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Theme 4: Opening-up better school/back-to-school operations and systems

Building back better to avert a learning catastrophe: Estimating learning loss from COVID-19 school shutdowns in Africa and facilitating short-term and long-term learning recovery

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Abstract

We model learning losses due to the COVID-19 pandemic and the potential for cost-effective strategies to build back better. Data from Early Grade Reading Assessments in Ethiopia, Kenya, Liberia, Tanzania, and Uganda suggest half to over a year's worth of learning loss. In modeling losses over time, we found that learning deficits for a child in grade 3 could lead to 2.8 years of lost learning by grade 10. While COVID-19 has stymied learning, bold, learning-focused reform consistent with the literature reviewed in this paper—specifically reform on targeted instruction and structured pedagogy—could improve learning even beyond pre-COVID-19 levels.

1. Introduction

The COVID-19 pandemic forced over 1.6 billion children temporarily out of school at the height of school closures (UNESCO, 2020a). In the UNICEF Eastern and Southern Africa Region,[1] 127 million school-going children were sent home at the end of March, and as of the end of November 2020, about two-thirds were entitled to return.[2] Of the many impacts school closures have had on children, loss of learning is likely to be particularly severe and to disproportionately affect the most vulnerable. Furthermore, this shock to children's learning has occurred in the context of a preexisting learning crisis in which 87% of 10-year-olds in sub-Saharan Africa are unable to read a simple story (World Bank, 2019).

The paper offers insights into the impact on learning of the COVID-19 shock and the mitigation strategies countries can undertake as they reopen and strengthen their education systems to emphasize learning. First, we present a model of the potential scale of learning loss using student learning data from Ethiopia, Kenya, Liberia, Tanzania, and Uganda (the sub-Saharan African countries for which we have the most comprehensive data available) and examine implications for equity[3]. We then explain our model of the potential long-term consequences of short-term learning losses. Second, we describe cost-effective direct educational and classroom interventions to stem learning loss and improve children's foundational skills. Third, we explore how education systems can implement reforms and rapidly deploy programs at scale to provide immediate learning recovery and lay the groundwork for changes that could enable long-term learning progress.

2. Estimating Learning Loss in Sub-Saharan Africa

The growing evidence base of the impact of school closures during summer breaks, natural disasters, and teacher strikes has shown large learning losses in high-, middle- and low- income countries (Andrabi et al., 2020; Cooper et al., 1996; Jaume and Willén, 2019; Slade et al., 2017b).

In the context of COVID-19, World Bank simulations have suggested that learning-adjusted years of schooling (LAYS; see Authors, 2020f) could fall from 4.9 years to 4.5 years in sub-Saharan Africa as a result of the time children spend out of school. This deficiency could result in a lifetime earnings loss of US$2,375 to US$6,848 per person in sub-Saharan Africa (Azevedo et al., 2020). Some of the first direct evidence of learning loss during COVID-19, from

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[1] The UNICEF Eastern and Southern Africa Region is made up of 21 countries: Angola, Botswana, Burundi, Comoros, Eritrea, Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Namibia, Rwanda, Somalia, South Africa, South Sudan, Tanzania, Uganda, Zambia, Zimbabwe.

[2] This is an estimate based on the grades that were officially open in the UNICEF Eastern and Southern Africa Region. The actual proportion back in school will be significantly lower due to out-of-school children and nonreturnees.

[3] For the purpose of this study, we are defining equity in terms of learning performance and being at risk for falling behind, rather than other dimensions of equity.

Maldonado and De Witte (2020), showed that students in the “COVID cohort” that suffered from school closures in Belgium had 0.19 standard deviations (SD) lower scores in mathematics than prior cohorts of students on standardized tests. Learning loss is often not evenly distributed; for example, data from the Netherlands showed a 0.08 SD loss overall, but 55% of the loss was concentrated in families with less educated family members (Engzell et al., 2020).

2.1 Estimating learning losses during school closures

As few countries in sub-Saharan Africa had new data on learning as of December 2020, we drew on existing learning data from Early Grade Reading Assessment (EGRA) results to estimate learning losses across the five African countries.

We consider learning loss to be a combination of learning “deterioration” of knowledge that is forgotten over time, as well as the “opportunity cost” of lost learning, i.e., the learning that students would have gained during a typical year of schooling had school closures not occurred. For learning “deterioration,” we used a standard value based on prior evidence from long holidays between school years (“summer loss”) of about 10% (Coe et al., 2020). For the “opportunity cost,” we derived parameter values from our data on typical learning gains for the time a child would normally be in school but was out due to school closures. For example, consider a student who learns 20% more reading comprehension on a given scale as they progress through grade 3. In a country such as Kenya, with a 38-week school calendar, this would equate to an approximate gain of 0.52% per week (assuming this learning trajectory is constant across weeks) and thus to a 0.52% loss (opportunity cost) for each week that schools were closed for a grade 3 student. While one can postulate that student progress through the school year might not be linear, emerging evidence suggests that this is not implausible for certain grade levels (Authors, 2020f); thus, we assumed linear student progress to simplify the representation. We also assumed that that little to no literacy and numeracy learning took place during school closures, because remote learning either was not taken up or was not effective. Available data indicated this was a reasonable assumption. For example, only 22% of Kenyan learners had any access to digital learning materials, with far fewer using the distance learning approaches provided by the Kenyan government consistently (Uwezo, 2020). Another study from 37 countries further disaggregated access to distance learning opportunities by socioeconomic status and found that only 1% of poor learners had access to internet for learning (Edwards, 2020). uni (2020) estimates that 50% of children (67 million out of 135 million) in the Eastern and Southern Africa region could not be reached by remote learning. Whilst this demonstrates distance learning did not reach many students, it is possible that the most advantaged children may have maintained their learning. As a result, our assumption of no learning during school closures may lead to an underestimation in the divergence between advantaged and disadvantaged students.

To estimate losses across countries, we examined distributions of oral reading fluency scores from students in consecutive grades (e.g., data sets with grade 1 and grade 2; grade 2 and grade 3). Our overall modeling approach and assumptions began with more than 100 recent early grade reading data sets from countries around the globe, which we then pared down to sub-Saharan Africa-only countries for the majority of this paper. These datasets include EGRA results from 2014 to 2016. Accordingly, they are used to represent 'typical' annual learning gains in these countries, as opposed to true baseline distributions for use in our learning loss calculations. In nearly all the data sets analyzed, we consistently found parallel distributions of gains in scores for students in consecutive grades in the middle of the distribution, as described in Authors (2020e). In other words, the expected gains for one year of schooling were constant for students in the middle of the distribution of scores. However, this trend did not hold for students in the tails of the distribution, particularly those at the lower end. While many nonreaders (i.e., those students reading zero correct words per minute, or cwpm) were able to make significant progress with a typical year's worth of learning, their lower initial scores and lack of security with reading skills means that they are at greater risk for suffering substantial learning losses without access to regular reading practice. Therefore, we estimated differences in learning losses across the distribution as well as simple averages.

We explored effects at all points on the distributions for each country-language data set within these five countries. Our estimates were driven by the following parameters:

1. *Start of school year and date of school closure.* These dates constituted the amount of schooling obtained for a given context. We estimated learning gains by calculating the proportion of school year completed relative to typical full-year gains.
2. *Expected and actual date of school reopening.* The school reopening date determined the amount of time out of school. Losses were calculated in terms of weeks out of school. Therefore, longer school closures led to larger expected losses (in terms of both deterioration and opportunity cost).
3. *Bottom tail.* We defined the bottom tail of the distribution as the proportion of students unable to read at least 10 cwpm. Although most students throughout the distribution had their losses estimated as a function of time out of school relative to their expected gains, our model assumed students who were unable to read more than 10 cwpm at the time of school closures were nonreaders (i.e. 0 cwpm) due to the extended school closures and the fragility of their limited pre-crisis reading ability.

In Figure 1, using examples from Kenya and Liberia, we illustrate how we applied the model to each country's existing data. The data used are from EGRA surveys completed in Liberia toward the end of grades 2 and 3, and in Kenya in grades 1 and 2 (see additional details in Table 1). The expected increase from the lower to upper grade in the two countries is shown as the vertical distance between those end-of-year points: a gain of roughly 12 cwpm between grades 2 and 3 in Liberia and 24 cwpm between grades 1 and 2 in Kenya. Our model simulated the interrupted school year for the upper grade in each country.

Given the difference in the school calendars for these two countries, we can see that the closing of school in March 2020 occurred at different points in the school year. In Liberia, where the school year starts in September, the interruption occurred more than halfway through the year. In Kenya, where school starts in January, the interruption occurred less than three months into the year. Therefore, the proportion of a "normal" year's progress students would have made when school closed is decidedly different in these two countries: 29% in Kenya and 67% in Liberia.

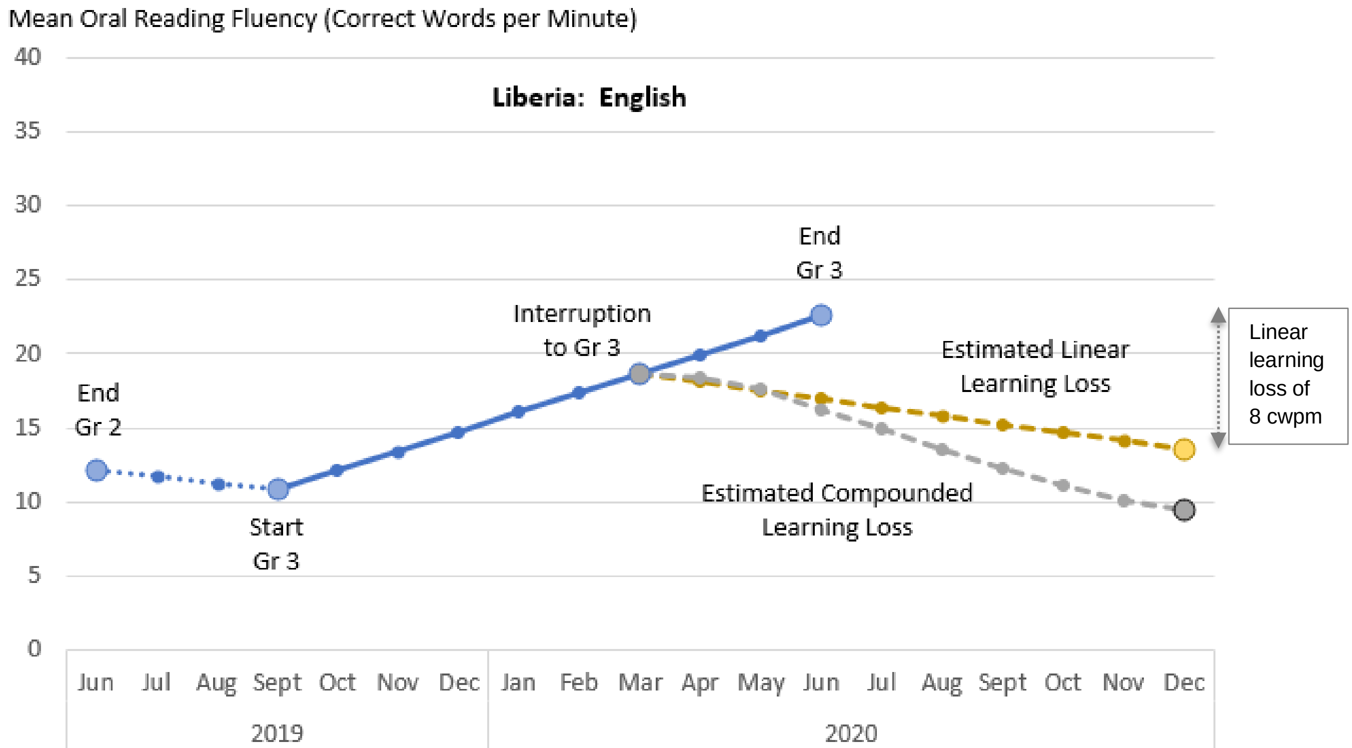
We then simulated learning loss using two methods. The first method assumed a linear deterioration of learning as time passed (following our assumption of linear learning gains and an approximate 10% linear deterioration for a typical summer-length school closure). The second assumed that learning loss was compounded for each additional week that students were out of school (i.e., instead of each week out of school accounting for the same amount of learning deterioration, it's assumed that deterioration increases with each additional week). We included both the linear and compounded estimates in these depictions to compare various sets of assumptions regarding how time away from school would impact young learners.

The total learning loss due to expected deterioration and the missed opportunity to learn is the vertical distance between the ends of the loss projection (the yellow or gray line) and the typical learning trajectory (the end of the blue line), in Figure 1. In the case of English in Kenya, we estimated a total linear learning loss of 28 cwpm; for English in Liberia, we estimated 8 cwpm. Because students are expected to return to school in the same grade they were in when schools closed, we calculated the estimated losses from the end of a typical grade trajectory. However, it is clear from Figure 1 that as of December 2020, school closures were extending well beyond the end of a typical school year in many instances, and therefore these losses can be seen as lower-bound estimates (since they do not account for the opportunity cost of students beginning a new school year in the ensuing grade).

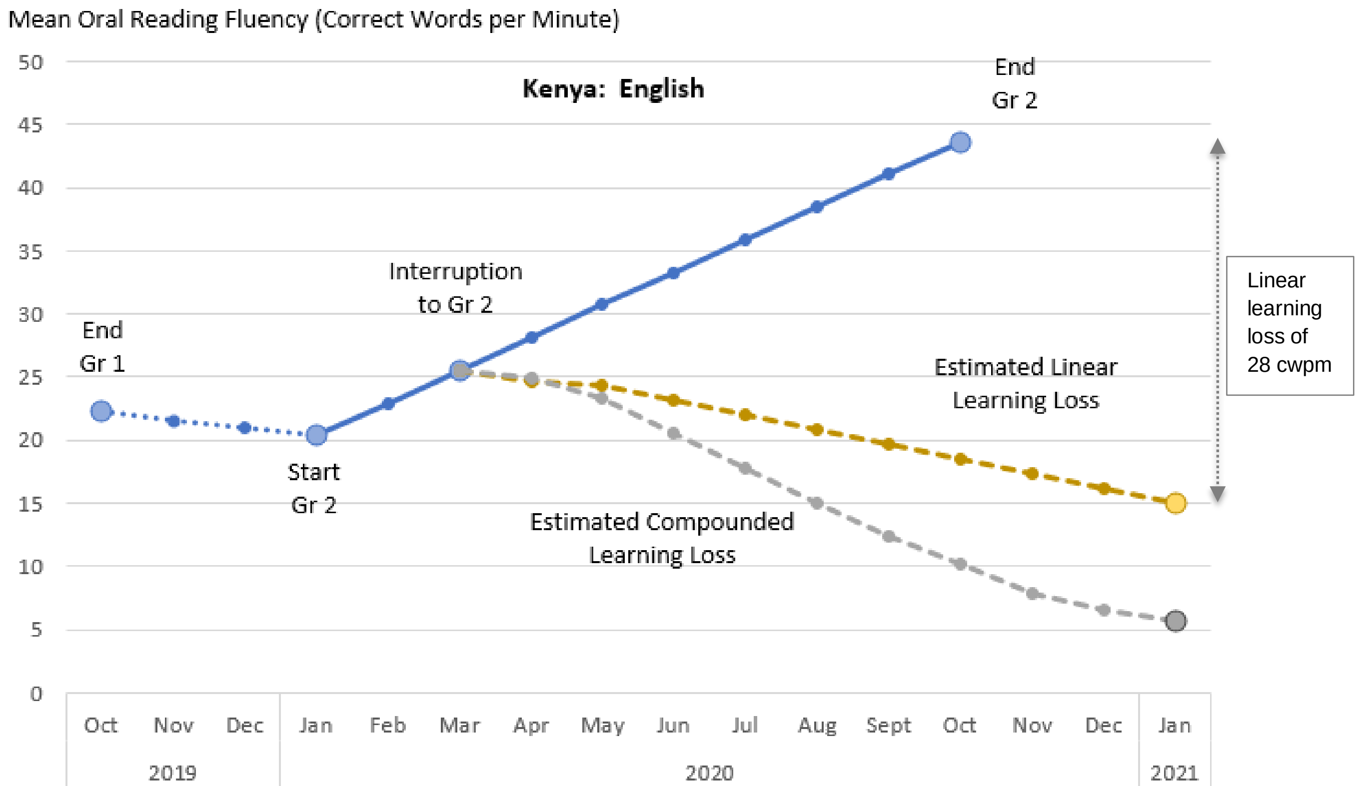
As Figure 1 shows, if loss were compounded, it would push Liberian and Kenyan students back below the starting point of the interrupted grade, and more severely in Kenya, where the compounded model projected students falling to less than half their previous level of reading ability. Due to the potentially unrealistic severity of these losses in extended school breaks, we chose to rely on the more conservative linear loss estimates for the remainder of this paper (noting that these may therefore provide lower bound estimates, if there is truly a compounding effect over time).

Figure 1: Estimated linear and compounded learning loss by level of oral reading fluency (ORF) in Liberia[4] and Kenya

[4] The solid lines represent real data. All data used in this paper were collected prior to 2019. We assume similar reading distribution patterns would occur for these countries in 2019/2020 had COVID not occurred.



Source: Liberia LTTP Endline 2015

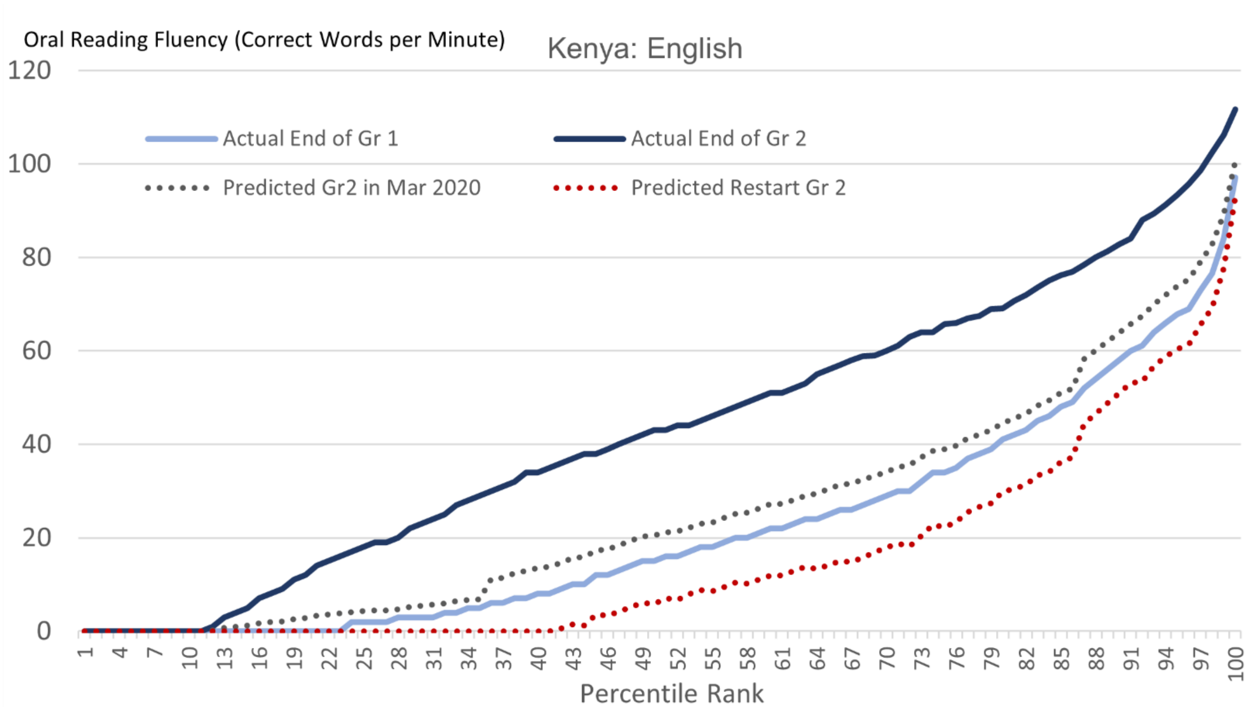


Source: Kenya Tusome Midline (2016)

Figure 1 models learning loss only at the mean. Understanding how prolonged school closures impact students across the full spectrum of learning levels requires analyzing the distribution of prior levels of reading proficiency—paying particular attention to students with the lowest levels of reading proficiency.

In this section, we use cumulative distribution plots to illustrate learning losses across the entire distribution and to highlight inequities in losses, particularly for those students in the lower end of the distribution (i.e., left tail). In Figure 2a, we show an example from Kenya (empirical data are shown with solid lines, while predicted estimates are represented by dotted lines). The black dotted line represents the estimated learning attained at the time of school closures in March 2020 (based on the proportion of the school year covered and typical learning trajectories). Predicted losses can be seen in the drop from the dotted black line to the predicted restart line (dotted red). We predict that when grade 2 students return to school in January 2021, their reading ability will be well below what it was when they finished grade 1. More importantly, our model predicted that school closures will lead to a substantial increase in the proportion of nonreaders (i.e., those students reading zero correct words per minute). While the proportion of nonreaders in Kenya was estimated to be 13% in March 2020, our lower bound estimate predicts that this rate could be as high as 42% when schooling resumes.

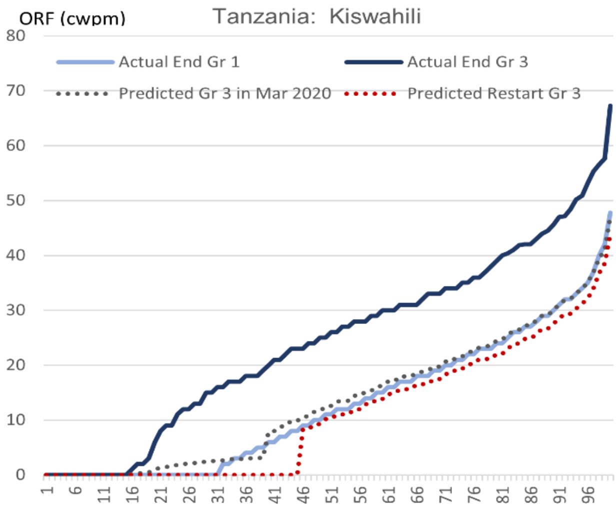
Figure 2a: Distribution of learning loss by level of oral reading fluency (ORF) in Kenya with a 42-week COVID-19 school break.



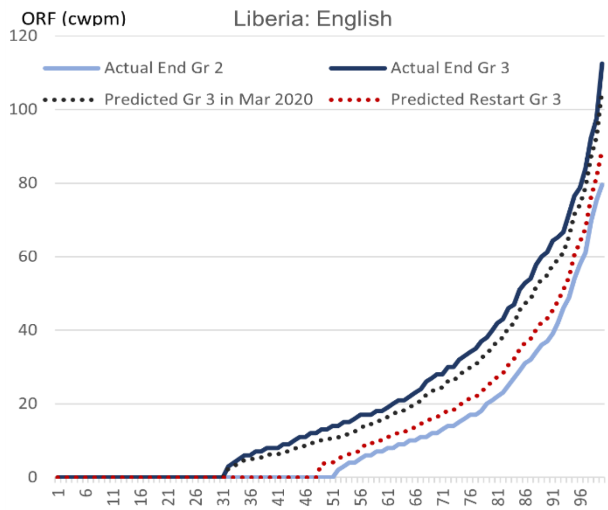
Source: Kenya Tusome Midline (2016)

Figure 2b shows estimates of loss across a set of countries in sub-Saharan Africa. Although the magnitude of the loss was driven (predictably) by time in and out of school, the inequitably large impact on struggling readers was consistent across all of these cases (as evidenced by the extended dotted red line along the *x*-axis in each figure).

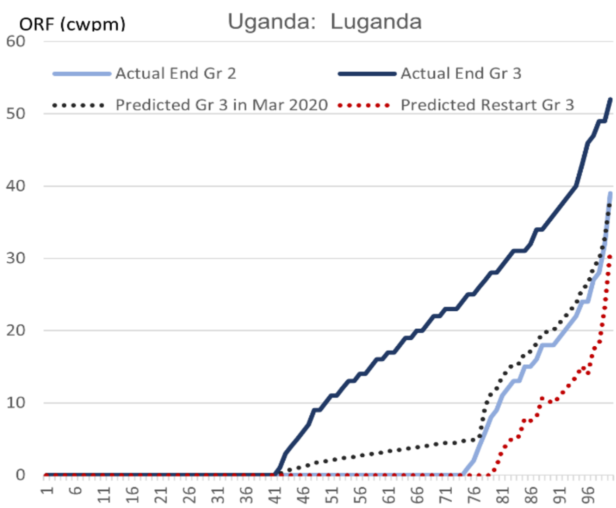
Figure 2b: Distribution of learning loss by level of oral reading fluency (ORF) in Tanzania (13-week break), Liberia (39-week break), Uganda (45-week break), and Ethiopia (33-week break)



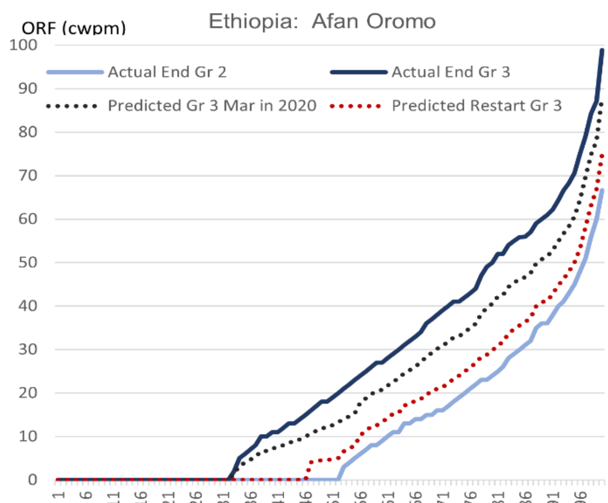
Source: Tanzania Tusome Pamoja Baseline (2016)



Source: Liberia LTTP Endline (2015)



Source: UGANDA SHRP COHORT 1 (2014)



Source: Ethiopia IQPEP (2014)

Note. ORF = oral reading fluency, cwpm = correct words per minute.

Table 1 summarizes the learning-loss calculations included in the analysis for five sub--Saharan African countries. As mentioned earlier, differences in the amount of the school year completed before the COVID-19 interruption, the length of time before schools restarted, and typical learning gains in a regular (non-crisis) year, varied across these five countries, which contributed to variations in the estimated learning loss. The table summarizes the simulated impact of school closures on the lower end of the distributions—in terms of both the percentage of students dropping from nonzero to zero scores and the resulting increases in the overall percentage of children with zero scores. Liberia had the greatest share of students reading at a low level who were predicted by the model to become nonreaders, 19%. But students learning in Amharic in Ethiopia were predicted to have the greatest percentage increase in zero scores, as 75% more children could be zero readers when schools reopen. Kenya had the largest drop in average oral reading fluency, for two reasons: (1) Kenyan students had the highest levels of fluency to begin with, so therefore they will have more to lose; and (2) Kenya may end up experiencing one of the longest interruptions to the school year (42 calendar weeks). Ugandan students were estimated to lose fully 56% of the learning they would otherwise have obtained, because they may miss an even greater amount of schooling (45 calendar weeks). Estimated losses were relatively smaller in Tanzania due to the shorter length of school closures (only 13 weeks). Overall, our model estimated that these countries could experience a cumulative 46% increase in students unable to read a single word of grade-level text and could see as much as a 51% decline in oral reading fluency at the mean. The magnitudes of these declines were not evenly distributed, as the columns to the right show, with children at the higher end of the distribution likely to lose less learning than those at the lower end.

Table 1: Estimated linear learning losses, by country

	Grades	Year	Language	% population taught in the language	Sample of the upper grade	% of school year completed at break	Weeks of COVID-related break	Mean ORF at school closure (cwpm)	% nonzero dropping to zero	% increase of zero scores	% learning loss (of nonzero scores)	Avg. learning loss (cwpm)	% change in mean ORF	% loss at given percentile			
														25th	50th	75th	90th
Ethiopia	2, 3	2014	Afaan Oromo	34%	1,218	67%	33	21	10%	22%	41%	11	-42%	na	75%	41%	33%
Ethiopia	2, 3	2014	Amharic	29%	1,603	67%	33	29	10%	75%	41%	9	-28%	100%	31%	22%	16%
Kenya	1, 2	2016	English	50%	2,344	24%	42	26	8%	64%	52%	28	-64%	100%	87%	66%	39%
Kenya	1, 2	2016	Kiswahili	50%	2,344	24%	42	15	7%	32%	52%	16	-64%	100%	100%	59%	37%
Liberia	2, 3	2015	English	100%	1,224	78%	39	19	19%	42%	49%	8	-36%	na	71%	38%	29%
Tanzania	2, 3	2016	Kiswahili	100%	670	17%	13	14	9%	53%	16%	6	-25%	100%	42%	26%	24%
Uganda	2, 3	2015	Luganda	17%	960	19%	45	6	15%	22%	56%	12	-83%	na	100%	100%	72%
Uganda	2, 3	2015	Runyankore/ Rukiga	7%	964	19%	45	5	12%	23%	56%	13	-84%	na	100%	100%	64%
Weighted average							32		12%	46%	41%	13	-51%	100%	73%	48%	36%

Our analysis reveals how several factors combine to determine the estimated severity of the learning losses that students in different countries may =experience. Where the country was in March 2020 in terms of progress toward full literacy is one prominent determinant in our model. Data from sub-Saharan Africa show that the vast majority of students in the early grades of primary school are well below what could be considered secure literacy, meaning they are more likely to experience learning loss, especially if their time out of school is spent mostly in non-literate environments. Another factor is when the COVID-19 interruption to normal classes occurred, as illustrated by the Kenya and Liberia comparisons above, which emphasizes the different amount of instructional time that took place prior to schools closing. Less time in class before school closed means less opportunity to develop additional literacy skills. And, of course, the longer students are away from school, the greater deterioration of skill can be assumed to occur. Finally, our analyses show how substantially the magnitude of learning loss depends on where a child falls in the distribution of learning outcomes within the country. Unfortunately, it appears that school closures could exacerbate inequities; those near the bottom of the distribution for whom literacy skill gains are more tenuous are likely to lose most, if not all, of the skills they had learned before COVID-19 induced school closures. This divide is likely to be further impacted by inequitable availability of and access to distance learning opportunities during school closures (e.g., favoring students from families with higher socio-economic status).

2.2 Simulating long-term learning loss resulting from school closures

We now consider how these learning losses could continue to accumulate even after children return to school. In Section 2.1, we described our model of how short-term learning losses occurring while children are out of school could accumulate even after schools reopen, and could do so with dire implications for students, particularly those who are furthest behind. If students were only marginally behind grade-level instruction before school closures, they might still benefit from day-to-day instruction once back in school. However, if students were to re-enter school further behind in the curriculum than when they departed, and if the curriculum were not adjusted accordingly, they might be too far behind to learn anything from day-to-day instruction.

When schools reopen, children are likely to be behind where they are expected to be in the curriculum and instruction—for two main reasons: (1) the learning loss they have suffered while schools were closed, as exemplified in the previous subsection; and (2) in many education systems, curriculum and instruction were already overambitious before the COVID-19 crisis (Authors, 2020h; Pritchett and Beatty, 2015). Curriculum and instruction often are not well-aligned with children's actual learning levels and needs; this begins at the start of formal schooling when the curriculum is set at a level that many children have not reached due to limited early childhood education (UNICEF, 2019) and continues through school, leaving many children to progress from grade to grade without gaining even foundational skills.[5]

If children do not receive adequate remediation to help them catch up, they could continue to fall further behind even after returning to school. Accumulated learning losses following school closures were observed in the case of the 2005 earthquake in Pakistan. Children who were affected by the earthquake missed an average of 14 weeks of school because of school closures. Four years later, these children were two years behind in learning compared to similar children who had not been affected—a deficit too large to be explained by the time out of school itself (Andrabi et al., 2020). The authors concluded that learning losses continued to accumulate after children returned, likely because children reentered school behind grade-level curriculum expectations and without remediation or adjustments to instruction they continued to fall further behind over time.

To model the potential long-term (up to grade 10[6]) learning loss due to the COVID-19-related school closures, we used a simulation model that was calibrated to replicate typical learning trajectories in low- and middle-income countries. This type of model, called a pedagogical production function (PPF), is described in detail in Authors (2020h) and Authors (2021a). A PPF allows simulation of learning trajectories for a full cohort of children and is calibrated based on the learning-profiles literature to replicate observed learning trajectories.[7] It simulates the learning that children achieve at each point in the initial distribution of their skills in each year of schooling. The PPF that we calibrated has two distinct features. First, the PPF has a range of initial skill levels within which children learn, and levels above and below which they do not. That is, if the instructional process is too advanced (e.g., teaching division to children who cannot recognize numbers) or too rudimentary (e.g., teaching number recognition to children ready for algebra), no new skills are gained. Second, the PPF has a trapezoidal functional form with a slope parameter, so that learning can vary across the initial student distribution. Here we assumed an upward sloping trapezoid, as in Authors (2020h), so that high performers learn more per year than low performers. This assumption also aligns with the estimates in Section 2.1 that initially low performers tend to learn less in a year of schooling than initially high performers. We then calibrated the model so that simulated grade 10 learning

[5] See, for example, Uwezo (2019), which found that 33% of Primary 3 to 7 (i.e., grades 3 to 7) students in Uganda could read a Primary 2 level story; and Muralidharan et al. (2019), whose study in Delhi, India, found that on average, children in grade 8 were at a grade 4 mathematics level.

[6] Up to grade 10 corresponds to a standard course of basic education in Eastern and Southern Africa.

[7] The learning-profiles literature that informed the calibration is summarized in Authors (2020h), and covers cross-country variation in learning profiles (Authors, 2020h; Muralidharan and Singh, 2019; Pritchett and Sandefur, 2020); within-country variation in learning profiles (Akmal and Pritchett, 2019); the limited range of learning levels that gain from a given level of instruction (Beatty et al., 2018; de Hoyos et al., 2019); and the role of instructional alignment in learning profiles (Banerjee et al., 2007; Banerjee et al., 2016; Büchel et al., 2019; Duflo et al., 2011; Glewwe et al., 2009; Muralidharan et al., 2019).

outcomes would replicate average learning outcomes among the seven countries that participated in the PISA-D assessments.[8]

To simulate potential long-term learning losses from the COVID-19 school closures, we used this model to introduce a shock to a grade 3 cohort and simulated their learning trajectories and outcomes through grade 10.[9] We ran three shock scenarios informed by the severity of shocks estimated earlier in this section. We then converted the modeling based on EGRA data in Section 2.1 into "years of learning lost." This analysis revealed that children in Tanzania are likely to have lost about half a year's worth of learning. Among the samples in Ethiopia and Liberia, the model suggested learning losses of about three-quarters of a year's worth of learning, and the remaining countries could have learning losses of more than 1.25 years' worth of learning. To model long-term learning losses, we first modeled a scenario that reduced grade 3 learning gains by one-half, and simulated learning trajectories and outcomes through grade 10. We then modeled initial losses in grade 3 of three-quarters of a year, and finally of one year's worth of initial learning loss,[10] each time simulating learning trajectories and outcomes through grade 10. In these scenarios, we assumed children would reenter business-as-usual schooling, with no adaptations to instruction to account for the periods of closure.

Our estimates found that reducing grade 3 learning by one-half resulted in 1.5 years' worth of learning loss by grade 10.[11] School closures that reduced learning by three-quarters of a year for the grade 3 cohort reduced their eventual grade 10 learning by 2.2 years. In this scenario, by grade 10, 92% of in-school children would have fallen behind the level of instruction and would not be learning. Finally, reducing grade 3 learning by one year resulted in long-term learning loss of 2.8 years by grade 10. Fully 97% of in-school children were far enough behind that they would not be learning by grade 10. In each scenario, children would reenter school increasingly further behind the level of instruction and curriculum. As a result, they would continue to miss out on learning even after they were back in school.

To showcase how COVID-19 has exacerbated the preexisting learning crisis, the overall basis of the graph in Figure 3 is a typical education system with 10 years of schooling. We then adjusted these years of schooling for an illustrative low-quality education system, assuming

[8] PISA-D: Program for International Student Assessment for Development, spearheaded by the Organisation for Co-operation and Development. Only in-school children are included in most international learning assessments, including PISA-D. Across the seven countries that have participated in PISA-D (Cambodia, Ecuador, Guatemala, Honduras, Paraguay, Senegal, and Zambia), only 43% of 15-year-olds were in school and eligible for the assessments. In calibrating the PPF model, we assumed that low-performing children would drop out first—i.e., that dropout would be endogenous to performance—and calibrated the model so that the top 43% of the initial distribution would replicate PISA-D results in grade 10 (the average grade for 15-year-olds). More details on this calibration, as well as results using an alternative dropout assumption, are given in Authors (2020h).

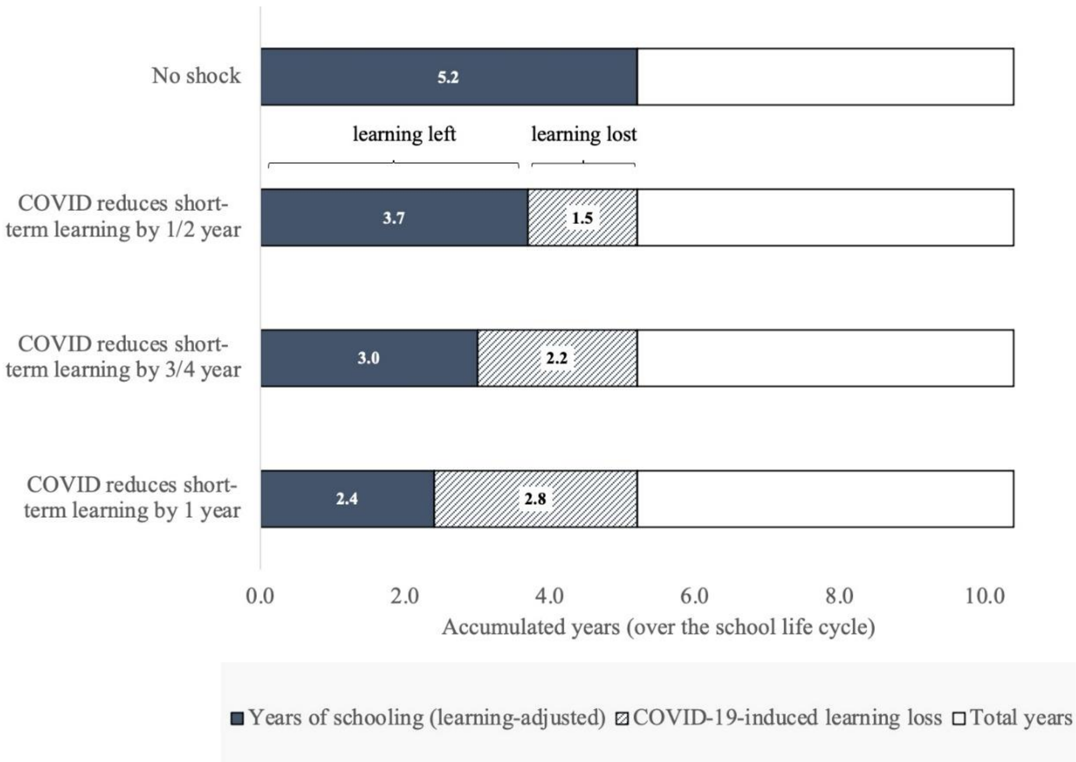
[9] The grade 3 cohort is illustrative; the shock could be introduced for any grade cohort.

[10] We treated one year's learning loss as a "pessimistic" scenario, but based on the EGRA modeling, even this scenario could underestimate losses for countries that could lose 1.25 years' worth of learning or more.

[11] To report results in terms of "years of learning lost," we converted from points on the PISA scale using the average grade 1 learning gain of 36 points. See Authors (2020g) for more details.

students learn around half of what they do in high-quality education systems, resulting in 5.2 learning-adjusted years of schooling (LAYS) (Authors, 2020f); see the status quo bar (the "no shock" scenario before COVID-19 school closures). We mapped our three scenarios of accumulated learning losses in terms of "years lost" on top of this prior gap in quality education. In the most severe case, where a one-year shock resulted in 2.8 years lost by grade 10, the average student would be left with the equivalent of just 2.4 out of a total of 10 years of schooling.

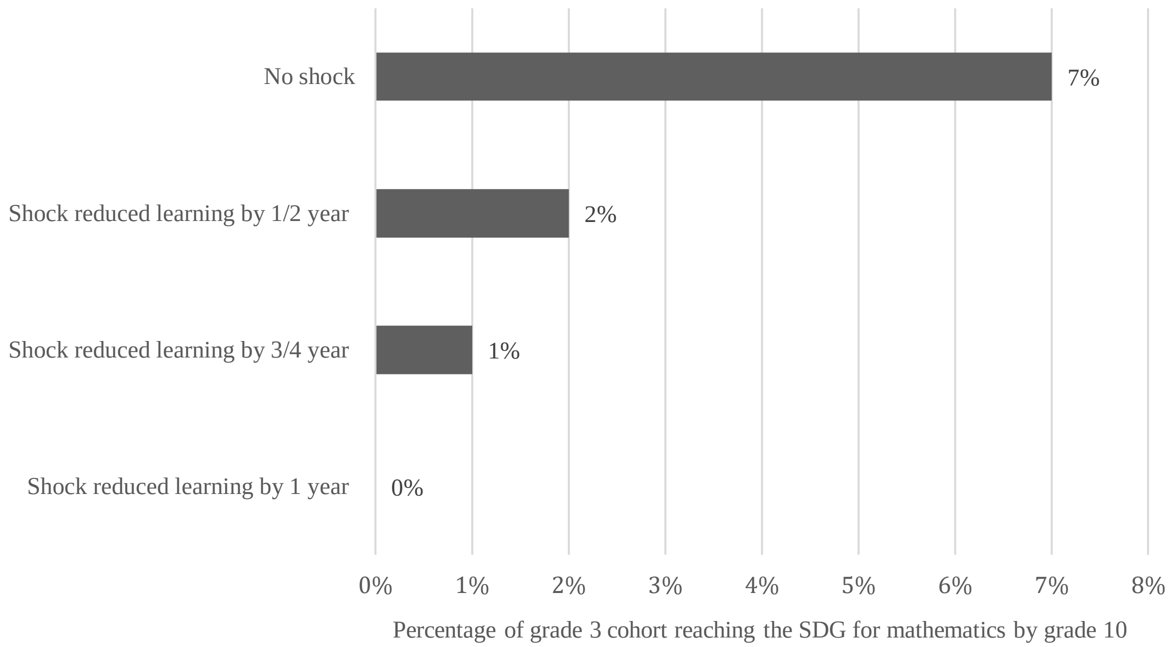
Figure 3: Modeling the accumulated long-term lost learning from COVID-19 school closures for a grade 3 cohort: Equivalent years of learning behind in grade 10 compared to the counterfactual of no shock



Source: Data used to calculate Learning-Adjusted Years of Schooling is derived from the World Bank Human Capital Index. Modeled learning loss is derived using estimates from this study.

The model also allowed simulation of the percentage of the cohort reaching the Sustainable Development Goal (SDG) of minimum proficiency in mathematics (SDG Indicator 4.1.1). One established measure of minimum proficiency is reaching a Level 2 on the PISA assessment, roughly equivalent to a score of 400 (Atinok, 2017). Figure 4 shows the percentage of today's grade 3 cohort in a typical low- or middle-income country who would be on track to reach the SDG target of minimum proficiency by grade 10 in each shock scenario, including the counterfactual of no shock (if COVID school closures had not occurred). With no school closures, 7% of this cohort of grade 3 students in our sample of countries were on track to reach the SDG for mathematics. A shock that reduced grade 3 learning by half, without mitigation, reduced the percentage estimated to reach the SDG in our simulation to just 2%. A shock of three-quarters of grade 3 learning reduced those reaching the SDG by grade 10 to 1%, and a shock of a full year's worth of learning reduced it further to 0% reaching the SDG by grade 10.

Figure 4. Percentage of grade 3 cohort reaching the Sustainable Development Goal (SDG) of minimum proficiency in mathematics in each simulated scenario



Source: Modeled learning loss is derived using estimates from this study.

3 Mitigating Learning Loss and Maximizing Learning Gains

Although the COVID-19 school closures are likely to result in dire learning losses, they have also created the urgency and, potentially, the opportunity to institute practices and policies that were already needed to address the underlying learning crisis and to recover from the COVID-19 crisis.

While the COVID-19 pandemic is a unique crisis, it has exacerbated challenges that already existed pre-pandemic: overambitious and rigid curricula (also mentioned in Section 2.2),[12] large

[12] The challenge of overambitious curricula is common across many low- and middle-income countries where children enter schools without school-ready competencies, are expected to keep pace with grade-level material that is far above their actual learning level, study in a language that they lack mastery in and learn in a context which moves at a pace at which they cannot keep up as teachers teach to the median level (Abadzi, 2006). A randomized evaluation that measured the impact of providing textbooks to students in Kenyan classrooms found no improvements in learning for the average student. However, the textbooks did improve learning for the highest-scoring students: those who could read the English-language textbooks, most students' third language. This finding

classes with high heterogeneity, teachers with low levels of content knowledge and pedagogic skill, high levels of teacher absenteeism, students falling substantially below grade-level expectations and lacking mastery of basic numeracy and literacy skills, limited and unsupportive learning conditions at home for children, and lack of support for teachers (Abadzi, 2007; Banerji and Chavan, 2016; Authors, 2020c; Glewwe et al., 2009; Pritchett and Sandefur, 2020; Karamperidou, 2020; UNICEF, 2020b; Uwezo, 2016; World Bank, 2018).

This list of challenges is not intended to be exhaustive; rather it serves to highlight primary challenges that were in place pre-pandemic and that COVID-19 school closures are likely to exacerbate. For example, greater variation within classrooms is expected as children re-enter school; many students will fall behind, but some children who can access learning support at home will maintain grade-level expectations (Carvalho and Hares, 2020); and the demands on teachers to implement health and safety rules will increase. Critically, with tightening fiscal space into the medium term (Muchabaiwa and Cummins, 2020), cost-effective solutions to support high-quality instructional practices are needed.

To address the challenges exacerbated by COVID-19 school closures, in Section 3.1, based on a review of the literature, we outline two highly cost-effective interventions to improve learning. In Section 3.2 we then model how approaches like these can help mitigate the learning losses simulated in Section 2, as well as the potential for curricular and instructional reforms that could be enacted in response to the COVID-19 crisis, not only to make up for losses, but also to improve education systems to deliver learning gains above their pre-COVID-19 levels.

3.1 Lessons from the evidence

To address the learning losses due to the pandemic, and at the same time address the barriers to learning that predated the pandemic, we highlight lessons from the evidence on improving children's foundational skills in literacy and numeracy. Our review builds on a growing evidence base of direct educational and classroom interventions that have worked at scale in low- and middle-income countries to improve foundational skills.

A review by Authors (2020b) compared over 150 education impact evaluation studies using randomized controlled trial or quasi-experimental methods across 46 low- and middle-

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suggests that the textbooks were written at the appropriate level for high-scoring students who could follow the curriculum, but that lower-scoring students may need textbooks better suited to their level (Glewwe et al. 2009). Data from a number of countries have further suggested that children are unable to keep pace with curriculum expectations and are falling far behind. In 2018, over 20% of grade 2 students in Tanzania could not read a single word. These rates were as high as 60% to 80% of grade 2 students in Uganda, Ghana, and Malawi (World Bank, 2018). A similar picture emerges for grade 2 students unable to perform basic mathematical operations. As of 2018, over 80% of students in Uganda, at least 60% of students in Ghana and Kenya, and over 10% of students in Malawi were unable to complete two-digit subtraction (World Bank, 2018). In this environment, children who have fallen behind, stay behind, because they are unable to grasp grade-level material during day-to-day instruction. If they lack the building blocks of foundational skills, higher-order competencies will remain out of their grasp. Furthermore, children must master these foundational skills early in their schooling years to engage in later learning (Belafi et al., 2020).

income countries using a unified education measure: learning-adjusted years of schooling or LAYS. Their review complemented a series of additional evidence reviews (Conn, 2017; Evans and Mendez Acosta, 2020; Evans and Popova, 2016; Friedman et al., 2016; Ganimian and Murnane, 2016; Glewwe and Muralidharan, 2016; Kremer et al., 2013; Snilstveit et al., 2015). The review also feeds into a new effort by the World Bank, the Building Evidence in Education (BE2) working group, and United Kingdom's Foreign, Commonwealth & Development Office (FCDO) to prioritize cost-effective education investments in a series of "Smart Buys" notes. This effort is stewarded by a Global Education Evidence Advisory Panel, and is informing the UNICEF Foundational Literacy and Numeracy initiative (World Bank et al., 2020).

Results from the Authors (2020b) review revealed that while many education interventions were unfortunately not effective, some were highly cost-effective, providing up to three years of high-quality schooling among the most effective education systems. Two categories of pedagogy improvements which stood out in this review were (1) targeting instruction to a child's level; and (2) introducing structured pedagogy programs, which combine structured lesson plans, student books, teacher training, and instructional support. The median gain for both approaches was around 3 LAYS per US$100. To put these effects in context, these learning gains were nearly equivalent to the system-level education gap between Zambia (5 LAYS), one of the lowest performers in sub-Saharan Africa; and Kenya (8.5 LAYS), one of the highest performers (World Bank et al., 2020).

This evidence is consistent with rigorous research demonstrating that approaches providing school-based inputs alone or offering general-skills teacher training have not improved learning. Instead, the evidence points to the promise of teaching and learning shifts that emphasize foundational skills for a portion of the day, alongside structured support to teachers. Below, we describe in more detail these two robust evidence-based pedagogical principles that can cost-effectively improve learning

3.1.1 Structured pedagogy

Recent reviews—including Conn (2017), Evans and Popova (2016), Friedman et al. (2016), and Snilstveit et al. (2015)—have consistently found that changing how teachers teach through structured pedagogy approaches improves learning in general, and foundational literacy and numeracy in particular.

Effective structured pedagogy programs are typically centrally designed and effectively delivered interventions aimed at impacting classroom behaviors. These programs equip teachers and learners with the tools and capacities to build foundational skills. The programs supply expertly developed teaching and learning materials—including teachers' guides with lesson plans, student textbooks or workbooks aligned with those lesson plans, and teacher training and ongoing expert coaching and peer-mentoring to help teachers develop the skills to follow and embed the practices within their repertoire. The governance and management of structured pedagogy programs in the system are designed to secure consistent implementation at scale.[13]

Four components (two core and two additional) of structured pedagogy approaches seem to consistently be included in effective programs. Teacher professional development that is practice-based and focused on instructional behaviors in the classroom makes a difference (Authors, 2018c). This initial teacher training is reinforced by coaching, in order to reinforce the skills in the classroom (Authors, 2015; Authors, 2020d). Secondly, simplified teaching and learning materials, including teachers' guides matched with student textbooks, have been more effective at improving learning than detailed word-for-word guides (Authors, 2018b; World Bank et al., 2020).

In addition to those two core elements to structured pedagogy, there is emerging evidence about how these programs can be made more effective. Formative assessments are critical because they provide ongoing feedback on learner levels and allow teachers to ensure teaching is appropriate for the child. Finally, primary caregiver engagement, which has become particularly relevant during the COVID-19 pandemic, may also encourage students' learning in school (Authors, 2020d). The structured pedagogy model could lend itself to harnessing technology for learning to increase cost-effectiveness, by introducing digital forms of parent and teacher support and deploying adaptive digital learning software as part of the teaching and learning materials—although empirical evidence on effectiveness is limited.[14]

Several low and middle-income contexts have provided evidence that structured pedagogy programs can be successful at improving learning outcomes at large scale (Authors, 2021b). One example is the Kenya Tusome intervention. Based on the evidence of previously piloted structured pedagogy programs in literacy (Authors, 2014) and numeracy (Authors, 2016a), the Tusome program was launched by the Kenyan President in 2015 and was implemented in all of Kenya's more than 23,000 public primary schools as well as 1,500 low-fee private schools. The program was similar to the general structured pedagogy programs in that it included textbooks at a 1:1 student-to-book ratio, in both English and Kiswahili; and it offered a government-implemented teacher coaching support system, large-scale teacher coaching using a tablet-based

[13] Effective governance and management can be seen as involving four areas: linking resources to key priorities (i.e., classroom-level change); collecting data on what matters and using the data to inform decision making and establish performance management routines; involving teachers and other front-line workers (head teachers, district and subnational officers) in owning outcomes, analyzing problems, and developing solutions; and communicating effectively to improve accountability, make rapid course corrections, and lead to culture change (Todd, 2018).

[14] In addition to pedagogical improvements, the role of parents and caregivers in a child's education has become even more relevant with school closures due to the pandemic, including leveraging low-cost, high-access "low-technology" such as mobile phones. Although these approaches have received significant attention during COVID-19 school closures, where they have become the central alternative, there is limited evidence on their effectiveness in middle- and low-income settings. Early results from a randomized trial in Botswana suggested that low-tech approaches can stem learning losses substantially and are most useful for the lowest-performing students (Authors, 2020a). However, prior evidence from three different digital technology interventions showed no additional impact above the gains from a core structured pedagogy program (Authors, 2016b). To this end, this new wave of innovation will need accompanying evidence to reveal cost-effective approaches to improve learning.

feedback system using government officers (Authors, 2017a), and ongoing teacher training using a modified cascade system managed by the Kenyan Ministry of Education (Authors, 2018a). External evaluation results showed that the percentage of children reaching government benchmarks doubled in both English and Kiswahili in both grades 1 and 2 after one year (Freudenberger and Davis, 2017). Expressed in effect sizes, the typical gains were between 0.7 and 1.0 SD across a range of literacy outcomes. Essential to the gains experienced in Kenya were that more than 80% of teachers were using the Tusome program materials either four or five days a week; and that collectively, the government coaches observed more than 20,000 classrooms every day. In short, structured pedagogy was an approach that could be used at scale by typical government officers inside of Kenya's systems.

Tusome is an example of an effective structured pedagogy program, but the evidence of this approach having an impact on learning at scale is growing, with several examples from sub-Saharan Africa (Authors, 2021). Tusome's gains were similar to those experienced in Sobral, Brazil; and Puebla, Mexico, and the core structured pedagogy components were similar, although the government management mechanisms differed (Crouch, 2020). Moreover, a recent study of eight highly effective large-scale interventions called "Learning at Scale" in low- and middle-income countries identified six of these highly effective programs (in Ghana, India, Kenya, Nigeria, Pakistan, and Senegal[15]).

3.1.2 Target teaching instruction by learning level

Nearly two decades of rigorous research from contexts as varied as Chile (Cabezas et al., 2011), Ghana (Duflo et al., 2020, Innovations for Poverty Action 2019), India (Banerjee et al., 2017; Lakshminarayana et al., 2013; Muralidharan et al., 2019), Kenya (Duflo et al., 2011), Peru (Gallego et al., 2019), and the United States (Cook et al., 2014, 2015) have shown that targeting instruction according to students' learning level rather than by their age or grade improves learning, especially foundational literacy and numeracy. Implementation models leveraging a range of tutors, community volunteers, government teachers, teaching assistants, or education technology, which provided targeted instruction for a portion of the day, have been effective.

For example, the Indian nongovernmental organization Pratham's Teaching at the Right Level (TaRL) approach first assesses children, generally in grades 3 to 5, with a simple tool. In groups based on children's learning levels rather than their age or grade, trained instructors target

[15] The most commonly cited program characteristics that these programs identified as essential to their program success were that the teacher training emphasized modeling and practicing new skills (7 programs), teachers received structured teachers' guides (6 programs), coaches were given structured tools to support teachers (6 programs), the program used face-to face training methods for initial trainings (6 programs), direct-instruction pedagogical methods were promoted (5 programs), books were available to all students at a 1:1 ratio (4 programs), the program used a phonics-based instructional methodology (4 programs), the program built capacity at decentralized levels (4 programs), and the program was designed to align with existing government education plans (4 programs). All these characteristics are typical of structured pedagogy programs, but the Learning at Scale research was able to tease out these particular characteristics that were deemed critical to the programs being successful at large scale (Authors, 2020i).

teaching using interactive activities. Children are continuously assessed and regrouped as they make progress. Six randomized evaluations in rural and urban areas of India showed that the TaRL approach increased literacy and numeracy skills by between 0.07 and 0.70 standard deviations. An evaluation of a scalable model of the approach, which trained volunteers to implement learning camps in short bursts during the school day, doubled—from 24% to 49%—the number of children who could learn enough in 50 days to be able to read a paragraph or story (Banerjee et al., 2017).

Designed with scale in mind and implemented by the government, the Teacher Community Assistant Initiative in Ghana compared the effectiveness of four targeted instruction programs: (1) in-school remedial instruction by teaching assistants; (2) after-school remedial instruction by teaching assistants; (3) grade-level instruction sessions by teaching assistants; and (4) targeted, remedial instruction by government teachers. A nationwide randomized evaluation found that the in-school and after-school models led by teaching assistants were most effective at improving learning (Duflo et al., 2020). The in-school remedial program increased test scores by 0.11-0.14 SD, and the after-school remedial program increased test scores by 0.08-0.17 SD for grade 3 and 4 students, compared to students who received no additional support at all. One year later, grade 4 students continued to experience positive impacts on learning. An evaluation of the Strengthening Teacher Accountability to Reach all Students (STARS) program in Ghana is measuring whether mentorship and support by head teachers and circuit supervisors can increase teacher compliance to implement targeted instruction approaches (Innovations for Poverty Action 2019). Preliminary results indicate that English and math test scores improved by 0.07 SD and 0.11 SD, respectively (Innovations for Poverty Action, 2019). The government of Ghana has committed to scale the STARS program to 10,000 primary schools, reaching over two million children over five years (Innovations for Poverty Action, 2019).

In addition to in-person instruction, targeted instruction has successfully been delivered through education technology in contexts with the necessary connectivity, infrastructure, and access (Escueta et al., 2017). One example is Educational Initiatives' Mindspark platform, which is an adaptive software that personalizes content based on the level and rate of progress for each student. A randomized evaluation that provided students with vouchers to attend after-school Mindspark centers improved math test scores by 0.37 SD and Hindi test scores by 0.23 SD in 4.5 months (Muralidharan et al., 2019). Other computer-assisted learning programs in high-, middle-, and low-income countries have also improved learning, especially in math (Büchel et al., 2019; Escueta et al. 2017). During COVID-19 school closures, "low-tech" approaches have been tested to target instruction through mobile phone texts and phone calls. Results showed that weekly calls and texts improved learning by 0.12 to 0.17 SD, with greater learning gains for lower-performing students, suggesting the potential of low-tech options to close equity gaps as well as average learning (Authors, 2020a) Of note, feature phones have particularly high access relative to other technologies, such as computers (Carvalho and Crawford 2020)—a critical equity consideration when using technology to target instruction.

These examples highlight the flexible and adaptable nature of targeted instruction programs, which can be implemented through a range of methods. Such programs have been particularly effective in contexts where learning levels are low, there is within-grade variation in learning levels, and teachers are inclined to teach to the top of the class. As the COVID-19 pandemic continues, we anticipate these learning barriers to become even more salient than they were pre-pandemic.

Additionally, as education systems adjust to learners re-entering school further behind grade-level expectations, they may also consider incorporating low-stakes and easy-to-use assessments such as the Annual Status of Education Report (ASER) instrument and the EGRA to diagnose children's learning levels, as a first step to target instruction by learning level.

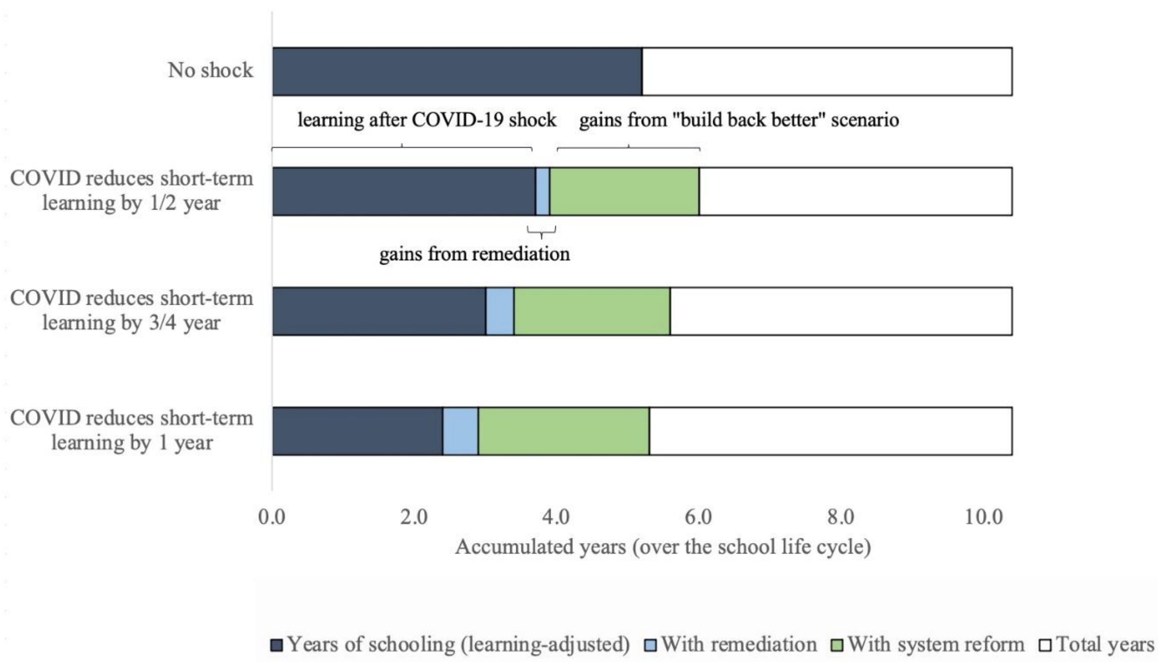
In the long term, supporting education systems in setting more realistic curriculum standards is a way to operationalize the "targeting instruction" principle and to help teachers teach foundational literacy and numeracy and foster children's learning. Although this approach itself has not yet been tested in a randomized controlled trial, it is consistent with mechanisms shown to work in dozens of trials and contexts and has some related quasi-experimental evidence. A study by Mbiti and Rodriguez-Segura (2020) evaluated the impact of a curricular reform in Tanzania that radically reduced the intended content in the grade 1 and grade 2 curriculum (removing topics such as "Vocational Skills"), and placing 80% of instructional time on foundational literacy and numeracy. Their preliminary results suggested that streamlining of the curriculum had substantial positive impacts on children's learning outcomes.

3.2 Modeling the potential for cost-effective educational investments to "build back better"

We extended the model in Section 2.2 to simulate education policies and interventions including short-term remediation and longer-term curricular and instruction reforms to mitigate learning loss and, in some cases, to *improve* learning over pre-COVID-19 trajectories. For each initial shock scenario, we simulated two mitigation approaches, both of which reflect the principles of aligning instruction with children's learning levels (Authors, 2020j). The first was a short-term remediation approach. This approach assumed that the material children missed while out of school would be covered as part of regular instruction in the year they returned to school. One example of this would be dedicating an hour each school day to a teaching at the right level approach to catch children up on foundational skills they missed. Because the instructional time required for remediation reduces the time available for regular grade-level instruction, learning losses are partially but not fully compensated in this simulation. With an initial shock of half of a year, our simulation suggested short-term remediation could mitigate long-term learning losses by 0.20 years (the blue part of the bars in Figure 5). With a shock of three-quarters of a year's initial loss, remediation mitigated long-term losses by 0.40, and with a full year's initial learning loss, remediation reduced long-term losses by 0.5 years. Figure 5 demonstrates how remediation could help partially close gaps to pre-COVID-19 levels.

Secondly, we simulated a broader curricular and instruction reform. This reform could occur if education systems were to use the COVID-19 crisis as an opportunity to align instruction with children's learning levels on a long-term basis using the methods, such as curriculum reform or structured pedagogy programs, that we have described above. We assumed that systems would conduct remediation, as described in the previous scenario, in the year children returned to school. We then assumed that, in all subsequent years, the pace of the curriculum and instruction would be adjusted so that it would better track with the pace of children's learning, meaning that more children would continue learning for longer and children were less likely to be left behind. If the curriculum pace were aligned with the pace of children's learning, and teachers were adequately supported to implement the newly paced curriculum, we could see potentially large learning gains. In all three shock scenarios, our simulations suggested education systems could improve on pre-COVID learning trajectories by introducing these reforms (these gains are represented by the combination of blue (gains from remediation) and green (gains from maintaining reforms long term to "build back better") parts of the bars in Figure 5).

Figure 5: Remediation reduces long-term learning losses; long-term system reforms could improve learning over pre-COVID trajectories



Source: Data used to calculate Learning-Adjusted Years of Schooling under the "no shock" scenario is derived from the World Bank Human Capital Index. Modeled learning loss is derived using estimates from this study.

4 Building Back Better

4.1 Examples of evidence-based government reforms improving learning during COVID-19

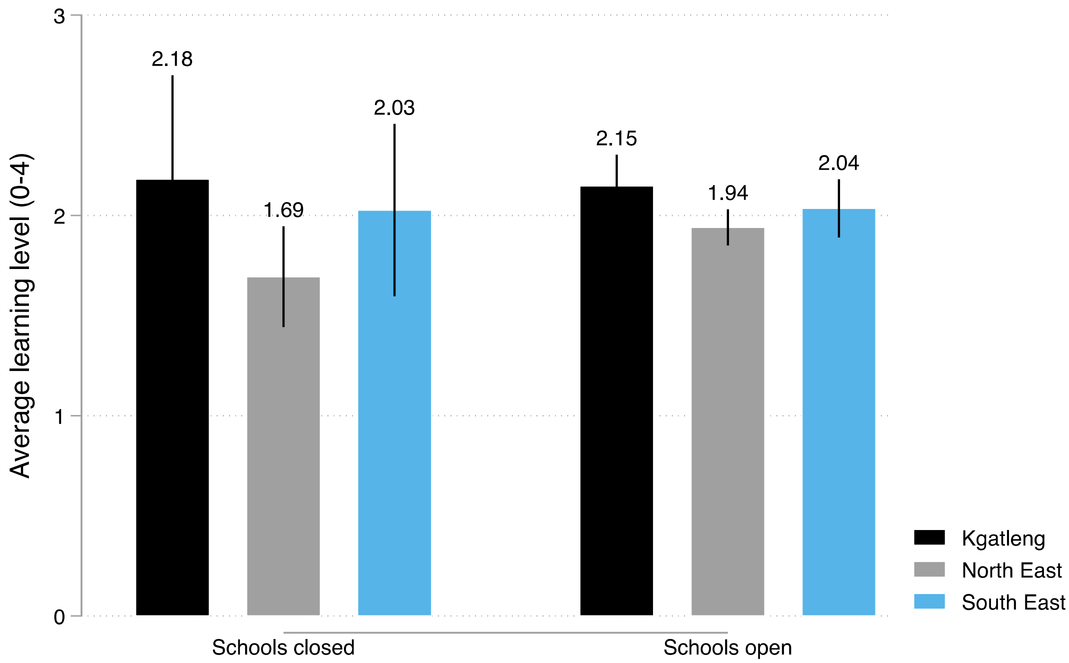
The COVID-19 crisis presents a historic opportunity to enact ambitious reforms that can foster learning. Focusing on foundational literacy and numeracy leveraging the two evidence-based approaches in Section 3 are promising ways to mitigate learning losses and improve learning to pre-COVID-19 levels. A broader version of these approaches would include. adjusting curricula and norms to be better tailored to children's learning levels. While historically, these types of reforms have been difficult to achieve (Prichett 2018; Habyarimana et al., 2020), there are signs on the African continent that such reform is possible, with COVID-19 potentially accelerating political will to act. Moreover, the approaches identified in Section 3 have shown promise across multiple countries in sub-Saharan Africa, revealing the potential to exchange promising practices across contexts.

In Botswana's second largest region in the country, the North East, in June 2020 the Ministry of Basic Education's regional director called for all schools to implement targeted instruction immediately as schools reopened, and updated staff's roles and responsibilities to formalize this expectation. Trainings were held, expectations were set for weekly reporting on progress, and the regional director has visited schools directly to monitor implementation. Although no causal evidence is available, early data suggest the region might indeed be "building back better," with learning levels in the North East region of Botswana improving faster than in other regions.

We constructed Figure 6 using learning data collected over two rounds, in April as well as late July of 2020. It shows estimated average learning levels in 2020 when schools were closed (in the first round of data collection) and after schools reopened (in the second round of data collection). Learning data captured numeracy levels for students in grades 3-5 on a scale of 0–4, coded to the highest skill level that a child had reached (i.e., no mathematical operations, addition, subtraction, multiplication, or division). Data were collected as part of a pre-existing randomized controlled trial by Authors (2020a). We have reported learning estimates from the control group to describe trends over time.

In two regions, Kgatleng and South East, learning levels when schools were closed were similar to when schools were open. In the North East, with its ambitious reforms in terms of targeting instruction and focusing on foundational literacy and numeracy, learning improved. These gains equate to about 0.25 SD. At this pace, in just a few months, students will have gained the equivalent of a year's worth of schooling in Botswana, based on typical year-on-year learning trajectories, by the end of the term in December. These early estimates are consistent with models in earlier sections suggesting that cost-effective reforms could mitigate COVID-19 learning losses and reorient education systems to improve on pre-COVID-19 levels.

Figure 6: Basic numeracy learning levels during COVID-19 school closures and building back better with big, bold reform after school reopening



Notes. Data for 846 students on learning were collected via phone in April 2020, when schools in Botswana were closed; and again in late July, when schools reopened. The instrument used was adapted from the Annual Status of Education Report (ASER) and Uwezo assessments and included formal validation tests. All data were taken from the control groups in an ongoing randomized trial, which also incorporated the results of these validity assessments (Authors, 2020a).

In South Africa, the Department for Basic Education is undertaking curriculum repackaging reforms to respond to extended school closures and the significantly reduced academic calendar. This effort has involved producing updated Annual Teaching Plans (ATPs), which guide teachers to respond to the reduced 2020 teaching time and underscore foundational skills. The 2021 ATPs were being produced as of December 2020, this focus on foundational skills is set to continue creating opportunities and permissions for teachers to mitigate learning loss.

Recognizing the severity of the learning crisis in Madagascar even before the COVID-19-enforced school shutdown,[16] and seeing that further learning loss would accrue, the Malagasy government instructed all regions to strengthen the national catch-up program, *cours de remise à niveau* (CRAN). CRAN is a summer program that provides a two-month intensive learning

[16] According to a 2018 UNICEF Multiple Indicator Cluster Survey (MICS 6), whose results can be downloaded from https://weshare.unicef.org/Folder/2AM408PUO6GQ, only 7% of children ages 7–14 had reached basic competencies in math and 23% had achieved basic competencies in reading.

period to children who dropped out in the previous two years so they can rejoin the formal classroom at grade level. By the end of 2018, CRAN had been implemented with UNICEF support in 7 out of 22 regions of Madagascar. National monitoring exercises (2017–2019) suggested that the catch-up program improved retention in school for these children at risk of dropping out; however, catch-up class students had lower pass rates on national exams at the end of the primary and lower secondary cycle. To ensure that the program reinforces the quality of learning for this vulnerable population and offers inclusive education for all students, UNICEF began working with the government to integrate targeted instruction into the catch-up program in five pilot regions. As of late 2020, the TaRL approach had been successfully implemented at small scale in Madagascar. Although the government and UNICEF are in the early stages of this work, it shows how governments can strengthen existing programs—even if small scale—to shift national teaching and learning practices to align with the cost-effective interventions documented in this paper.

Structured pedagogy programs in low and middle-income countries have had a wide variety of approaches to supporting governments in reforming educational implementation to respond to the COVID-19 era. Programs in Liberia, Ghana, Nigeria and Kenya have supported governments in the development of distance learning lessons derived from the structured pedagogy materials and delivered using radio or television during the period where schools were closed. While little rigorous evidence exists on the relative impact of these efforts on reducing learning loss, several other interventions are planning to start the 2021 academic year with a heavy emphasis on the power of structured pedagogy interventions to support catch-up. Countries as varied as Jordan, Rwanda and Kenya have planned targeted catch-up interventions built from the structured pedagogy materials in order to reduce loss and build from programs that have been shown to be successful.

4.2 Principles around at-scale reform

If and when large-scale reform occurs, a few scaling-up principles are important to consider. We first draw on the experience of an iterative evaluation process between the Abdul Latif Jameel Poverty Action Lab (J-PAL) and Pratham of the TaRL approach over 20 years, which as of late 2020 was reaching over 60 million children in India and several African countries (Banerjee et al., 2017). We emphasize four lessons from this scaling journey. First, including a variety of contexts in proof-of-concept studies can demonstrate the relevance and effectiveness of interventions across setting while also creating flexibility for future application in line with the evidence as it helps to unpack the mechanisms underpinning the approach. Second, after initial proof-of-concept evaluations, several studies can explicitly test scalable models that integrate the approach within the government school system. This suggested step relates to a broader lesson on continued rigorous testing at scale (Muralidharan and Niehaus, 2017). Third, a combination of evaluation data and process monitoring can highlight both effective and ineffective delivery models such as the range of instructors who can be trained to implement a pedagogical approach and any necessary teacher coaching or mentoring that may be needed. Fourth, even when a sweeping curriculum reform is not possible, designating specific hours for a given approach to signal government and school buy-in can make a substantial difference in ensuring a program is implemented as expected. Beyond understanding these scaling principles, knowing the context, understanding mechanisms on why programs worked, and aggregating the experience and tacit knowledge from practitioners who have driven these changes are critical to translating principles into actionable programs at scale. Additionally, sustained and consistent political, bureaucratic-technical and funding commitment is vital to maintaining focus in scaling-up and managing the inevitable challenges through the process (Sirali et al., 2015). Tested ideas are a useful starting point; tools including a generalizability framework (Bates and Glennerster, 2017) can guide application, and, ultimately, learning in the classroom requires sound implementation from partners on the ground who know local contexts.

We also draw on the Learning at Scale study (Authors, 2020i), which in 2019–2020 reviewed long-term efforts that (1) used evidence-based measures such as TaRL and structured pedagogy, and (2) both showed short-term impacts on learning and achieved sustained change at the systematic level. We highlight three overarching recommendations. The first is to invest in effectively training decentralized system actors in the program methodology and support. This characteristic is often left out of small-scale interventions due to its cost, but several programs identified it as an essential element of working with the system. The second is to design the program to align well with the existing education plans in the country, including the sector plan and budget cycle and other key government documents. Whereas this point may appear to be obvious, far too many externally supported and developed interventions have moved forward without a deep analysis of the political economy of the interventions inside of the broader governmental priorities. Pausing for this analysis step did not mean that the reviewed Learning at Scale programs simply did whatever the government plan said without considering the evidence on what works; instead, they entered into a process of negotiation and adaptation with the government about how the design of these effective programs could and should work in the systems' priorities.

The third most prevalent characteristic of these effective programs was developing and using a mechanism such as a data dashboard to share results and manage the program at national and decentralized levels. The solutions are not simply technocratic ones—the availability of data on large-scale instructional improvement, and the impact of those data on learning, are essential to support the complex process of scale-up. These "system reform" elements, in conjunction with a complex instructional reform initiative that changed classroom practice at scale, worked together to improve outcomes. Several countries are planning to leverage the materials and design of their structured pedagogy interventions to create the differentiated support needed to help children who will arrive back at school with a wide spectrum of skills.

5 Conclusion

The COVID-19 pandemic closed schools for over 1.6 billion children at the height of the pandemic. Using EGRA data from Ethiopia, Kenya, Liberia, Tanzania, and Uganda, we estimated learning losses in sub-Saharan Africa from half a year to over one year in the short term. These losses can accumulate over time: without remedial education upon school reopening, children who have fallen behind might be unable to catch up. We modeled how short-term learning deficits for a child in grade 3 could accumulate to the equivalent of 2.8 years of lost learning by grade 10.

At the same time COVID-19 has stymied learning, it also offers a chance to enact reforms and revamp education systems to respond to the growing learning crisis. We reviewed the literature and identified two cost-effective strategies to improve foundational literacy and numeracy skills: targeted instruction (such as TaRL) and structured pedagogy. We estimated a model in which bold reform consistent with these approaches—such as realigning curriculum expectations to better match children's learning levels—could potentially mitigate all of the COVID-19 learning losses, as well improve learning compared to pre-COVID-19 levels. We have documented a few early examples of governments that have started to enact reforms by early 2021. The examples to date, however, are limited and on-the-ground experience is illustrating how demanding the activities of safely opening schools is for Ministries of Education, let alone learning reforms.

We have set out principles for effective at-scale reform to support policy makers seize this historic opportunity to reorient education systems to improve learning for all. Without urgent action, short-term learning losses could stunt the next generation of students for a lifetime, with potential intergenerational consequences.

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