

Learning Loss or Learning Gain? A Potential Silver Lining to School Closures in Indonesia

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Introduction

After schools all over the world closed their doors in the first half of 2020 to curb the COVID-19 pandemic, an estimated 1.58 billion affected students are now at risk of suffering from learning loss, with those in less developed countries at a disproportionately higher risk (United Nations, 2020). This includes 69 million students in Indonesia, 60 percent of whom, as of October 2021, had yet to return to classrooms since their schools closed nineteen months prior in March 2020 (Pusdatin, 2021). With limited internet coverage, little to no live interaction between teachers and students, and a lack of teachers' skills in adjusting the materials to each of their students' ability levels, most Indonesian students are at a high risk of experiencing learning loss (Arsendy et al., 2020).

A recent study on the effect of fourteen-week school closures following an earthquake in Pakistan in 2005 showed that students who experienced learning loss due to the disaster continued to learn less than those who were not impacted even after they returned to school. The gap between the two groups continued to grow four years after the disaster (Andrabi et al., 2020). Recognising the potential long-term impact of the situation, we realise that a lack of monitoring student learning progress and effective recovery efforts could lead to permanent effects.

To add to the concern, Indonesian students have lagged behind their global peers since before the COVID-19 pandemic. Even in an actual classroom setting, Indonesian teachers still struggle to teach basic curriculum materials effectively and have a narrow focus on preparing students for high-stakes exams (Afkar et. al, 2018; Berliner, 2011). Student performance in both the Programme for International Student Assessment (PISA) and the Trends in International Mathematics and Science Study (TIMSS) have indicated that the majority failed to achieve the minimum proficiency level in all subjects and have consistently ranked amongst the lowest of the participating countries (OECD, 2019; Mullis et al., 2016). Furthermore, using nearly-nationally representative data, Beatty et al. (2021) revealed that numeracy abilities across the country have deteriorated between 2000 and 2014, despite rising average years of schooling and encouraging policies.

Key Points

- The COVID-19 pandemic has significantly affected learning practices in Indonesia, decreasing the role of teachers as instructors and instead driving parents to replicate the classroom environment at home.
- Given a supportive home environment, some students, particularly those with low initial achievement, enjoyed learning gains during school closures, as parents were able to directly teach to their level.
- However, the quality of the pedagogical tools used by schools during closures potentially determines the maximum possible level of learning during the period, as most parents solely rely on teacher-provided assignments to teach their children and other teaching resources are limited.
- A simplified curriculum may lead initially high-achieving students to suffer significant learning losses relative to their pre-pandemic counterparts, even despite a supportive environment, as they no longer have access to higher-level learning materials.
- As schools reopen, students will benefit from continued additional support in their education from their household. It is also important to reintroduce a challenging curriculum to recover potential learning losses at the upper tail of the distribution.

Given the risk of significant loss and permanence of the phenomenon in low- and middle-income countries, along with the particularly lengthy period of school closure in Indonesia, this paper aims to give an insight into the discussion on student learning progress during school closures. We will present the impact of the closures on primary school students' achievement in Bukittinggi, the third-largest city on the island of Sumatra and a highly urbanised area. The city has consistently performed well in most education-related measures due to a strong cultural emphasis on education and a supportive government (Nihayah et al., 2020), but has been significantly affected during the pandemic as most students are confined to their homes with very limited teacher-student interaction.

We use a panel sample of students from RISE Indonesia's other study in Bukittinggi. We reassessed the sample in 2020, one year after its initial assessment. We then compare the performance of each of the 2020 grade cohorts against the 2019 cohorts to measure the impact of school closures on learning outcomes. To our surprise, our findings suggest that Bukittinggi students' abilities have actually improved during school closures. This improvement is mainly driven by students with low initial achievement with no differences between genders, while initially high-performing students did in fact suffer from learning loss. The increase is large and significant in both numeracy and literacy—with the gain in numeracy amounting to approximately half of a typical Indonesian student's gain over their whole schooling years.

Learning Loss and the COVID-19 Pandemic

In past literature, the term “learning loss” had been loosely defined and employed in various contexts. Broadly, there are two main forms of learning loss that have been intensively studied. The first is the decline in learning outcomes after an extended break incorporated within the school year, such as summer holidays or grade promotions, while the second is the impact on learning outcomes of an unexpected disruption or interruption during a normal schooling period. The former is the amount of learning retained in the absence of any learning activities, while the latter represents foregone learning relative to a normal school year due to the interruption.

At a glance, school closures due to the COVID-19 pandemic may fit better with the latter form, and it is indeed the definition we employ in our study. But from our experience, learning loss within the context of COVID-19 pandemic school closures does not exactly fit neatly within the definition, and so we would like to include a caveat. Some students were able to swiftly shift to online learning, allowing their teachers to keep up with the curriculum albeit with a potential decrease in effectiveness. Others had to rely on teacher-assigned tasks or even completely cease any learning activities. Learning loss in this case can be defined as both the impact on the students' learning trend and a shift of the trajectory itself, depending on the experience of each student.

Several studies have calculated numerous projections of learning loss. Using the typical summer learning loss as a basis (as it measures the decline in learning outcomes in the absence of teaching and learning activities), Kuhfeld et al. (2020) predicted that the loss of students' literacy ability due to the COVID-19 school closure would be 1.2 times higher than the typical summer learning loss. Not only will students have lower academic achievement when they return to school, the gap between high and low achievers will also widen and necessitate teachers to further differentiate instruction. However, the summer learning loss data also showed that children who experienced a higher drop in their ability are more likely to gain more learning when schools reopen than those who only experienced a modest decline during summer.

Some studies have attempted to predict losses, specifically in low- and middle-income countries. Employing a Pedagogical Production Function (PPF) to replicate learning trajectories in low- and middle-income countries, Kaffenberger (2021) estimated that a 4-month school closure would translate into an accumulated loss of 1.5 years of schooling among the current third graders by the time they reach Grade 10 (in the absence of any mitigation efforts after school reopened). In Ghana, a considerable loss of basic numeracy ability in early grade students is also predicted to occur based on data on the decline of the students' ability during the three-month out-of-school period between graduating from the Compulsory Basic Education (CBE) programme and entering formal school (Sabates et al., 2021). The authors mentioned that the loss among young pupils is about 20 percent of what they had learned during CBE per month, worse than the loss predicted among older pupils in Kaffenberger's study.

In August 2020, the World Bank released estimations of the learning loss that Indonesia might experience in the absence of any government interventions to mitigate the loss. The pessimistic scenario (8-month closure) showed that students would suffer a loss of 0.7 years of learning. The optimistic scenario (6-month closure) did not promise a significantly better prediction; students are expected to experience a loss of about 0.5 years of learning (Yarrow et al., 2020). The authors also projected the long-term effect of this loss on the students' future annual earnings. Students are estimated to lose US\$367 or US\$484 annually under optimistic and pessimistic scenarios, respectively (Yarrow et al., 2020). More recently, a joint study by INOVASI and the Ministry of Education's Policy Research Centre (Puslitjak) (2021) suggests that, after eleven months of school closures, students in Grades 1 to 3 suffered from six and five months of learning loss in literacy and numeracy, respectively. The study was conducted in seven rural districts, and the loss was found despite additional assistance programmes by INOVASI.

Given the diversity of home learning facilities, internet access, school quality, and local education policies on distance learning, we expect learning losses to be unequally distributed across students of different characteristics. Several studies show factors that could buffer or worsen the loss. In Andrabi et al. (2020), for example, children whose mothers completed primary schooling are protected from the loss of about 0.32 standard deviation compared to their peers who experience the same shock. In line with Pakistan's study, empirical learning loss in the Netherlands also found that students from less-educated homes suffered losses 40 percent higher than those of the average students (Engzell et al., 2021). Kuhfeld et al. (2020) also projected a 0.75 standard deviation achievement gap between students from high and low socioeconomic status (SES) schools. It was assumed that students from high SES schools were more likely to receive intensive remote instruction and support from their home environment.

More than a year after the first COVID-19 school closures, there is still very limited empirical finding on the actual learning loss experienced by students worldwide. A recent paper on learning loss comes from the Netherlands, where the country experienced a "best-case" scenario with only eight weeks of lockdown. With such a short period of school closure, the country still experienced a 0.08 standard deviation of loss in student achievement, equivalent to one-fifth of a school year (Engzell et al., 2021). In Indonesia, schools have been closed for nineteen months (from March 2020 to October 2021). At the time of writing, as of October 2021, only 39 percent of schools have welcomed their students back into the classrooms under a hybrid learning arrangement (Pusdatin, 2021).

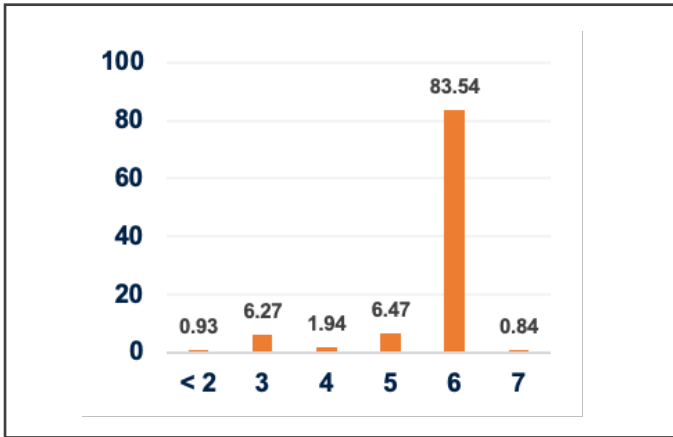
Distance Learning in Bukittinggi

In late 2019, the RISE Indonesia team went to Bukittinggi to assist the city's education agency in developing a teacher assessment tool, which they will use to determine the promotion of school-based contract teachers in public schools to district-level contract teachers. We assessed 1,513 students taught by the teachers in our sample to analyse the relationship between teacher assessment results and student performance. The absence of any intervention in this study serves as an opportunity for us to look at the effect of school closures on student learning, as there would be no confounding effects between school closures and any potential treatment.

We conducted another assessment on the same cohort of primary school students in late 2020. While we were able to conduct the assessment under a traditional classroom setting in 2019, we had to rely on home visits in 2020 due to the pandemic. To replicate the testing environment, the students worked on the pencil-and-paper test under the supervision of the enumerators. We then ran a remote survey in 2021 to ask Bukittinggi parents about their distance learning practices during school closures. To improve representativeness, we included the initial 2020 sample and added another parent sample with characteristics similar to the 2020 sample. As the differences in the results between the two groups are small, we will report the larger sample in our figures.

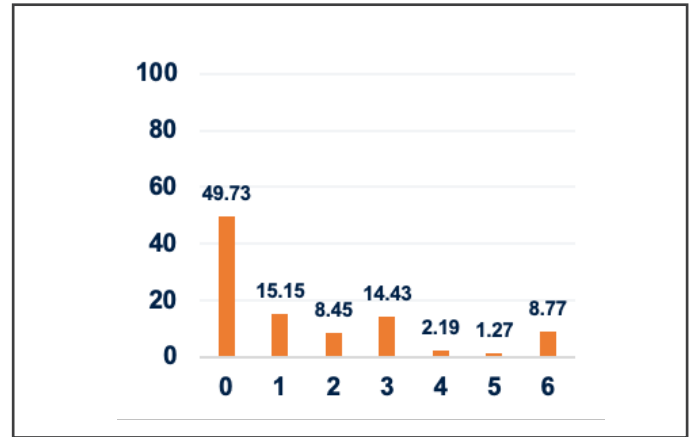
At the time of the second assessment, Bukittinggi students had undergone nearly nine months of continuous school closures from March to November 2020. However, the closure did not significantly affect their learning habits; Figure 1 shows that the majority of students continued to learn at least six days a week, which was the usual number of school days per week in Bukittinggi for primary school students. A more concerning statistic is shown in Figure 2: While students maintained the frequency of their learning, communication with teachers plummeted. Almost all students saw a decrease in communication frequency with their teachers during school closures, with close to half having no communication at all. This suggests a marked decline or even the absence of active instruction from teachers.

Figure 1: Days of learning per week (%)



Note: n=3445

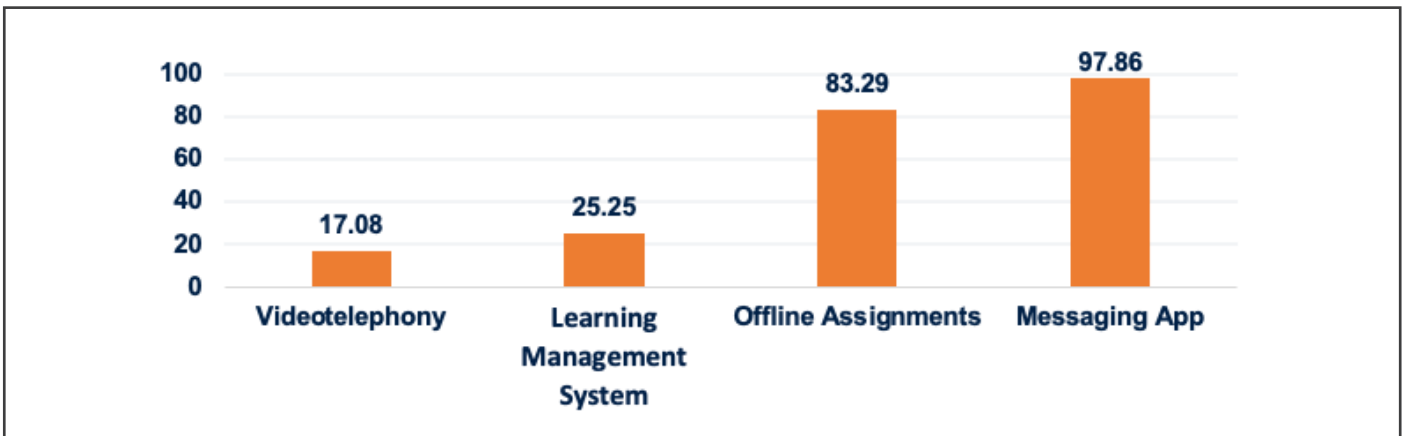
Figure 2: Days of communication with teachers per week (%)



Note: n=3445

The statistic becomes clearer when we look at the medium these students used while learning from home. While the use of digital technology has been widely touted in discussions by both the public and the government, in practice—particularly in regions outside Java and Bali—this has not been the case. Figure 3 shows that even in Bukittinggi, a highly urbanised city with widespread access to the internet and technology, only 17.08 percent of the surveyed students use videotelephony software to learn during school closures. In fact, most students had to rely on doing paper assignments (usually delivered by their teachers through messaging apps or collected by their parents at school) for their learning. This significantly changes the learning process, as interaction between students and their teachers is now very limited, replaced by traditionally complementary aspects of schooling.

Figure 3: Medium consistently used for learning during school closures (%)



Note: n=3454

The Effect of School Closures on Learning Outcomes

To establish the net effect of school closures on student learning outcomes, we compare the assessment results of second to fifth graders in 2020 with those of their counterparts in 2019. The students in our sample were all taught by teachers who participated in the assessment, randomly sampled from public schools in Bukittinggi. This makes it possible to directly treat the 2019 assessment results as the counterfactual to the 2020 assessment results in the absence of school closures.

While the nature of the study may imply that our results are only applicable to students taught by the teachers in our sample, we believe that our results can be generalised to the Bukittinggi primary school student population for four reasons. First, the sample teachers in our study are diverse in their pedagogical capabilities, which allows us to rule

out any selection bias from teacher performance. Second, at the primary school level, students are randomly placed into classes and are randomly assigned a homeroom teacher, who teaches almost every subject. This suggests that the students in our sample are a random subset of public-school students in Bukittinggi. Third, schools in Bukittinggi—both public and private—are generally at a similar level, with only small differences in average academic performance between them. This potentially extends our results' applicability to private schools in the region. Finally, most distance learning practices in Bukittinggi do not rely on technology, which dismisses any concerns that the students in our sample may benefit from being taught by contract teachers, who tend to skew younger and are more adept at using technology.

Table 1 shows our regression results. Consistent with our expectations, exposure to school closures significantly affects both numeracy and literacy assessment results. But to our surprise, and contrary to other studies, the effect is strongly positive. Students in 2020 scored on average almost half a standard deviation higher in numeracy and 0.3 standard deviation higher in literacy relative to their 2019 counterparts. This is a stunning improvement because, before the pandemic, Indonesian students had only gained on average one standard deviation in their numeracy score over **twelve years** of schooling (Beatty et al., 2021).

In columns 2 and 4, we included several potential intermediate variables in our regressions: parental engagement, intensity of communication with teachers during the week, availability of internet access, and whether the technology used for schooling is shared within the household. Compared to the first two columns, we can immediately see that there is no significant change to the coefficient on exposure to school closures, which suggests that none of these intermediate variables are channels that affect distance learning outcomes. Our results confirm our hypothesis that, due to the learning arrangements in the city, neither digital technology nor teacher interaction plays a large role in the distance learning process in Bukittinggi. Parental engagement is a trickier variable to infer, as almost all parents are either directly involved in their child's learning or delegate the task to another party—usually a private tutor.

Table 1: Multilevel Regression Results - Performance on Standardised Test

	(1) Literacy	(2) Literacy	(3) Numeracy	(4) Numeracy
Exposure to School Closures	0.321*** (0.0516)	0.327*** (0.0502)	0.460*** (0.0583)	0.457*** (0.0584)
Asset Index	-0.00393 (0.0165)	-0.00696 (0.0165)	0.0237 (0.0175)	0.0229 (0.0176)
Gender (Female = 1)	0.264*** (0.0420)	0.261*** (0.0422)	0.0500 (0.0446)	0.0537 (0.0448)
Mother Graduated High School	0.221*** (0.0495)	0.202*** (0.0504)	0.222*** (0.0526)	0.209*** (0.0536)
Parental Engagement		0.00993 (0.0417)		-0.0355 (0.0444)
No. of Days Communicating with Teachers per Week		0.000400 (0.000916)		-0.000749 (0.000973)
Internet Access		-0.0708*** (0.0241)		-0.0214 (0.0257)
Shared Technology		0.00976 (0.0215)		-0.0294 (0.0229)
Constant	-0.268*** (0.0758)	-0.180* (0.108)	-0.132 (0.0850)	0.0144 (0.119)
Intermediate Variables	N	Y	N	Y
N	1919	1763	1919	1763

Standard errors in parentheses

Note: Regression was run using a multilevel generalised linear model, nested at the individual, grade, and school level. Intercept is omitted from the table. Asset Index is a composite score based on the ownership of computers, bedroom, mobile phone, tablet, car, motorcycle, playstation, washing machine, air conditioner, refrigerator, and television. Sample size includes both 2019 and 2020 observations, some individuals are omitted due to missing relevant variables in their survey.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

How Does the Effect Differ between Groups?

Investigating further into the results, we found significant heterogeneity—and some surprising homogeneity—in the effect of school closures between groups. Figures 4 and 5 show the distribution of assessment results between 2019 and 2020 for students in the lowest and highest tercile. For low-performing students, the distribution of both numeracy and literacy scores shows a clear shift to the right from 2019, suggesting that most of the effect has been driven by the gain enjoyed by this group. By contrast, the score distribution of high-performing students in 2020 reveals that many in the group had, in fact, suffered from learning losses, as a significant portion now falls to the left of the 2019 distribution.

Figure 4: Numeracy score distribution by performance in 2019 assessment

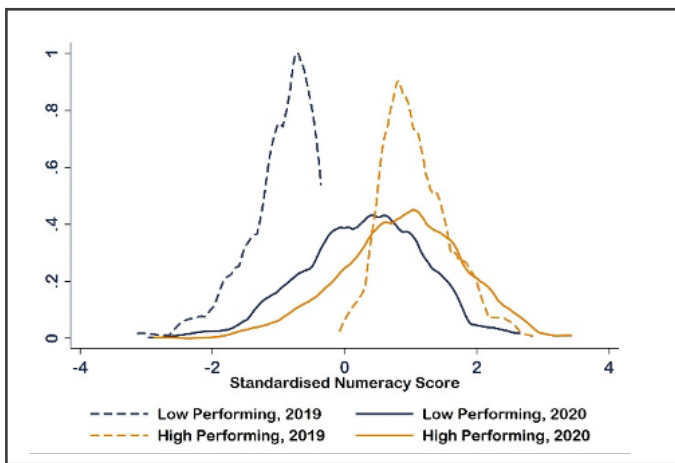
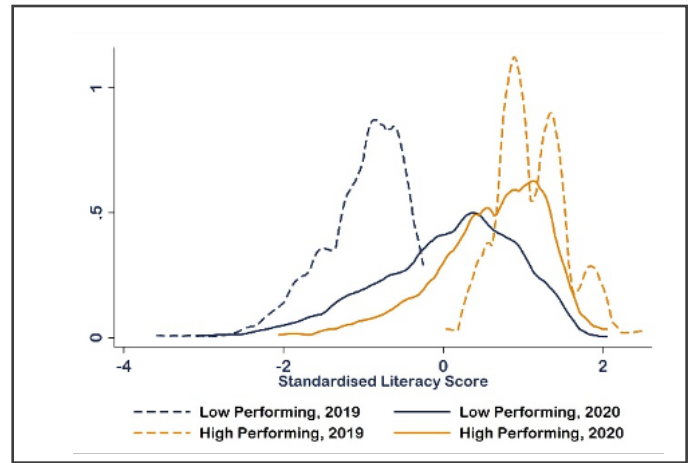


Figure 5: Literacy score distribution by performance in 2019 assessment



This is yet another surprising finding, particularly since low-performing students were frequently identified as the group most susceptible to learning loss, while high-performing students were the most resilient. Accordingly, school closures also seem to have reduced overall inequality amongst students with different initial achievements, contrary to findings from other countries. This has not been negated by increasing inequality in other areas either. As shown in Figures 6 and 7, there is virtually no considerable difference between the score distribution of children from poor and rich households both before and during school closures.

Figure 6: Numeracy score distribution by household asset index

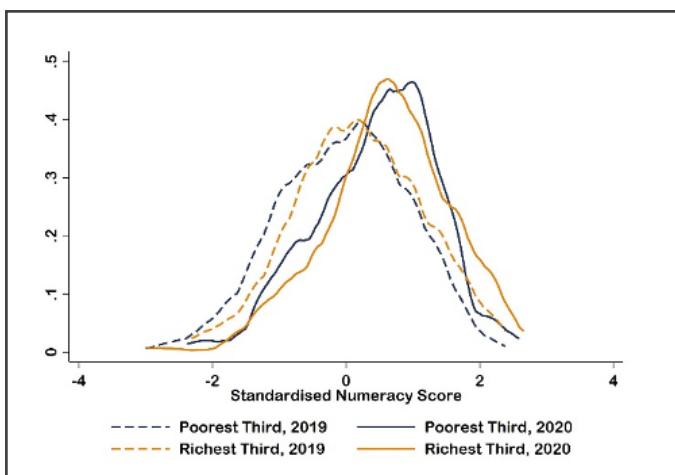
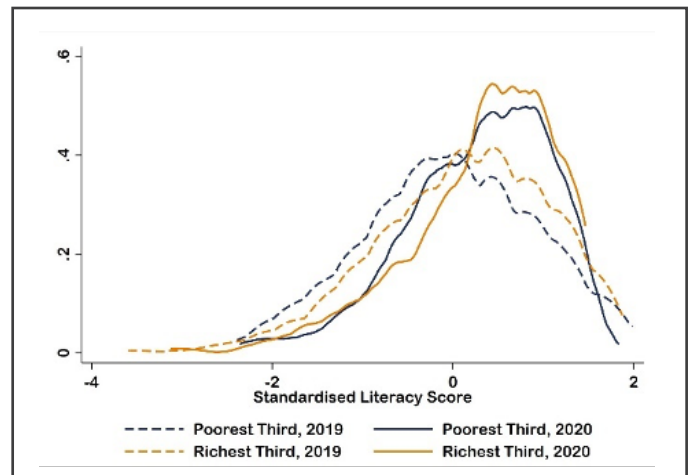


Figure 7: Literacy score distribution by household asset index



What Influences the Results in Bukittinggi?

The discussion so far paints an optimistic picture of the effect of school closures, at least relative to many expectations and findings in other countries. But what we see is likely unique to Bukittinggi, where education is a particularly important element of the local society and culture. The city's national examination average consistently ranks the highest in the province, and amongst the highest in the country. Its citizens are generally well educated, and qualitative evidence have highlighted that parents are actively involved in improving their child's learning outcome (Nihayah et al., 2020). The strong emphasis on education within households potentially enables the city to better transition into distance learning relative to other regions.

Even before the pandemic, 93 percent of the surveyed parents regularly assisted their children's studies for an average of 1.25 hours per day. When schools shifted to distance learning, the hours increased by 66 percent. This suggests that parents are likely used to creating a learning environment within their homes and have recalibrated their role in response to changes in schooling inputs. The shift from teachers to parents as the primary educator may also make a child's ability more salient and enable them to be taught at the right level, which was previously difficult to achieve in a teacher-centred classroom environment. Furthermore, our analysis is done at the primary school level, which covers basic concepts familiar to most educated adults.

But this has yet to explain why students at the upper tail of the distribution suffer from learning loss. The answer to that question most likely lies in the pedagogical tools used during school closures: while parents may be capable of assuming the role of an instructor, most still rely on the assignments given by the teachers as the basis of their teaching. During the pandemic, the Bukittinggi Education Agency published a guideline followed by most schools to simplify and lessen the difficulty of the curriculum. This potentially deprives high-performing students of the resources they otherwise could capitalise on to increase their ability.

Implications for the Rest of Indonesia

The Indonesian education system was hit hard by the COVID-19 pandemic. With education facilities closed, totalling around half a million early childhood centres, schools and universities, the time spent on learning has been limited to an average of 2.2 to 3.5 hours each day around the country (UNICEF, 2021). The UNICEF report also states that nearly half of all households have reported child behavioural challenges, with children finding it hard to concentrate. The school closure during the COVID-19 pandemic also exacerbates learning inequality; unequal access to facilities and infrastructure, differences in remote-teaching abilities, the type and location of schools, and students' household environments contribute to stark variations in distance learning outcomes.

Many teachers have been unable to teach effectively due to unequal internet access and poor network coverage. This practice is particularly common in public schools in rural areas and regions outside Java. During the first three months of school closures, around 30 percent of teachers in Java did not teach every working day, and this share may reach up to 50 percent in districts outside Java (Alifia et al., 2020). In many of these cases, students' access to smart devices or internet service is limited. Under such conditions, teachers have to physically visit their students and rely on assignment distribution to deliver subject materials, without any active teaching and learning activity. Teachers in these situations are often unable to accurately assess their students' assignments or provide opportunities to ask questions.

Unfortunately, as we have mentioned above, Bukittinggi is a highly urbanised area that is unique in its strong emphasis on education within households. Schools in other regions may not have the capability to adapt their pedagogy for distance learning, and their parents are usually not as well educated or highly involved as we saw in Bukittinggi. Parents from poor families and rural areas experience difficulties supporting their children's home-based learning due to limited facilities, such as not having a smartphone or internet data (Alifia et al., 2020). Parents in these households are usually unaware of their children's education and are less likely to participate in children's learning because they lack the information and confidence to fill that role. In contrast, students with above-average performance—like those in Bukittinggi—are more likely to have a supportive environment; they live in urban areas, have better access to facilities for distance learning, and their well-educated parents actively participate in guiding their learning as well as maintaining consistent communication with their teachers.

It is thus unlikely that we will see such optimistic results in other regions in Indonesia. In fact, as other regions are missing the enabling factors that contribute towards the success of Bukittinggi, it is very likely that the students are suffering from learning loss instead. Therefore, while within-region inequality may decrease, between-region inequality may actually increase significantly after the pandemic. It is imperative for the government to identify these regions and enact relevant efforts to recover the losses.

Conclusion: Finding a Silver Lining

Our analysis has highlighted the importance of an often-underappreciated group during school closures to which the government can shift part of its focus: parents. To date, discussion in education technology has been centred on assisting teachers and students in their teaching and learning activities. However, our findings suggest that it is equally important to assist parents in assuming the role of an educator at home. This may be through creating a structured and conducive learning environment at home or by directly teaching children the materials provided by the school as a complementary form of learning. Bukittinggi parents are evidently equipped with the right tools to assist their children due to the strong sociocultural emphasis on education that influences their pre-pandemic behaviours. But this characteristic is unlikely to extend uniformly to parents in other regions. Technologies that could facilitate these parents would significantly benefit students and potentially improve learning outcomes beyond school closures.

Our findings have also potentially emphasised the effectiveness of teaching at the right level. As schools reopen, this could be a strategy that can be utilised to improve learning outcomes. This can be achieved by maintaining parents' involvement as active instructors beyond school closures or through additional programmes such as a targeted afterschool class. Such a strategy aims to improve the learning process for initially lower-achieving students and allow initially high-achieving students to engage in a more challenging curriculum to leverage their capabilities.

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