects can be seen by pre-pandemic data on what happens when children miss key developmental milestones. Students who can't read at grade level by third grade are four times less likely to graduate high school.<sup>5</sup> Ninth graders who

*The consequences of pandemic-induced learning loss, in other words, are likely to be long-term, and these consequences will be most dire for the most disadvantaged children.*

<sup>3</sup> The majority of students are one to two years behind (Peters et al. 2017).

<sup>4</sup> Private communication, Jens Ludwig with Steve Raudenbush.

<sup>5</sup> 16 percent of students who are not at grade-level reading proficiency in third grade do not go on to graduate high school, compared to only 4 percent of students who are proficient (see Hernandez 2011).

have not yet passed their required entry-level math class (Algebra I) are five times less likely to graduate.<sup>6</sup>

Something desperately needs to be done. Why hasn't it been done yet?

### 3. A Case Study: Tutoring

To see both what *could* be done to overcome pandemic-induced learning loss, and why that hasn't been done yet, we consider the case study of one specific instructional technology. With the distribution of federal ESSER funding, US Secretary of Education Miguel Cardona encouraged districts to prioritize resources for an approach that is promising for accelerating learning of students of any age: intensive or “high-dosage” tutoring (Belsha 2022).

#### 3.a. Empirical Support for Tutoring

High-dosage tutoring (HDT) dates back at least to the fifteenth century at Oxford University, where one or two students at a time would meet with their instructor for several hours per week. (One could think of this practice as extreme class-size reduction). High-dosage tutoring helps address what teachers report in surveys to be the two most difficult, and perhaps related, challenges of classroom teaching: variability in students' academic levels (and hence their needs); and classroom management. These challenges are more difficult with older students because as students age, their academic levels become increasingly variable (students become more and more different from one another) and disruptive behaviors get more prevalent.

Modern statistical analysis has confirmed the wisdom of the Oxford dons hundreds of years ago: the data suggest that tutoring is indeed the best way to teach anyone anything. A series of demonstration projects in the 1980s found that compared to regular classroom instruction, students tutored one-to-one spend almost 40 percent more time on-task. Students in tutoring learned fully 2 standard deviations (SDs) more than their peers in traditional classroom settings (Bloom 1984). As a way to benchmark the enormous magnitude of that learning gain, the average test-score gain over the course of a student's high school career is about 0.6–0.7 SDs, and the test-score gap between high- and low-income eighth graders is 1.4 SDs (Reardon 2011; Loveless 2012). Another way to get a sense of the magnitude here is that a student who improved their test score by 2 SDs would move approximately from the 15th to the 85th percentile.

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<sup>6</sup> 80 percent of students who do not pass algebra do not go on to graduate high school, compared to only 15 percent of students who do pass algebra (see Schachter 2013).

We also see large gains from tutoring outside of controlled lab conditions, in real-world school settings. A review of more than 90 randomized controlled trials (RCTs) of smaller-scale tutoring programs showed an average effect of 0.37 SDs (Nickow, Oreopoulos, and Quan 2020).<sup>7</sup> Our own RCT of high-dosage high-school math tutoring in partnership with the Chicago Public Schools (CPS) and the non-governmental organization (NGO) Saga Education, involved 2,633 ninth- and tenth-grade students in low-performing schools in economically under-resourced areas on the south and west sides of Chicago. We found two-on-one tutoring for 45-50 minutes a day in school every day increased math test scores by 0.16 SDs and reduced math-course failures by 49 percent (Guryan et al. 2023).

A replication RCT in the 2014–2015 academic year with 2,710 ninth and tenth graders found even larger impacts, with test score gains of 0.37 SDs and grade impacts comparable to the first study. When the studies were pooled together, the overall effect on math test scores in eleventh grade was 0.23 SDs—the equivalent of an additional 1.5 years of learning (and, coincidentally, the same size as the drop in eighth-grade math test scores in 2021) (Guryan et al. 2023). As Nickow, Oreopoulos, and Quan (2020) described the results from the two RCTs we reference here, these effect sizes are “exceptional relative to the potential alternatives at the secondary level.”

A separate analysis compared potential learning loss policy solutions, including high-impact tutoring (Kraft and Falken 2021).<sup>8</sup> Overall, the learning gains from HDT are much closer to offsetting the average learning loss experienced during the pandemic than other potential policy measures are. HDT is plausibly the intervention most up to the task of meeting the scale of our current learning-loss challenge. As one education expert put it, tutoring sessions are “the best learning conditions we can devise” (Bloom 1984).<sup>9</sup>

### **3.b. Change Requires Change**

If tutoring is so helpful to children, why haven’t schools been doing more of this on the heels of the pandemic?

7 The review, which covered tutoring programs ranging in dosage from 1–2 days per week to every day of the week, found that the more time students spent in tutoring, the better. In-school programs were also nearly twice as effective as after-school programs. However, paraprofessional tutoring programs generated effect sizes nearly as large (0.4 standard deviations) as professional teachers (0.5 standard deviations), indicating that who performs the tutoring is not as large a determining factor for program success as might be expected. See Nickow, Oreopoulos, and Quan 2020.

8 Kraft and Falken (2021) includes an excellent discussion of the measured impact of alternate policies such as class-size reduction, additional school hours, additional school days, and summer school. All these alternatives show relatively lower impact than HIT.

9 As we discuss below, our research to date suggests that tutoring is effective when it’s done in schools at a ratio of two students per full-time, dedicated adult tutor, meets daily, and follows a set curriculum. Whether tutoring might be equally effective at higher student ratios, or with peer tutors, or when face-to-face instruction is supplemented with computer time—these remain open questions.

Part of the issue is that the ESSER funding was probably not enough to start with. Total school spending for the academic year 2019-20 (setting aside capital outlays and debt interest) was \$757 billion. The ESSER money, which was intended to be spread out over multiple years, represents a mere 6 percent increase in funding.<sup>10</sup> There are also signs that a lot of this money went to simply replacing lost tax revenue, rather than to new initiatives to remediate learning loss.

But schools have also had a hard time modifying standard operating procedures to incorporate tutoring. In fairness, school systems across the country had to manage all sorts of exceptional challenges as in-person school started up again on the heels of the pandemic (like, for instance, contingency plans for what to do if a student gets COVID-19, what to do if there is a new COVID-19 outbreak, etc.) But there have been other reasons schools have struggled to do tutoring as well.

For starters, it has been hard for schools to find dedicated time during the school day itself to incorporate tutoring. Past research (and our own experiences working with different districts around the country) suggest it is enormously difficult to get students to participate at large scale in either after-school tutoring or virtual tutoring at home. Having this happen during the school day while children are in the building seems to be a key feature of successful tutoring programs. Presumably, that's been hard for schools to do in part because all organizations suffer from a general change-aversion. In our discussions with educators, resistance also sometimes is motivated by an assumption that reducing the time spent on the things that children like (including art, music, gym, etc.) and make them enthusiastic about school could cause students to become disengaged. What that reasoning misses is that being behind grade level in reading or math creates frustration and boredom that can also lead to disengagement from school. So anything that helps students better engage with their core academic classes has a countervailing effect to help reduce frustration and disengagement. The data confirm this view: Carving out time to give students more time on core academic tutoring (like in math) does not on net reduce attendance (Guryan et al. 2023).

Delivering high-dosage tutoring at scale in a way that's both truly high-dosage and scalable also requires using a different sort of human resources model than schools are necessarily used to. The key insight behind tutoring is that once "class size" gets small enough, the nature of teaching becomes qualitatively different. In a regular classroom setting with 20-35 students, teachers need a great deal of prior

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10 This figure assumes distribution of funds over four years (May 2020 through September 2024) and annual school spending of approximately \$757B on instructional expenses such as teacher salaries and benefits. Total school spending is actually closer to \$870B when including non-instructional expenses such as capital outlays and debt service. See National Center for Education Statistics 2023.

pedagogical training and on-the-job learning to successfully personalize instruction and handle classroom management. But once class size is reduced to just 1 or 2 students those two tasks become fundamentally different, and easier. In our own work in partnership with the Chicago Public Schools and the NGO Saga Education, we see that paraprofessionals with little prior educational background who are willing to work for one year as a tutor for a modest stipend (\$20-30,000 per year) can be remarkably successful. Using fully certified teachers as tutors, who cost two or three times as much as paraprofessionals, is both unnecessary for a tutoring program to succeed and winds up greatly increasing costs. And in terms of efforts to scale high-dosage tutoring, cost is the enemy of both high-dosage and scale.

This is all to say that to change student learning requires schools to change what they're doing and that's hard under the best of circumstances. For schools to do the kind of high-dosage tutoring Saga implemented in Chicago—using paraprofessionals (to hold costs down), a structured curriculum (not just homework help), and a high dosage of tutoring (several hours per week delivered in school)—requires lots of things to be different. This is also true of setting up summer schools, as Harvard's Tom Kane and others have called for, and other useful programs.

What we have seen in practice is that when schools are faced with the possibility of change, they tend to do fewer of the hard things that will help students and more of the easier things that are likely to have fewer learning benefits for children. For example, in our experiences working with districts around the country, many have punted on the problem of trying to find time during the school day and instead relied on after-school programs or tried virtual tutoring at home in the evenings or on weekends. None of those efforts that we have seen firsthand led to a high “dosage” of tutoring delivered to students at any sort of scale.

As another example, a different district we worked with tried a decentralized approach to tutoring, giving individual schools lots of discretion over how they deployed their tutors. Often, the tutors wound up simply serving as teachers' aides, which the research suggests have little impact on student learning in part because these aides wind up being assigned to largely do the parts of the teacher's job teachers like least (grading, making copies, etc.) (Krueger 1990; Hemelt et al. 2021).

#### **4. A Different Path Forward**

If America wants to avoid lifelong harm to the current generation of 50 million school-age children across the country, we need to change course. What should we do instead?

We need to provide schools with:

- An extension (more time) to spend down federal pandemic assistance.
- More resources beyond the initial federal ESSER allocations, given the scale of need.
- More accountability and other nudges to push schools to make the hard changes that will actually change student learning.

Even with these three necessary ingredients in place, astute observers of US social policy will note that very few social policies succeed at massive scale. We think that is a solvable problem partly because of encouraging recent evidence that technology can partly substitute for tutor time, at least to some degree, to reduce cost and increase scalability. There is the very real possibility, in our view, to build a new at-scale component of the American education system that not only overcomes pandemic-induced learning loss but also helps address the large disparities in academic outcomes that even pre-dated the pandemic.

#### **4.a. More Time, More Money, More Accountability**

It seems unarguable that the federal government should provide school districts with more time to spend their existing ESSER funding. Schools have made remarkably little progress remediating pandemic-induced learning loss. Schools didn't have any infrastructure in place to introduce high-dosage tutoring into standard operating procedures, so most needed to build that from scratch. Worse still, they were trying to build tutoring programs from scratch amid national labor shortages (Belsha 2021). Only now are even some of these districts really starting to put that infrastructure in place. Pulling their federal funding at the end of the 2023-24 academic year would be like calling it quits before the real work even begins.

We believe there is also an argument to provide additional resources beyond what the initial federal government ESSER money provided. The ESSER funding initially averaged out to about a 6 percent increase in annual K-12 public spending, with a lot of that available to districts to overcome tax revenue lost due to the pandemic. What's the argument for providing more resources beyond that, focused exclusively and relentlessly on solving pandemic-induced learning loss? Our previous estimates suggest that every dollar put into some version of tutoring described above (and below in the next section) can return \$2 to \$13 in social value in return.<sup>11</sup>

<sup>11</sup> Guryan et al. (2023) shows that the benefit-cost ratio of high-dosage tutoring ranges from 2.4 to 8. If it's really possible to reduce costs by 30 percent using technology without compromising effectiveness, the benefit-cost ratio could be as high as 13 (dividing the highest benefit cost ratio of regular tutoring, 8:1, by 0.7).

What sort of resources are we talking about, exactly? In the short term, school administrators estimate almost half of students are behind grade level in at least one subject.<sup>12</sup> That’s about 25 million students. We can conservatively assume each of those students needs a year of tutoring to get back up to grade level, although because tutoring can accelerate learning by up to an extra 1.5 years or more in a single year, in practice a lower dosage of tutoring might wind up being sufficient. If it were possible to deliver a package of tailored tutor-plus- computer-assisted learning (CAL) personalized instruction to students at an average cost of \$3,000 per student (a reasonable estimate based on our own past work), the cost of remediating the remaining pandemic-induced learning loss would be on the order of \$75 billion.

But that \$75 billion will only lead to improved student learning if and only if schools change standard operating procedure to faithfully implement the type of tutoring that will genuinely help students. To ensure schools do that with the additional resources, additional accountability (and perhaps other types of nudges) are likely to be required.

#### **4.b. Solving the Scale-Up Challenge**

The history of US social policy is one of challenges to scale. Even if we can get schools more time, more money, and more accountability to do the hard things that will help students, how do we know we can solve the perennial scale-up problem?

One version of the scale-up problem stems from the fact that so much of social policy involves hiring one person to work with another person (caseworkers, teachers, etc.). Typically, that type of work is highly contingent – on the context, on what’s going on with the person that day, etc. To solve that contingency, the human provider is given a great deal of discretion in what they choose to do in the program at any given moment. That in turn requires a large amount of skill. Writing down the “formula” or “recipe” for how to use that discretion optimally is challenging partly because the space of contingencies is enormous, and partly because so much of what skilled people do in a given circumstance stems from tacit knowledge that cannot be communicated explicitly (because even we as people cannot consciously access what we do in those circumstances). Luckily, this does not seem to be a key challenge in tutoring because the task is simplified enough for a broad class of people to succeed as tutors.

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12 This estimate is drawn from a 2022 survey of school administrators (National Center for Education Statistics 2022a); however, 2022 eighth-grade NAEP scores indicate that the true level may be higher, given that fully 74 percent of students were testing below proficiency in math and fully 69 percent were testing below proficiency in reading (National Assessment of Educational Progress n.d.a; n.d.b).

The scaling challenges here seem to stem instead from a combination of limited money and limited labor supply (i.e. a finite supply of tutors). Luckily there's a lower-cost (indeed, zero marginal cost) way of providing the same sort of high-time-on-task, personalized instruction that tutoring provides, one that doesn't require

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hiring people to deliver. That way is technology. We think the selective, strategic use of technology in tutoring programs can help reduce costs and improve scalability.

High-quality computer-assisted learning (CAL) platforms—just like tutoring—are designed to help students at the academic level they're currently operating at, and to progress at their own pace. It also maximizes

time on-task free from the disruption and management challenges that can come with regular classroom teaching. There have been enormous venture-capital investments in CAL in recent years, with the industry reaching \$20 billion in funding in 2021 (Fittes 2022). There is every reason to believe that the capabilities of CAL platforms to provide personalized instruction and feedback to students will only get better over time with the advent of new and better tools from artificial intelligence.

A key insight is that CAL can be a near-perfect substitute for tutoring, but only on the margin. Previous research has shown that CAL has diminishing marginal returns (Bettinger et al. 2023). When people think of diminishing marginal returns they usually think about the “diminishing” part of the curve where returns start to flatten out. (For CAL specifically, every parent of a child during the pandemic thinks immediately of a kid sitting bored for the week's 25th hour on a computer screen.) The focus on the flat part of the curve has the tendency to divert our attention from the part of the curve where returns on the margin can be quite high.

An illustration of the opportunities the steep part of the curve provides comes from some research our team did in partnership with Saga Education and the Chicago Public Schools (CPS). In the CPS, Saga tried a variant of their tutoring program in which, rather than spending every day working with a tutor two-on-one, students spent only *every other day* with a tutor and spent the *off days* on a high-quality CAL platform (like ALEKS). The result was to cut costs by about one-third relative to daily tutoring and to cut in half the number of tutors needed to serve a given number of students.

Yet the benefits to student learning from every-other-day tutoring (with off days on CAL) were almost the same as every-day tutoring. A series of randomized evaluations during the 2018–2019 and 2019–2020 academic years across seven high schools in CPS and the NYC Department of Education showed that the gains were nearly identical to what we see from daily two-on-one tutoring, with effects of 0.23

standard deviations on math scores (Bhatt et al. 2023), basically the effect of everyday tutoring (0.26 SD in Guryan et al. 2023).

If it's possible to replace 50 percent of tutor time with CAL time without sacrificing student learning, how much further can we go? The answer might be: It depends on the student. CAL only helps students learn if they use it, and data from previous studies show enormous variation across students in their level of engagement with CAL. While around 20 percent of students never utilized the assigned CAL platform at all, 36 percent attempted all the CAL learning modules they were assigned (Lab for Economic Opportunities 2022). Moreover, the students who differ so much in their willingness to use CAL seem to be observably different. Those who use CAL more tend to already have had higher grades, higher test scores, higher attendance, and less misconduct (Bhatt et al. 2023).

In principle it should be possible to offer these students a tutoring package that is relatively lighter on tutor time and heavier on CAL time, which would free up scarce, costly tutor time to give to the students who are less inclined to engage with CAL. This type of “personalizing the instructional personalization,” so to speak, would help hold down costs and ensure that a given budget helps as many students learn as much as possible. Where is the tipping point for a given student in how much CAL time (relative to tutor time) to give them before learning benefits start to decline? Go too far in replacing tutor time with CAL and learning gains will surely be reduced; stop too soon in substituting CAL for tutor time and we miss an opportunity to free up resources by doing something cheaper rather than more expensive, to serve more students.

#### **4.c. A Positive Legacy of the Pandemic?**

If we can overcome pandemic-induced learning loss, we'd expect the academic status quo to look a bit more like it did pre-pandemic. Even with no more learning loss, that involves lots of variation across students in their learning levels and needs, and lots of students who remain behind grade level and so may not be benefiting from regular classroom as much as anyone might wish.

One could imagine there being great benefits to sustaining a system of high-dosage tutoring in schools to intervene whenever any student falls behind grade level, to get them back on track so they can benefit from regular classroom settings. What might that cost?

In 2019, school administrators estimated that 36 percent of students were behind grade level (Institute of Education Sciences n.d.). If we assume that under “normal” conditions each student in need requires closer to half a year of tutoring rather than

a full year (and acknowledging that early intervention would help prevent students from falling behind and staying behind, thereby reducing the amount of tutoring required overall), then the US education system would want about nine million student-years of tutoring capacity in place every year to meet student needs moving forward. That might cost something like \$27 billion annually; or put differently, for a 3.6 percent<sup>13</sup> increase in annual public K-12 spending, we could reduce the disparities that pre-dated the pandemic and increase the productivity of student time in school (because now they are getting more from grade-level lectures from teachers).

Many policy debates in the US are, at their heart, about how to tradeoff efficiency versus equity. The reimaged public education system we propose here has the great advantage of offering the potential for substantial progress on both fronts. By helping millions more students reach their potential, the result would be substantially improved long-term economic growth (efficiency). The fact that the millions of students who would benefit the most are disproportionately lower-income students and students of color means disparities in educational opportunities would be substantially reduced (equity). Building this reimaged public education system is a difficult—but, in our view, critical—endeavor.

## References

- Abdulkadiroğlu, Atila, Joshua D. Angrist, Susan M. Dynarski, Thomas J. Kane, and Parag A. Pathak. 2011. "Accountability and Flexibility in Public Schools: Evidence from Boston's Charters and Pilots." *Quarterly Journal of Economics* 126, no. 2 (May): 699–748. <https://www.jstor.org/stable/23015687>.
- Banerjee, Abhijit V., Shawn Cole, Esther Duflo, and Leigh Linden. 2007. "Remedying Education: Evidence from Two Randomized Experiments in India." *Quarterly Journal of Economics* 122, no. 3 (August): 1235–64.
- Barnett, W. Steven, and Clive R. Belfield. 2006. "Early Childhood Development and Social Mobility." *Future of Children* 16, no. 2 (Fall): 73–98. <https://doi.org/10.1353/foc.2006.0011>.
- Barnett, W. Steven, and Leonard N. Masse. 2007. "Comparative Benefit–Cost Analysis of the Abecedarian Program and its Policy Implications." *Economics of Education Review* 26, no. 1: 113–25.
- Bassok, Daphna, Maria Fitzpatrick, and Susanna Loeb. 2014. "Does State Preschool Crowd-Out Private Provision? The Impact of Universal Preschool on the Childcare Sector in Oklahoma and Georgia." *Journal of Urban Economics* 83 (September): 18–33.

<sup>13</sup> Using \$757 billion of annual instructional expenses (which excludes capital outlays and debt payments) as a denominator.

- Belfield, Clive R., Milagros Nores, Steve Barnett, and Lawrence Schweinhart. 2006. "The High-Scope Perry Preschool Program: Cost-Benefit Analysis: Using Data from the Age-40 Followup." *Journal of Human Resources* 41, no. 1 (Winter): 162–90. <http://www.jstor.org/stable/40057261>.
- Belsha, Kalyn. 2022. "Cardona to educators: 'I know you're stretched.'" *Chalkbeat*, January 27. <https://www.chalkbeat.org/2022/1/27/22904563/cardona-speech-educators-exhaustion-tutoring>
- Belsha, Kalyn. 2021. "Tutors Wanted: Inside the Nationwide Sprint to Build Big New Programs to Catch Students Up." *Chalkbeat*, September 28. <https://www.chalkbeat.org/2021/9/27/22697432/tutoring-pandemic-recruitment-challenges>.
- Bettinger, Eric, Robert W. Fairlie, Anastasia Kapuza, Elena Kardanova, Prashant Loyalka, and Andrey Zakharov. 2023. "Diminishing Marginal Returns to Computer-Assisted Learning." *Journal of Policy Analysis and Management* 42, no. 2: 552–70.
- Bhatt, Monica, Jonathan Guryan, Salman Khan, and Michael LaForest. 2023. "Using Technology to Reduce the Cost of High Dosage Tutoring: Experimental Evidence." Working paper.
- Bloom, Benjamin S. 1984. "The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring." *Educational Researcher* 13, no. 6: 4–16.
- Campbell, Frances A., Elizabeth P. Pungello, Shari Miller-Johnson, Margaret Burchinal, and Craig T. Ramey. 2001. "The Development of Cognitive and Academic Abilities: Growth Curves from an Early Childhood Educational Experiment." *Developmental Psychology* 37, no. 2: 231–42. <https://psycnet.apa.org/doi/10.1037/0012-1649.37.2.231>.
- Campbell, Frances A., Elizabeth P. Pungello, Margaret Burchinal, Kirsten Kainz, Yi Pan, Barbara H. Wasik, Oscar A. Barbarin, Joseph J. Sparling, and Craig T. Ramey. 2012. "Adult Outcomes as a Function of an Early Childhood Educational Program: An Abecedarian Project Follow-Up." *Developmental Psychology* 48, no. 4 (July): 1033–43. <https://doi.org/10.1037/a0026644>.
- Cascio, Elizabeth U., and Diane Whitmore Schanzenbach. 2013. "The Impacts of Expanding Access to High-Quality Preschool Education" *Brookings Papers on Economic Activity* (Fall): 127–78. <https://www.brookings.edu/bpea-articles/the-impacts-of-expanding-access-to-high-quality-preschool-education/>.
- Cascio, Elizabeth U. and Douglas O. Staiger. "Knowledge, Tests, and Fadeout in Education Interventions." 2012. National Bureau of Economic Research, Working Paper 18038.
- Chang, Hedy, Robert Balfanz, and Vaughan Byrnes. 2022. "Pandemic Causes Alarming Increase in Chronic Absence and Reveals Need for Better Data." *Attendance Works* (blog), September 27. <https://www.attendanceworks.org/pandemic-causes-alarming-increase-in-chronic-absence-and-reveals-need-for-better-data/>.
- Chetty, Raj, John N. Friedman, and Jonah E. Rockoff. 2014a. "Measuring the Impacts of Teachers I: Evaluating Bias in Teacher Value-Added Estimates." *American Economic Review* 104, no. 9: 2593–632.
- Chetty, Raj, John N. Friedman, and Jonah E. Rockoff. 2014b. "Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood." *American Economic Review* 104, no. 9: 2633–79.

- Chicago Public Schools. n.d. "Demographics." District data, accessed June 29, 2023. <https://www.cps.edu/about/district-data/demographics/>.
- Chicago Public Schools. 2020. "Student Engagement Data." Press release, May. <https://www.cps.edu/globalassets/cps-pages/press-releases/pr-2020/05272020-student-engagement-data.pdf>.
- Coleman, James S., Ernest Q. Campbell, Carol J. Hobson, James McPartland, Alexander M. Mood, Frederic D. Weinfeld, and Robert L. York. 1966. *Equality of Educational Opportunity*. National Center for Educational Statistics report no. OE-38001. Washington, DC: Government Printing Office. <https://files.eric.ed.gov/fulltext/ED012275.pdf>.
- Cullen, Julie Berry, Steven D. Levitt, Erin Robertson, and Sally Sadoff. 2013. "What Can Be Done to Improve Struggling High Schools?" *Journal of Economic Perspectives* 27, no. 2: 133–52.
- Cunha, Flavio, James J. Heckman, Lance Lochner, and Dimitriy V. Masterov. 2006. "Chapter 12: Interpreting the Evidence on Life Cycle Skill Formation." In *Handbook of the Economics of Education*, vol. 1, edited by Eric Hanushek and Finis Welch, 697–812. Amsterdam: Elsevier.
- Deming, David. 2009. "Early Childhood Intervention and Life-Cycle Skill Development: Evidence from Head Start." *American Economic Journal: Applied Economics* 1, no. 3: 111–34.
- Dobbie, Will, and Roland G. Fryer, Jr. 2011a. "Are High-Quality Schools Enough to Increase Achievement among the Poor? Evidence from the Harlem Children's Zone." *American Economic Journal: Applied Economics* 3(3): 158 – 87.
- Eddy, Melissa. 2020. "Why Is Europe Keeping Its Schools Open, Despite New Lockdowns?" *New York Times*, October 29. <https://www.nytimes.com/2020/10/29/world/europe/schools-coronavirus-europe-lockdowns.html>.
- Fahle, Erin M., Thomas J. Kane, Tyler Patterson, Sean F. Reardon, Douglas O. Staiger, and Elizabeth A. Stuart. 2023. *School District and Community Factors Associated with Learning Loss During the COVID-19 Pandemic*. Cambridge, MA: Center for Education Policy Research, Harvard University, May. [https://cepr.harvard.edu/sites/hwpi.harvard.edu/files/cepr/files/explaining\\_covid\\_losses\\_5.23.pdf](https://cepr.harvard.edu/sites/hwpi.harvard.edu/files/cepr/files/explaining_covid_losses_5.23.pdf).
- Fittes, Emma Kate. 2022. "Global Venture Capital Investment in Ed-Tech Soared in 2021, Hitting \$20B." *EdWeek Market Brief*, January 10. <https://marketbrief.edweek.org/marketplace-k-12/global-venture-capital-investment-ed-tech-soared-2021-hitting-20b/>.
- Fitzpatrick, Maria D. 2008. "Starting School at Four: The Effect of Universal Pre-Kindergarten on Children's Academic Achievement." *B. E. Journal of Economic Analysis and Policy* 8, no. 1: article 46. <https://doi.org/10.2202/1935-1682.1897>.
- Friedman-Krauss, Allison, W. Steven Barnett, and Milagros Nores. 2016. *How Much Can High-Quality Universal Pre-K Reduce Achievement Gaps?* Washington, DC: Center for American Progress, April. <https://nieer.org/wp-content/uploads/2017/01/NIEER-AchievementGaps-report.pdf>.
- Fryer, Roland G., Jr. 2014. "Injecting Charter School Best Practices into Traditional Public Schools: Evidence from Field Experiments." *Quarterly Journal of Economics* 129, no. 3): 1355–407.
- Garces, Eliana, Duncan Thomas, and Janet Currie. 2002. "Longer-Term Effects of Head Start." *American Economic Review* 92, no. 4 (September): 999–1012.

- Gibbs, Chloe, Jens Ludwig, and Douglas L. Miller. 2011. "Does Head Start Do Any Lasting Good?" NBER Working Paper no. 17452, September. <https://www.nber.org/papers/w17452>.
- Gilraine, Michael, Jiaying Gu, and Robert McMillan. 2020. "A New Method for Estimating Teacher Value-Added." NBER Working Paper no. 27094, May. <https://www.nber.org/papers/w27094>.
- Goldhaber, Dan, Thomas J. Kane, Andrew McEachin, Emily Morton, Tyler Patterson, and Douglas O. Staiger. 2022. *The Consequences of Remote and Hybrid Instruction During the Pandemic*. Cambridge, MA: Center for Education Policy Research, Harvard University, May. <https://cepr.harvard.edu/files/cepr/files/5-4.pdf?m=1651690491>.
- Gordon, Robert, Thomas J. Kane, and Douglas O. Staiger. 2006. *Identifying Effective Teachers Using Performance on the Job*. Hamilton Project Policy Brief no. 2006-01. Washington, DC: Brookings Institution Press, April 1.
- Gormley, William T., and Ted Gayer. 2005. "Promoting School Readiness in Oklahoma: An Evaluation of Tulsa's Pre-K Program." *Journal of Human Resources* 40, no. 3: 533–58. <https://doi.org/10.3368/jhr.XL.3.533>.
- Guryan, Jonathan, Jens Ludwig, Monica P. Bhatt, Philip J. Cook, Jonathan M. V. Davis, Kenneth Dodge, George Farkas, Roland G. Fryer, Susan Mayer, Harold Pollack, Laurence Steinberg, and Greg Stoddard. 2023. "Not Too Late: Improving Academic Outcomes among Adolescents." *American Economic Review* 113, no. 3 (March): 738–65. <http://dx.doi.org/10.1257/aer.20210434>.
- Hanushek, Eric A. 2023. *The Economic Cost of the Pandemic*. Hoover Education Success Initiative report. Stanford, CA: Hoover Institution, Stanford University, January 4.
- Hanushek, Eric A., Jacob D. Light, Paul E. Peterson, Laura M. Talpey, and Ludger Woessmann. 2020. "Long-Run Trends in the U.S. SES-Achievement Gap." NBER Working Paper no. 26764, February. <http://doi.org/10.3386/W26764>.
- Hashim, Shirin A., Thomas J. Kane, Thomas Kelley-Kemple, Mary E. Laski, and Douglas O. Staiger. 2020. "Have Income-Based Achievement Gaps Widened or Narrowed?" NBER Working Paper no. 27714, August. <https://www.nber.org/papers/w27714>.
- Hemelt, Steven W., Helen F. Ladd, and Calen R. Clifton. "Do teacher assistants improve student outcomes? Evidence from school funding cutbacks in North Carolina." *Educational Evaluation and Policy Analysis* 43, no. 2 (2021): 280-304.
- Hernandez, Donald J. 2011. *Double Jeopardy: How Third-Grade Reading Skills and Poverty Influence High School Graduation*. Baltimore, MD: Annie E. Casey Foundation, April. <https://files.eric.ed.gov/fulltext/ED518818.pdf>.
- Huffman, Kevin. 2023. "Done Right, Tutoring Can Greatly Boost Student Learning. How Do We Get There?" *The 74*, March 6. <https://www.the74million.org/article/done-right-tutoring-can-greatly-boost-student-learning-how-do-we-get-there/>.
- Institute of Education Sciences. n.d. "School Pulse Panel." Accessed June 29, 2023. <https://ies.ed.gov/schoolsurvey/spp/>.

- Jack, Rebecca, Clare Halloran, James Okun, and Emily Oster. 2022. "Pandemic Schooling Mode and Student Test Scores: Evidence from US school Districts." *American Economic Review: Insights* 5, no. 2 (June): 173–90. <https://www.aeaweb.org/articles?id=10.1257/aeri.20210748>.
- Jackson, C. Kirabo. 2018. "What Do Test Scores Miss? The Importance of Teacher Effects on Non-Test Score Outcomes." *Journal of Political Economy* 126, no. 5: 2072–107.
- Johnston, Louis D. 2012. "History Lessons: Understanding the Decline in Manufacturing." *MinnPost*, February 22. <https://www.minnpost.com/macro-micro-minnesota/2012/02/history-lessons-understanding-decline-manufacturing/>.
- Kane, Thomas. 2022. "Kids Are Far, Far Behind in School." *Atlantic*, May 22. <https://www.theatlantic.com/ideas/archive/2022/05/schools-learning-loss-remote-covid-education/629938/>.
- Kane, Thomas J., and Douglas O. Staiger. 2008. "Estimating Teacher Impacts on Student Achievement: An Experimental Evaluation." NBER Working Paper no. 14607, December. <https://www.nber.org/papers/w14607>.
- Kane, Thomas J., Elena Doty, Tyler Patterson, and Douglas O. Staiger, D. 2022. *What Do Changes in State Test Scores Imply for Later Life Outcomes?* Cambridge, MA: Center for Education Policy Research, Harvard University. [https://educationrecoverycorecard.org/wp-content/uploads/2022/11/Long-Term-Outcomes\\_11.18.pdf](https://educationrecoverycorecard.org/wp-content/uploads/2022/11/Long-Term-Outcomes_11.18.pdf).
- Knudsen, Eric I., James J. Heckman, Judy L. Cameron, and Jack P. Shonkoff. 2006. "Economic, Neurobiological, and Behavioral Perspectives on Building America's Future Workforce." *Proceedings of the National Academy of Sciences* 103, no. 27: 10155–62.
- Kraft, Matthew A., and Grace T. Falken. 2021. "A Blueprint for Scaling Tutoring and Mentoring across Public Schools." *AERA Open* 7 (September): 23328584211042858. <https://doi.org/10.1177/23328584211042858>.
- Krueger, Alan B. "Experimental Estimates of Education Production Functions." *The Quarterly Journal of Economics* 114, no. 2 (1999): 497–532. <http://www.jstor.org/stable/2587015>.
- Lab for Economic Opportunities. 2022. "Computer Assisted Learning Shows Potential for Math Learning." Research brief.
- Lewis, Karyn, and Megan Kuhfeld. *Progress toward Pandemic Recovery: Continued Signs of Rebounding Achievement at the Start of the 2022–23 School Year*. Portland, OR: NWEA Center for School and Student Progress, December 2022. [https://www.nwea.org/uploads/2022/12/CSSP-Brief\\_Progress-toward-pandemic-recovery\\_DEC22\\_Final.pdf](https://www.nwea.org/uploads/2022/12/CSSP-Brief_Progress-toward-pandemic-recovery_DEC22_Final.pdf).
- Lewis, Karyn, Megan Kuhfeld, Meredith Langi, Scott Peters, and Erin Fahle. 2022. *The Widening Achievement Divide during COVID-19*. Center for School and Student Progress research report. Portland, OR: NWEA, November. <https://files.eric.ed.gov/fulltext/ED627139.pdf>.
- Loveless, Tom. 2012. "How Well Are American Students Learning?" *Brown Center Report on American Education* 3, no. 1 (February). [https://www.brookings.edu/wp-content/uploads/2016/06/0216\\_brown\\_education\\_loveless.pdf](https://www.brookings.edu/wp-content/uploads/2016/06/0216_brown_education_loveless.pdf).
- Ludwig, Jens, and Douglas L. Miller. 2007. "Does Head Start Improve Children's Life Chances? Evidence from a Regression Discontinuity Design." *Quarterly Journal of Economics* 122, no. 1: 159–208.

- Mervosh, Sarah. "U.S. Students' Progress Stagnated Last School Year, Study Finds." *New York Times*. July 11, 2023. <https://www.nytimes.com/2023/07/11/us/reading-math-test-scores-education-nwea.html>
- National Assessment of Educational Progress. n.d.a. "NAEP Report Card: Mathematics: State Achievement-Level Results." *Nation's Report Card*. <https://www.nationsreportcard.gov/mathematics/states/achievement/?grade=8>.
- National Assessment of Educational Progress. n.d.b. "NAEP Report Card: Reading: National Achievement-Level Results." *Nation's Report Card*. <https://www.nationsreportcard.gov/reading/nation/achievement/?grade=8>.
- National Center for Education Statistics. 2022a. "Administrators Report Roughly Half of Public School Students Began 2022–23 School Year Behind Grade Level in At Least One Academic Subject." Institute of Education Sciences press release, February 9. [https://nces.ed.gov/whatsnew/press\\_releases/2\\_09\\_2023.asp](https://nces.ed.gov/whatsnew/press_releases/2_09_2023.asp).
- National Center for Education Statistics. 2022b. "Fast Facts: Back-to-School Statistics." Institute of Education Sciences. <https://nces.ed.gov/fastfacts/display.asp?id=372>.
- National Center for Education Statistics. 2023. "Fast Facts: Expenditures." Institute of Education Sciences. <https://nces.ed.gov/fastfacts/display.asp?id=66>.
- Nickow, Andre, Philip Oreopoulos, and Vincent Quan. 2020. "The Impressive Effects of Tutoring on PreK-12 Learning: A Systematic Review and Meta-Analysis of the Experimental Evidence." NBER Working Paper no. 27476, July. <https://www.nber.org/papers/w27476>.
- Nielsen, Eric. 2023. "The variance of achievement increases during childhood," Federal Reserve Board of Governors working paper.
- Nye, Barbara, Larry V. Hedges, and Spyros Konstantopoulos. 2000. "The Effects of Small Classes on Academic Achievement: The Results of the Tennessee Class Size Experiment." *American Educational Research Journal* 37, no. 1: 123–51.
- Peters, Scott J., Karen Rambo-Hernandez, Matthew C. Makel, Michael S. Matthews, and Jonathan A. Plucker. 2017. "Should Millions of Students Take a Gap Year? Large Numbers of Students Start the School Year above Grade Level." *Gifted Child Quarterly* 61, no. 3 (July): 229–38.
- Reardon, Sean F. 2011. "The Widening Academic Achievement Gap between the Rich and the Poor: New Evidence and Possible Explanations." In *Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances*, edited by Greg J. Duncan and Richard J. Murnane, 91–116. New York: Russell Sage Foundation Press.
- Rivkin, Steven G., Eric A. Hanushek, and John F. Kain. 2005. "Teachers, Schools, and Academic Achievement." *Econometrica* 73, no. 2 (March): 417–58.
- Rockoff, Jonah E. 2004. "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data." *American Economic Review* 94, no. 2 (May): 247–52. <https://www.jstor.org/stable/3592891>.
- Rothstein, Jesse. 2010. "Teacher Quality in Educational Production: Tracking, Decay, and Student Achievement." *Quarterly Journal of Economics* 125, no. 1 (February): 175–214. <https://www.jstor.org/stable/40506280>.

- Schachter, Ron. 2013. "Solving Our Algebra Problem: Getting All Students through Algebra I to Improve Graduation Rates." *District Administration* 49, no. 5: 43–46.
- Shores, Kenneth, and Matthew P. Steinberg. 2022. "Fiscal Federalism and K–12 Education Funding: Policy Lessons from Two Educational Crises." *Educational Researcher* 51, no. 8: 551–58.
- United States Department of Education. 2016. *Non-Regulatory Guidance: Using Evidence to Strengthen Education Investments*. Washington, DC: US Department of Education, September 16.
- United States Department of Education. 2021a. "American Rescue Plan Act of 2021: Elementary and Secondary School Emergency Relief Fund (ARP ESSER)." US Department of Education fact sheet, March. [https://oese.ed.gov/files/2021/03/FINAL\\_ARP-ESSER-FACT-SHEET.pdf](https://oese.ed.gov/files/2021/03/FINAL_ARP-ESSER-FACT-SHEET.pdf).
- United States Department of Education. 2021b. "Supporting School Districts in Timely Investment of American Rescue Plan Act Funds." US Department of Education fact sheet, September. <https://oese.ed.gov/files/2021/09/Pre-award-costs-F09-01-2021.pdf>.
- United States Department of Education. 2023. "American Rescue Plan Elementary and Secondary School Emergency Relief Funds (ARP ESSER): State and Local Educational Agency (LEA)/School District Plans." Office of Elementary and Secondary Education, last updated April 26. <https://oese.ed.gov/offices/education-stabilization-fund/elementary-secondary-school-emergency-relief-fund/stateplans/>.
- United States Department of Health and Human Services. 2021. "Head Start Program Facts: Fiscal Year 2021." Head Start/Early Childhood Learning and Knowledge Center. <https://eclkc.ohs.acf.hhs.gov/sites/default/files/pdf/hs-program-fact-sheet-2021.pdf>.
- Weidner, Ross, and Jonathan Fagg. 2021. "Some CPS High Schools Report Nearly Half of Students Absent during Remote Learning." *ABC7 Eyewitness News*, March 6. <https://abc7chicago.com/chicago-public-schools-cps-high-school-remote-learning/10391713/>.
- Zerpa, Mariana. 2022. "Short and Medium Run Impacts of Preschool Education: Evidence from State Pre-K Programs." Working paper. September. [https://www.dropbox.com/s/7a8as23rgj7dx7x/Prek\\_Sep2022.pdf?dl=0](https://www.dropbox.com/s/7a8as23rgj7dx7x/Prek_Sep2022.pdf?dl=0)

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## About the Aspen Economic Strategy Group

The Aspen Economic Strategy Group (AESG), a program of the Aspen Institute, is composed of a diverse, bipartisan group of distinguished leaders and thinkers with the goal of promoting evidence-based solutions to significant U.S. economic challenges. Co-chaired by Henry M. Paulson, Jr. and Timothy F. Geithner, the AESG fosters the exchange of economic policy ideas and seeks to clarify the lines of debate on emerging economic issues while promoting bipartisan relationship-building among current and future generations of policy leaders in Washington.